HAWAII COMMUNITY
DEVELOPMENT AUTHORITY

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QUALITY CONTROL

January 12, 2015

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JAN 23 2015

Ms. Jessica Wooley, Director
Office of Environmental Quality Control
Department of Health
State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Ms. Wooley:

Re: Notice of Determination of Draft Environmental Assessment for the Mixed-Use Facility at Kewalo Basin at Tax Map Key ("TMK"): 2-1-058: 128 Por.

It is the Hawaii Community Development Authority's understanding that Environmental Risk Analysis, LLC has transmitted the Draft Environmental Assessment and anticipated Finding of No Significant Impact, in accordance with Hawaii Administrative Rules §11-200-11.1, for the Mixed-Use Facility at Kewalo Basin situated at TMK: 2-1-058: 128 Por., in the Honolulu District on the island of Oahu for publication in the next available edition of the Environmental Notice.

Should you have any questions or concerns regarding this Project, please contact Mr. Deepak Neupane, P.E., AIA, Director of Planning and Development, at 594-0338.

Sincerely,

Anthony J. H. Ching
Executive Director

AJHC/DN/CS:ak
c: Environmental Risk Analysis, LLC

APPLICANT ACTION
SECTION 343-5(C), HRS
PUBLICATION FORM (JANUARY 2013 REVISION)

Multi-Use Facility Kewalo Basin Draft EA
Island: Oʻahu
District: Honolulu
TMK: (1) 2-1-058:128 por**.**
Permits: Building Permit, Flood Determination, Development Permit, Special Management Area Use Permit, Site Development Approval, Sewer Connection Application, Environmental Assessment, Grading Permit, SHPD Approval, NPDES Permit

Approving Agency:
Hawaiʻi Community Development Authority, 461 Cooke St., Honolulu, Hawaiʻi 96813. Contact: Mr. Tony Ching, (808) 594-0300

Applicant:
Kewalo Waterfront Partners, Inc., 2365 Kalakaua Ave., Honolulu, Hawaiʻi 96815. Contact: Mr. Takuzo Takeda, (808) 931-8355

Consultant:
Environmental Risk Analysis LLC, 820 W. Hind Dr. #240606, Honolulu, Hawaiʻi 96821. Contact: Ms. Rachel Okoji, (808) 783-6840

Status (check one only):

_**X**_DEA-AFNSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day comment period ensues upon publication in the periodic bulletin.
__FEA-FONSI	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov; no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the approving agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov; a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the approving agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov. NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The applicant simultaneously transmits to both the OEQC and the approving agency, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqc@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The approving agency simultaneous transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the applicant. No comment period ensues upon publication in the periodic bulletin.
__Statutory hammer Acceptance	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it failed to timely make a determination on the acceptance or nonacceptance of the applicant's FEIS under Section 343-5(c), HRS, and that the applicant's FEIS is deemed accepted as a matter of law.
__Section 11-200-27 Determination	The approving agency simultaneously transmits its notice to both the applicant and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.

__Withdrawal (explain)

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page)**:**

The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The facility consists of four, two-level buildings with the majority on the second level equipped with an open deck and viewing. Combined, the four buildings include approximately 45,000 square feet of waterfront retail stores. The multi-use facility consists of four buildings and a parking structure. The buildings are two levels most with open decks viewing spaces on the second level. Buildings will be no more than 45 feet near the waterfront, as stipulated in the HCDA Makai Area Plan.

The proposed action will fully comply with programs designed for the protection and stewardship of Hawai‘i’s environmental resources and is intended to re-establish the Kewalo Basin area as a viable commercial area. The proposed action will facilitate the current and future uses of Kewalo Basin for commercial operations. As a part of the Kaka‘ako Community Development District Makai Area Plan, the proposed action is intended to create a vibrant pedestrian-oriented urban community. The multi-use facility will house various waterfront retail stores and small restaurants.

DRAFT
ENVIRONMENTAL ASSESSMENT

Multi-use Facility
Kewalo Basin
Proposed Development Project
1125 Ala Moana Blvd
Honolulu, HI 96814
Tax Map Key 2-1-058: 128 por.

Applicant:

Kewalo Waterfront Partners, Inc.

Approving Agency:

Hawai‘i Community Development Authority

January 2015

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DRAFT
ENVIRONMENTAL ASSESSMENT

Multi-use Facility
Kewalo Basin
Proposed Development Project
1125 Ala Moana Blvd
Honolulu, HI 96814
Tax Map Key 2-1-058: 128 por.

Prepared by:
Environmental Risk Analysis, LLC
820 West Hind Drive #240606
Honolulu, Hawai‘i 96824

Prepared for:

Kewalo Waterfront Partners, Inc.

Applicant:

Kewalo Waterfront Partners, Inc.

Approving Agency:

Hawai‘i Community Development Authority
461 Cooke St.
Honolulu, Hawai‘i 96813

January 2015

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Acronyms and Abbreviations

Census	U.S. Census Bureau
CIA	Cultural Impact Assessment
Cl^-	chloride
CO	carbon monoxide
dBA	decibels
DBEDT	State of Hawai‘i, Department of Business, Economic Development & Tourism
EA	Environmental Assessment
EIS	Environmental Impact Statement
HAR	Hawai‘i Administrative Rules
HCDA	Hawai‘i Community Development Authority
HDOH	Hawai‘i State Department of Health
HRHP	State of Hawai‘i Register of Historic Places
HRS	Hawai‘i Revised Statutes
FEMA	Federal Emergency Response Agency
FIRM	Flood Insurance Rate Map
FONSI	Finding of No Significant Impact
LOS	Level of Service
LR/FI	Literature Review and Field Inspection
mg/L	milligrams per liter
NAAQS	National Ambient Air Quality Standards
NO_2	nitrogen dioxide
OP	Office of Planning
PM2.5	particulate matter at 2.5 microns or less
PM10	particulate matter at 10 microns or less
SAAQS	State ambient Air Quality Standards
SEL	sound exposure levels
SHPD	State Historic Preservation Division
SMA	Special Management Area
SO_2	sulfur dioxide
TIAR	Transportation Impact Analysis Report
TMK	tax map key
ug/m^3	micrograms per cubic meter of air
UIC	Underground Injection Control
US	United States
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

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Executive Summary

This Environmental Assessment (EA) was conducted to assess potential environmental impacts associated with the construction and operation of a proposed multi-use facility at Kewalo Basin, Hawai‘i on the island of O‘ahu. The EA was prepared to identify, document and address potential environmental impacts associated with the Proposed Action. The EA examines two (2) alternatives, a No Action Alternative, and a Proposed Action Alternative defined as follows:

- Alternative I – No Action Alternative
- Alternative II – The Proposed Action – Construction of a multi-use facility: This project would provide community developments including commercial spaces and restaurants to both O‘ahu locals and visitors. This development aims to revive Kewalo Basin as a commercial area.

The following potentially impacted environments were evaluated in this EA.

- Topography and Geology
- Soils
- Natural Hazard
- Flora and Fauna
- Wetlands
- Water Resources
- Climate and Air Quality
- Noise
- Solid Wastes
- Land Use Considerations and Zoning
- Archaeological and Cultural Considerations
- Circulation and Traffic
- Social Factors and Community Identity
- Economic Considerations
- Recreational and Public Facilities
- Visual and Aesthetic Resources
- Infrastructure Systems and Utilities

<u>Findings</u>

- A Finding of No Significant Impact (FONSI) is anticipated based on the environmental and societal factors considered under Alternative I and Alternative II.
- While potential impacts to Soil, Air Quality, Noise and Circulation and Traffic are possible during construction, implementing best management practices would reduce these impacts to less than significant levels. Further impacts are anticipated during operation of the Proposed Action. These impacts can be minimized by best management practices, upgrades to infrastructure, and adherence to applicable regulations.
- Beneficial impacts to Land Use Considerations and Zoning are anticipated assuming implementation of Alternative II would address the commercial needs of the Kaka‘ako/Ala Moana neighborhood area and provide jobs to the island of O‘ahu.
- Under Alternative I, the No Action Alternative, Land Use Considerations and Zoning would incur a negative impact as full use of the land will not be realized. Additional

negative impacts are anticipated to Social Factors and Community Identity under Alternative I.

SECTION 1 INTRODUCTION AND SUMMARY

1.1 Scope and Authority

This Draft Environmental Assessment (EA) has been prepared pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS) and associated Title 11, Chapter 200 Hawaiʻi Administrative Rules (HAR). Section 343-5, HRS, establishes nine "triggers" that require environmental review under the statute. The specific trigger for environmental review of the proposed project is the use of State lands. The project area is owned by the State of Hawaiʻi. The project area is located within the Special Management Area (SMA), which is regulated by the State of Hawaiʻi, Department of Business, Economic Development & Tourism (DBEDT), Office of Planning (OP). This EA will also fulfill future SMA Use Permit application requirements of compliance with HRS Chapter 343.

State of Hawaii, Declaratory Ruling Nos. 80-01 and 84-01 state the entire Kakaʻako Development District Plan to be evaluated as a "group of proposed or possible actions" taken as a comprehensive whole. As projects are proposed for development, separate supplemental assessments are required for evaluation. The intent of the document is to ensure that systematic consideration is given to the environmental consequences of the Proposed Action. The Proposed Action is the construction of a new multi-use facility at Kewalo Basin, Oʻahu, Hawaiʻi (Figures 1 and 2).

1.2 Project Information

Project Name:	Multi-use Facility Kewalo Basin, Honolulu, Hawaiʻi
Applicant:	Kewalo Waterfront Partners, Inc. 2365 Kalakaua Ave Honolulu Hawaiʻi 96815 Contact: Mr. Takuzo Takeda (808) 931-8355
Agent:	Environmental Risk Analysis, LLC 820 West Hind Drive #240606 Honolulu, Hawaiʻi 96824 Contact: Rachel Okoji (808) 783-6840
Approving Agency:	Hawaiʻi Community Development Authority (HCDA) 461 Cooke St. Honolulu, Hawaiʻi 96813
Project Location:	Kewalo Basin Honolulu, Hawaiʻi 96814 Island of Oʻahu
Tax Map Key No.:	2-1-058: 128 por.
Total Affected Area:	Approximately 2.1 acres
Existing Land Use:	Currently paved parking area
State Land Use Classification:	Urban
State Special District:	Kakaʻako
LUO Zoning:	Kakaʻako Community Development District

LUO Special District:	Kakaʻako-Makai Area
Flood Zone:	Flood Insurance Rate Map Zone VE
Land Owner:	Kakaʻako Community Development Authority
Anticipated Determination:	Finding of No Significant Impact (FONSI)

1.3 Kakaako Makai Area Background

This section provides a background of the Makai Area, as excerpted from the 2005 Kakaako Makai Area Plan Amendment Final EA. The Kakaako Community Development District was established in 1976. This area is divided into two areas; Mauka and Makai:

- Mauka Area: The land between Punchbowl Street, King Street, Piikoi Street, and Ala Moana Boulevard.
- Makai Area: The land makai of Ala Moana Boulevard between Kewalo Basin and Pier 4, totaling 133 acres.

Over the years, many amendments to the Kakaako Makai Area Plan were made. In the 1985 revision, concerns unique to the Makai Area were addressed. These concerns included:

- Harbor use at the Fort Armstrong area;
- Central residential area;
- Preservation of scenic views;
- A proposed waterfront park at the kakaako peninsula; and
- Potential use of the Makai Area as a relocation area for displaced Kakaako Makai Area businesses.

The boundaries of the Makai Area were revised in 1987, then again in 1990. Land makai of Ala Moana Boulevard from Ala Moana Park to the Aloha Tower were now included. However, lands between Piers 4 and 8 were reassigned to the Aloha Tower Development Corporation. Property occupied by Hawaiian Electric Company makai of Nimitz Highway were excluded from those lands. The Makai Area expanded the area from 133 acres to 221 acres.

With the revised area, a 1990 revision to the Makai Area Plan was made. These revisions included:

- Removal of residential and industrial uses from the Makai Area;
- Relocation of existing uses to Sand Island, Kapalama, and Honolulu Harbors;
- Revision of roadways;
- Expansion of Ala Moana Park into Kewalo Basin;
- Creation of an inland waterway system;
- Provision for cultural and educational facilities within the waterfront park; and
- Passenger cruise ship terminals at Piers 1 and 2.

Feasibility studies were conducted in the early 1990s by HCDA on ideas proposed by the 1990 Makai Area Plan. A reevaluation of land use patterns and concepts followed, and the 1994 Proposed Makai Area Plan and Supplemental EIS were produced. This culminated in the Final Supplemental EIS which was accepted in October 1994, though the revisions to the Makai Area Plan were never adopted by HCDA.

A 1998 revision to the Makai Area Plan was made "because of a desire to balance public costs with revenues from private development, create a livelier urban environment, and improve vehicular and pedestrian flow through the area." Other revisions include, elimination of the proposed residential component from the 1994 plan, redesignation of the Commercial Zone to include a wide-range of commercial land uses such as office and retail, the addition of a Mixed-Use Zone-Industrial designation to support maritime activities, and reduction of the maximum building height from 300 to 200 feet. The 1998 Makai Area Plan was adopted by HCDA in August 1998.

The Waterfront Business Plan was adopted in October 2002. The Plan established a vision, mission, and strategy for future development of the Makai Area, and recognized the importance of residential use in a work-live-shop-play community.

The 2005 Kakaako Makai Area Plan Amendment Final EA addressed the need for residential use in the Makai Area. A Mixed-Use zone was proposed to include residential, commercial, and public use. Additionally, residential use would be allowed in the Waterfront Commercial zone. This EA will include the evaluation of the larger Makai Area in consideration of the Proposed Action.

1.4 Future Development

The Makai Area is currently undergoing many changes and development, with more planned for the future. Projects planned for the area include:

Bellavita: The site of the current a charter boat building located between Kewalo Basin Harbor and Ala Moana Blvd will be renovated and/or redeveloped to accommodate the needs of the proposed restaurant's operations, including the installation of a wood fired oven. The renovations may also include some site work for the construction of the outdoor seating patio. The proposed project will encompass approximately 6,000 square feet within Kewalo Basin and will be occupied by an Italian Restaurant, Napule.

Kupu Green Job Training Center: First-of-its-kind facility for creating leadership in the growing green jobs sector. The new facility will provide youth with the opportunity to learn skills for a more sustainable future and to build partnerships that can serve as a global model of responsible stewardship and a thriving community.

Kewalo Basin Improvements: Replacement of piers and utilities of the small boat harbor. Other improvements may include security upgrades and dock renovations, to benefit the charter boat businesses, fishermen and other harbor users, upgrading restrooms, adding food service and a convenience store for boaters.

Seagull Schools: Kaka'ako First School project will provide for a new 15,380 square foot center for up to 270 children on a 3/4 acre parcel of land adjacent to the Kaka'ako Park. The three building center consists of 11 classrooms, a commercial kitchen, administrative space, two playground areas, and a kupuna training/gathering room.

Historic Pump Station: Restoration of the historic structure and inclusion of plan for community use.

Kamehameha Schools Redevelopment: Kamehameha Schools lands west of the Kewalo Harbor are being redeveloped with low-rise residential and a few commercial units. There will be a pedestrian pathway to access the City & County of Honolulu rail station.

Howard Hughes Corporation: Currently constructing luxury high-rise condominiums mauka of Ala Moana Boulevard, with development rights for a total of 22 condos in its Ward Villages master plan.

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Environmental Risk Analysis	PROJECT NAME: Environmental Assessment for Kewalo Waterfront Partners, Inc. Kewalo Basin Honolulu, Hawaii	FIGURE TITLE: Site Location Map FIGURE NUMBER: 1

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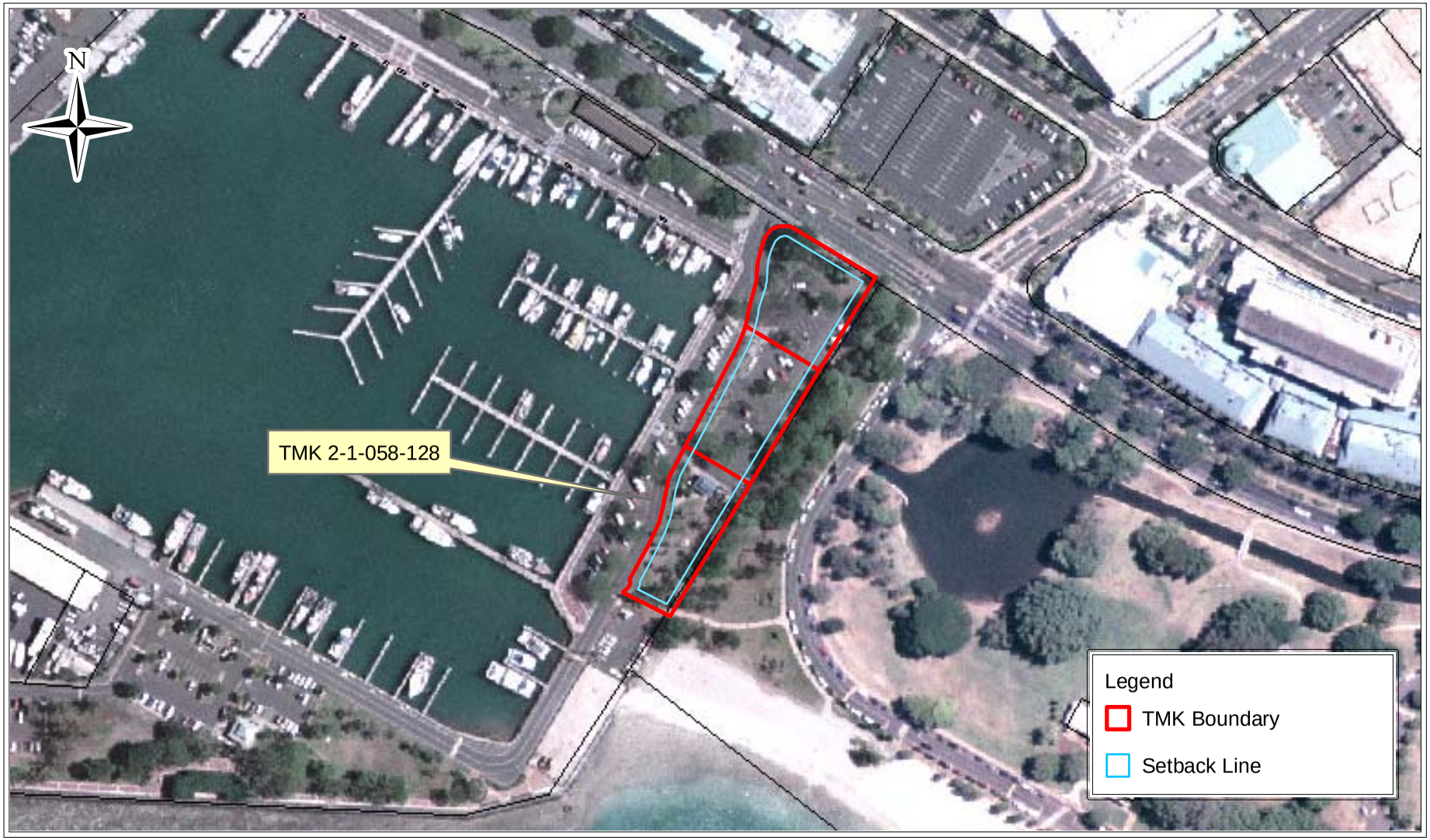

Environmental Risk Analysis	PROJECT NAME: Environmental Assessment for Kewalo Waterfront Partners, Inc. Kewalo Basin Honolulu, Hawaii	FIGURE TITLE: TMK Map FIGURE NUMBER: 2

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SECTION 2 PROJECT DESCRIPTION

2.1 Purpose and Need

Purpose: This EA has been prepared to satisfy the requirements of HRS Chapter 343. The purpose of the Proposed Action (i.e., the proposed addition) is to re-establish the Kewalo Basin area as a viable commercial area.

Need: The proposed action will facilitate the current and future uses of Kewalo Basin for commercial operations. As a part of the Kakaʻako Community Development District Makai Area Plan, the proposed action is intended to create a vibrant pedestrian-oriented urban community. The multi-use facility will house various waterfront retail stores and small restaurants.

2.2 Project Description

The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The facility consists of four, two-level buildings with the majority on the second level equipped with an open deck and viewing spaces (Figures 3 through 7). Combined, the four buildings include approximately 45,000 square feet of waterfront retail stores. The multi-use facility consists of four buildings and a parking structure. The buildings are two levels most with open decks viewing spaces on the second level. Buildings will be no more than 45 feet near the waterfront, as stipulated in the HCDA Makai Area Plan.

- Building 1, located adjacent to Ala Moana Boulevard, will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants.
- Moving southwest, Building 2, similarly to Building 1, will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants.
- Building 3 will offer commercial uses including a live entertainment venue and a restaurant and bar on the ground floor, and office space and open decks on the 2nd floor.
- Building 4 is separated from the other buildings by a 24-foot wide drive aisle and is located east of Building 3. Building 4 will offer commercial uses which include a café on the ground floor and a multipurpose hall on the 2nd level.
- A 250-stall garage is a two level structure and will be located between Buildings 1 and 3, adjacent to Building 2.

2.3 Construction Time Frame and Estimated Project Construction Costs

Construction is expected to commence in September 2015. It is projected that construction would take place for a duration of 15 months. The total budget for these improvement activities is estimated at $40 million. Kewalo Waterfront Partners, Inc will provide the anticipated primary financing.

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Project Location
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 3

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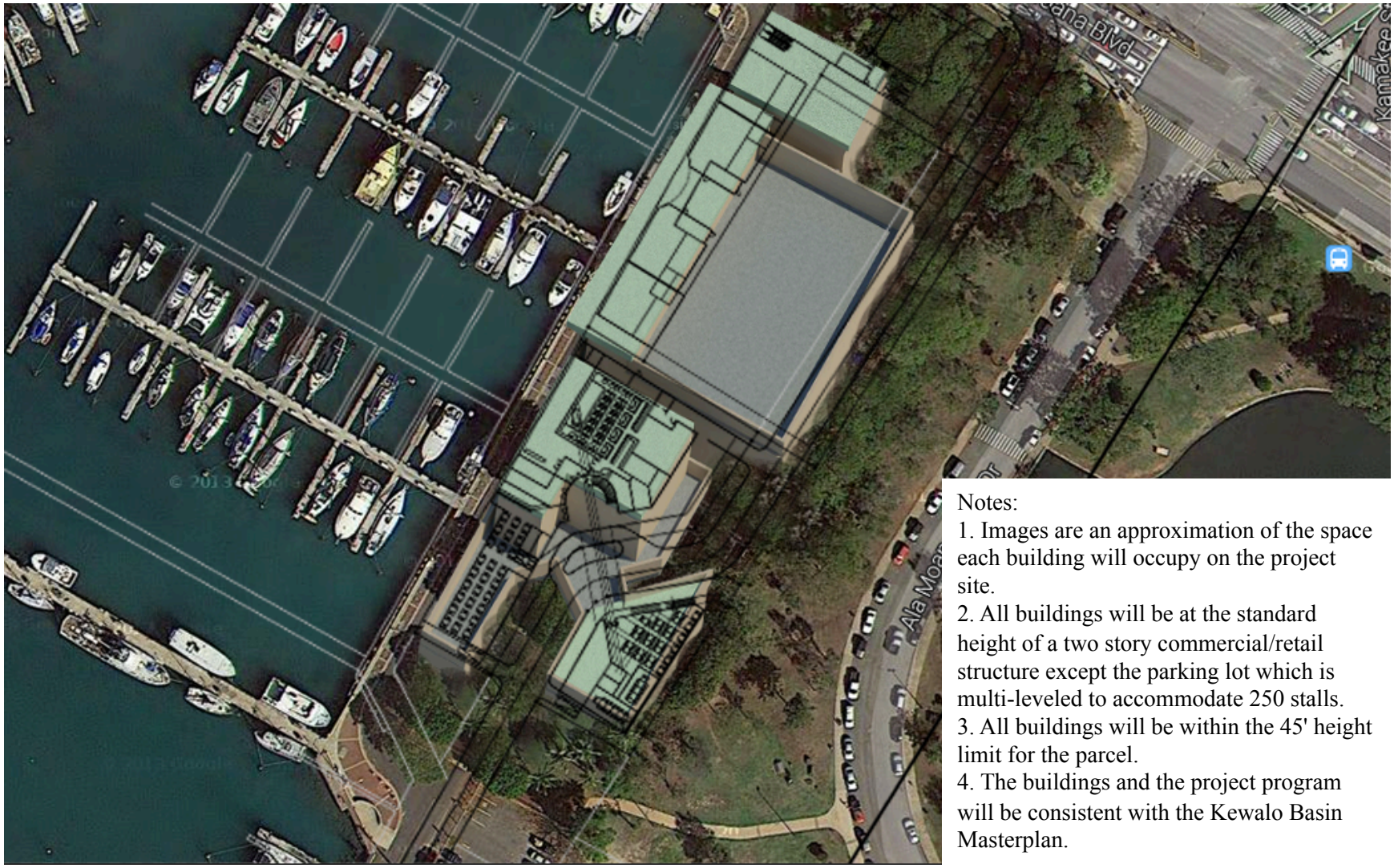

Notes:
1. Images are an approximation of the space each building will occupy on the project site.
2. All buildings will be at the standard height of a two story commercial/retail structure except the parking lot which is multi-leveled to accommodate 250 stalls.
3. All buildings will be within the 45' height limit for the parcel.
4. The buildings and the project program will be consistent with the Kewalo Basin Masterplan.

Environmental Risk Analysis

Site Layout and Massing
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 4

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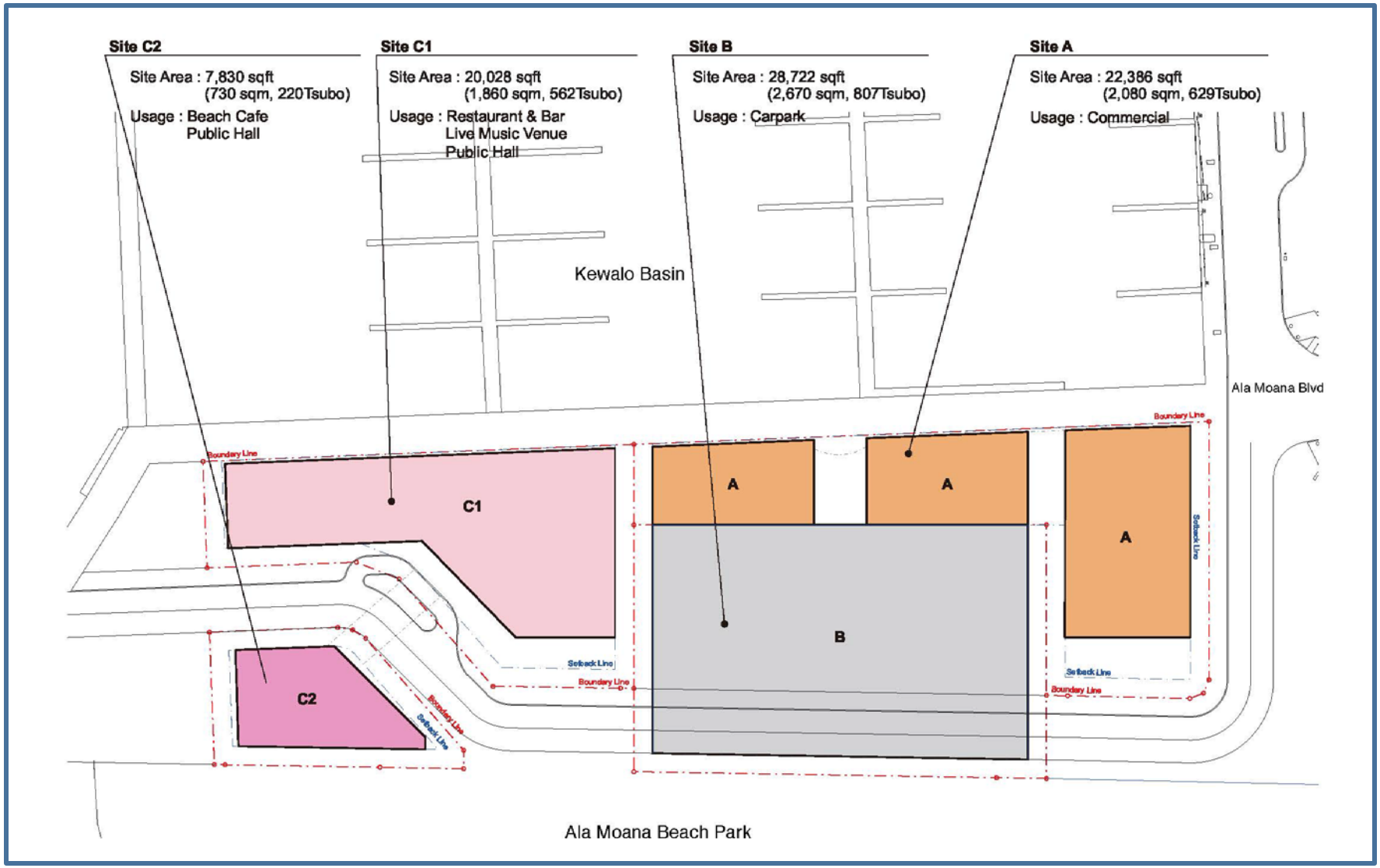

All structures depicted are new construction.

Environmental Risk Analysis

Site Layout
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 5

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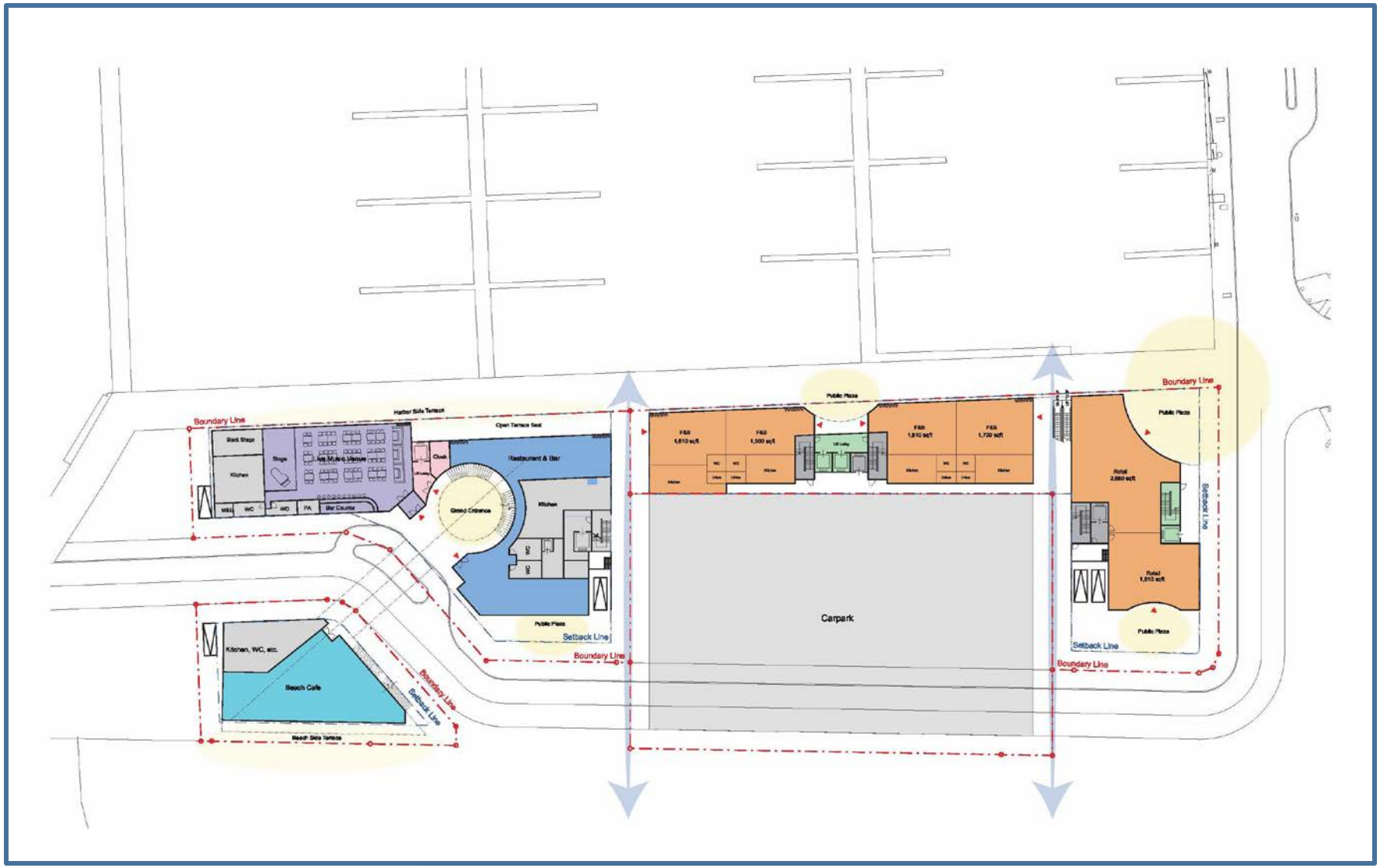

All structures depicted are new construction.

1st Floor Plan
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 6

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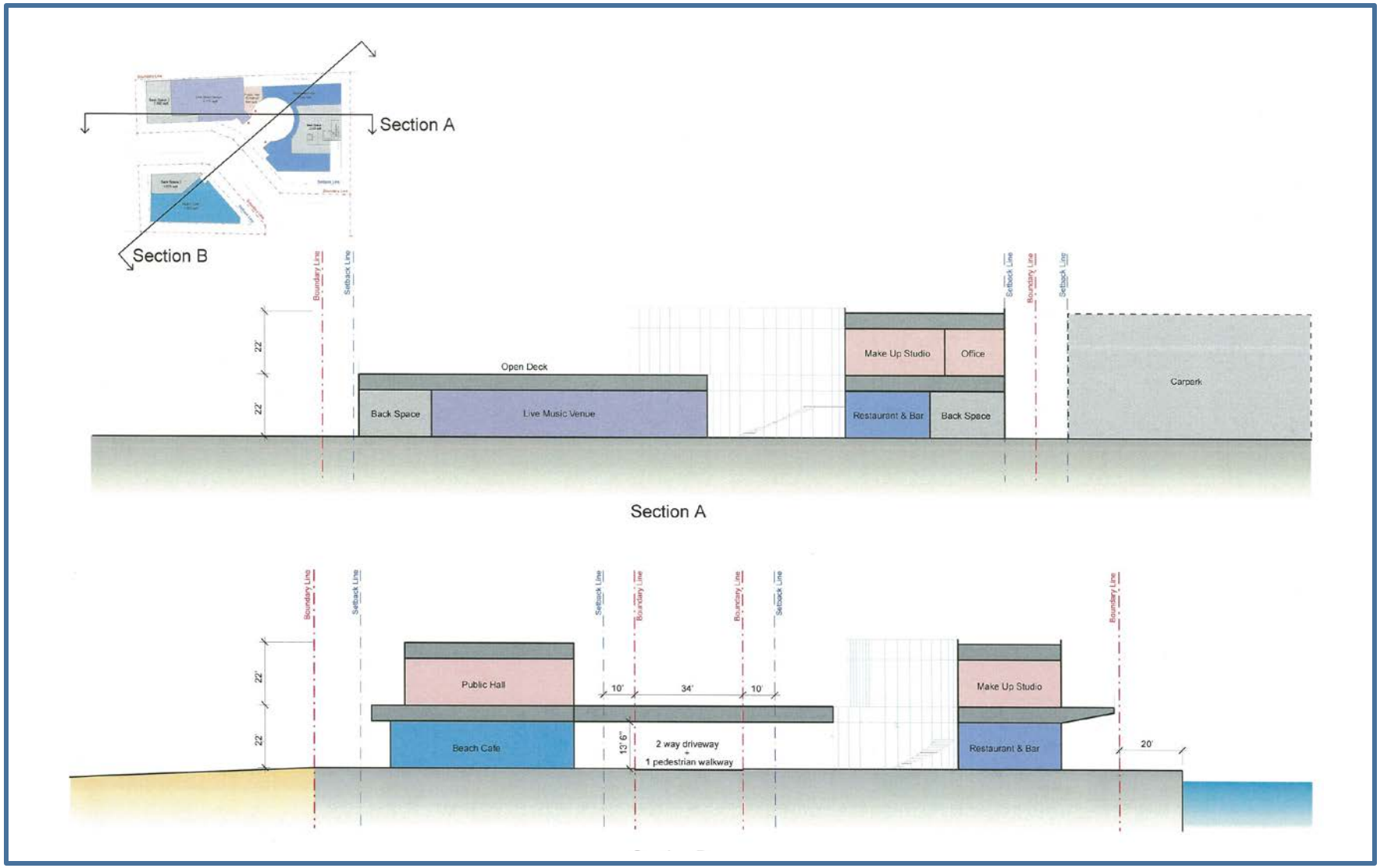

All structures depicted are new construction.

Building Sections
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 7

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SECTION 3 ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section details the alternatives that were analyzed in the Draft EA. Under HAR, Title 11, Department of Health, Chapter 200 Environmental Impact Statement Rules, Section 11-200-17(f), all alternatives considered for the proposed project should be evaluated. These alternatives may possibly enhance environmental quality or avoid, reduce, or minimize some or all of the adverse environmental effects, costs, and risks.

3.1 Alternative I: No Action Alternative

Under the No Action alternative, the Site would be kept as is with no changes or alterations. This alternative would not accomplish the goals detailed in Section 2.1, Purpose and Need and would leave much of the existing Site vacant.

3.2 Alternative II: The Proposed Action

Encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park, the proposed project is a multi-use facility. It will consist of four, two-level buildings with the majority on the second level equipped with an open deck and viewing spaces. Combined, the four buildings include approximately 45,000 square feet of waterfront retail stores; small restaurants, cafes and bars; commercial office space; a live entertainment venue; and a large observation deck and signature multipurpose venue on the second floor. Additionally, the proposed project includes a 250-stall, multi-level parking structure.

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SECTION 4 AFFECTED ENVIRONMENT

This section discusses the current status of the potentially affected environments should the Proposed Action be implemented. Affected environments inclFude important natural and cultural sources and systems. Environmental consequences are provided in Section 5.

4.1 Physical Environment

4.1.1 Topography and Geology

According to the U.S. Geological Survey (USGS), Honolulu, Hawaiʻi, 7.5 minute topographic quadrangle map, the Kewalo Basin Harbor elevation is approximately 0 feet above mean sea level (USGS, 1989). The Site is primarily flat and is mostly paved or constructed upon. The area of the proposed construction currently is a paved asphalt parking lot.

The 2005 Makai Area Final EA noted the Makai area is underlain by a coral layer approximately 5 to 20 feet below mean sea level.

4.1.2 Soils

The *Web Soil Survey* (U.S. Department of Agriculture (USDA), 2012) presents detailed information regarding soil types present on the Island of Oʻahu. The dominant soil type in the project area is listed as 100% Fill Land, material dredged from the ocean or hauled from other sources. Existing vegetation is sparse and only in designated planter box or lawn areas.

4.1.3 Natural Hazard

Flood hazard areas are delineated by Flood Insurance Rate Maps (FIRMs) prepared by the Federal Emergency Response Agency (FEMA), National Flood Insurance Program. Firm Panel 15003C0362G depicts flood hazard for the Site (Figure 8). The project area is categorized as Zone AE and defined as an area where flood hazards are determined.

A tsunami is a series of great waves, typically the result of a violent displacement of the seafloor. Tsunamis are characterized by high speed (up to 560 miles per hour (mph), long wave lengths (up to 120 miles), and long periods between successive wave crests (up to several hours). Tsunamis have the potential to inundate the coastline, causing severe property damage and/or loss of life. The Tsunami Inundation Zone Map 17 indicates the tsunami hazard for the area (Figure 9). The project area is designated as Tsunami Inundation Zones (City and County of Honolulu, 2010). Draft Extreme Tsunami Evacuation Maps were produced by the City and County of Honolulu and proposed in 2014. The area is located on Map 19, Inset 2, and is still designated as a tsunami hazard zone.

4.1.4 Flora and Fauna

There is moderate landscaping on Site consisting mainly of trees and grasses. As noted in the Kewalo Basin Repairs Project, Draft Environmental Impact Statement (October 2010), a few native species were observed in the park landscaping. These included the hala, loulu palm, and areca palm.

Dogs, cats, rodents, and mongoose have been documented in the Kakaʻako area. Birds commonly observed in the area include common mynahs, common pigeons, zebra dove, spotted dove, sparrows, and finches. University of Hawaiʻi, Center for Conservation Research and Training records were reviewed by the U.S. Fish and Wildlife Service (USFWS) resulted in no record of threatened or endangered species at the Site.

4.1.5 Wetlands

The USFWS National Wetland Inventory (USFWS, 2014) did not identify any wetlands in the project area. However, the harbor area is approximately 20 feet from the project area. It is classified as a 32.97-acre estuarine and marine deepwater wetland.

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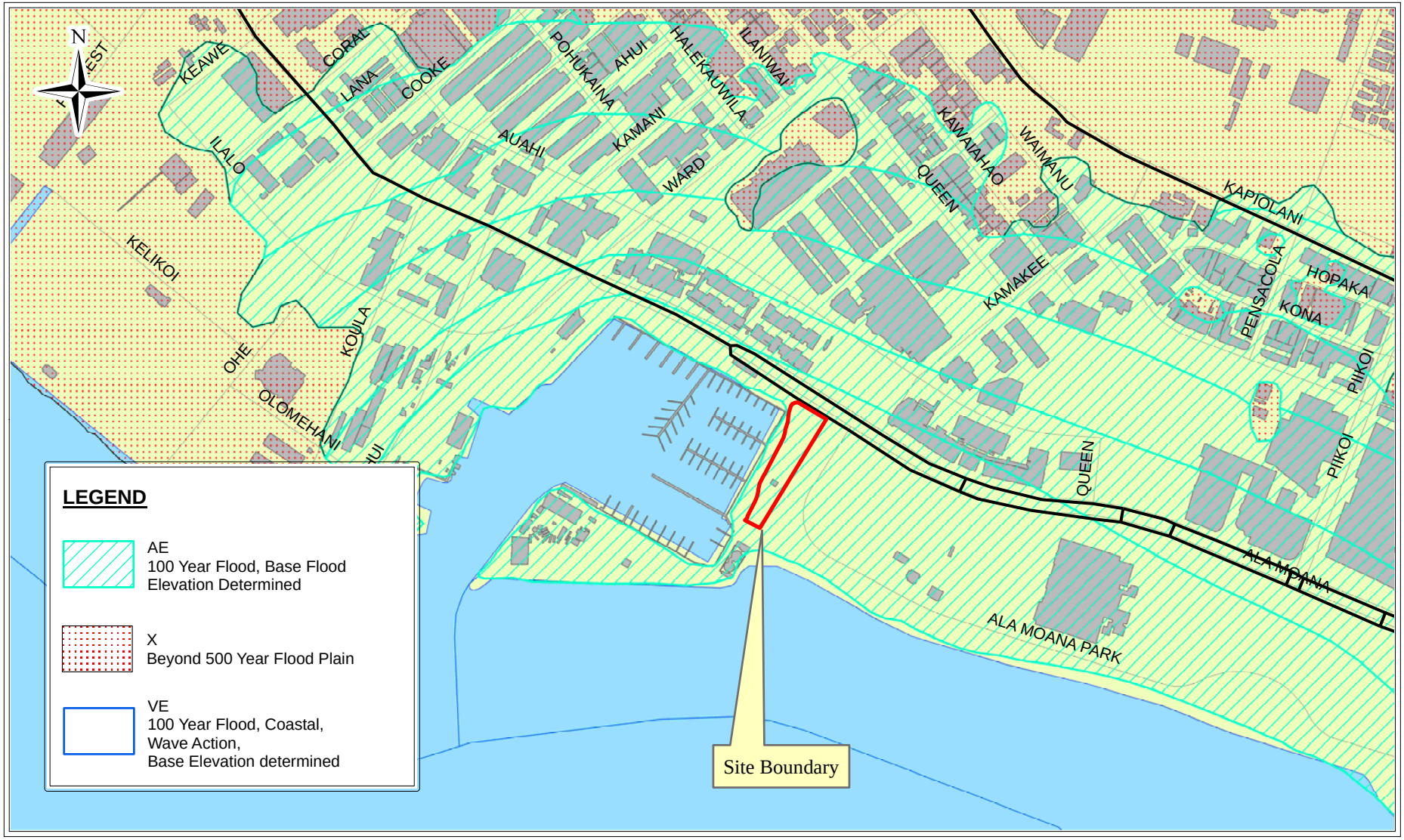

0 0.125 0.25 0.5 0.75 Miles

Environmental Risk Analysis	PROJECT NAME: Environmental Assessment for Kewalo Waterfront Partners, Inc. Kewalo Basin Honolulu, Hawaii	FIGURE TITLE: FIRM Map FIGURE NUMBER: 8

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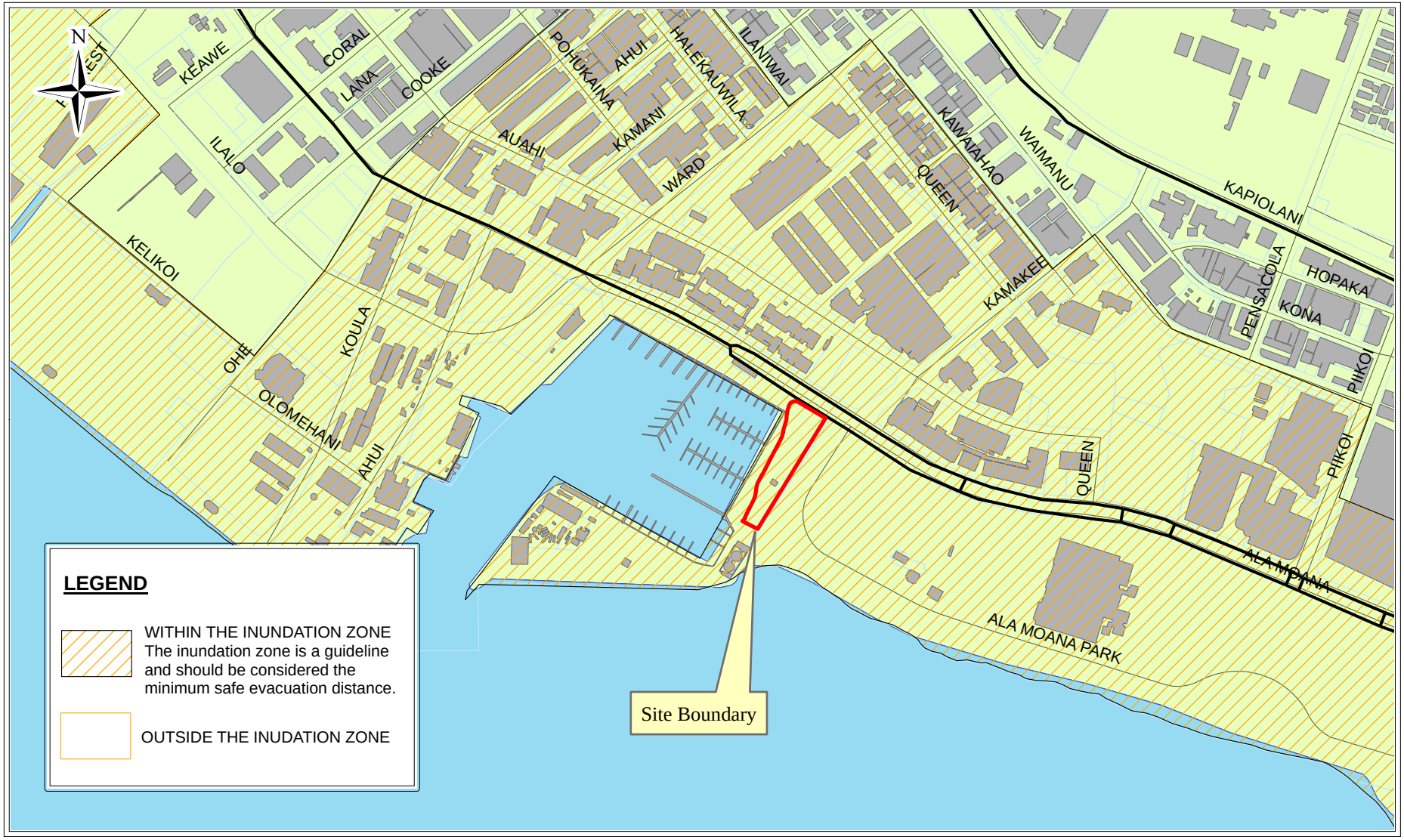

Environmental Risk Analysis	PROJECT NAME: Environmental Assessment for Kewalo Waterfront Partners, Inc. Kewalo Basin Honolulu, Hawaii	FIGURE TITLE: Tsunami Inundation Zone Map FIGURE NUMBER: 9

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4.1.6 Water Resources

Groundwater

The Site is defined by aquifer code: 30101116 (23321). The Site is situated in the Palolo aquifer system which is comprised of a sedimentary caprock aquifer. The upper, sedimentary caprock aquifer is an unconfined, sedimentary, basal aquifer. It has moderate salinity (1000-5000 milligrams per liter [mg/L] chloride [Cl^-]), and is categorized as a non-drinking water source that is also not ecologically important. It is replaceable, and highly vulnerable to contamination (Mink and Lau, 1990). The majority of the aquifer system is makai, or down-gradient, of the Hawai‘i State Underground Injection Control Line (UIC). Typically, aquifers that are down-gradient of the UIC line are considered non-potable, and aquifers up-gradient of the UIC line are considered potential drinking water sources. Since the Site is located down-gradient of the UIC line, the water below the Site is characterized as non-potable.

Surface Water

There are no streams or surface water features at the Site. The nearest surface water bodies are the Pacific Ocean to the west and Kewalo Harbor to the north.

4.1.7 Climate and Air Quality

The climate found in Kewalo Basin is characterized by mild and constant temperatures, moderate humidity, and the persistence of the northeasterly trade winds. Daily maximum temperatures range from low to high 80s. Daily minimum temperatures range from mid-60s to low 70s. The average annual rainfall is approximately 20 to 25 inches per year. The majority of the total annual rainfall occurs between October and March, with the wettest months occurring in November through January.

Air quality at the Site is considered to be good and meets National Ambient Air Quality Standards (NAAQS) and State Ambient Air Quality Standards (SAAQS). Air quality in the vicinity is most likely affected by emission from industrial activities, commercial vessels, and motor vehicle traffic on local roadways.

The Hawai‘i State Department of Health (HDOH) maintains air monitoring locations throughout the state. There are two monitoring locations near the Site. The Honolulu air quality monitoring station is located on the roof of the DOH building (Kinau Hale) in downtown Honolulu’s business district, approximately 1.5 miles north of the Site. Parameters monitored at this location are carbon monoxide (CO), particulate matter at 10 microns or less (PM10), particulate matter at 2.5 microns or less (PM2.5), nitrogen dioxide (NO_2), and sulfur dioxide (SO_2). Measurements reported in the 2011 Annual Summary Hawai‘i Air Quality Data (HDOH, 2011) and applicable NAAQS and SAAQS are found in the following table, Table 1.

Table 1: Hawai‘i Air Quality Data 2011

2011 Annual Summary of Hawai‘i Air Quality Data					
Air Pollutant	**Averaging Time**	**Annual Mean (micrograms per cubic meter of air [ug/m^3])**	**Standards**		
			Hawai‘i State Standard (ug/m^3)	**Federal Primary Standard (ug/m^3)**	**Federal Secondary Standard (ug/m^3)**
Carbon Monoxide	1-hour	0.4	10,000	40,000	40,000
	8-hour	0.4	5,000	10,000	10,000
Nitrogen Dioxide	Annual	---	70	100	100
PM_{10}	24-hour	12.2	150	150	150
$PM_{2.5}$	24-hour	4.7	---	65	65
Sulfur Dioxide	3-hour	0.001	1,300	---	1,300
	24-hour	0.001	365	365	---

4.1.8 Noise

Noise impacts from construction-related activities are regulated under the HAR, HDOH, Title 11, Chapter 46, Community Noise Control. The project area is zoned urban; and as such falls into District Class B under the HDOH regulations, with a maximum day (7:00 a.m. to 10:00 p.m.) and night (10:00 p.m. to 7:00 a.m.) sound level threshold of 60 A-weighted decibels (dBA). District Class B covers areas zoned as multi-family dwellings, apartment, business, commercial, hotel, or resort type facilities.

Construction activities will exceed the HDOH sound level thresholds noted. Table 2 lists sound exposure levels (SELs) associated with typical equipment, in varying operating modes. A construction noise permit will be required during construction activities.

Table 2: Typical Equipment Sound Levels

Equipment	**Sound Level (in dBA) Under Indicated Operational Mode**		
	Idle Power	**Full Power**	**Moving Under Load**
Dozer	63	74	81
Dump Truck	70	71	74
Excavator	62	66	72
Forklift	63	69	91
Front-end Loader	60	62	68
Grader	63	68	78
Sweeper	64	76	85
Tractor-Trailer	67	78	77

Once operations of the multi-use commence, noise at the Site will increase via contributions through operation of the restaurant, live music, and other entertainment type activities. Those establishments with a liquor license will be held to the Hawaii Liquor Commission laws. Hawaii Liquor Commission laws are similar to HDOH regulations. The project area falls into Zoning district B under the Hawaii Liquor Commission rules, with a maximum day (7:00 a.m. to 10:00 p.m.) and night (10:00 p.m. to 7:00 a.m.)

sound level threshold of 60 C-weighted decibels (dBC). Zoning district B covers areas zoned as multi-family dwellings, apartment, business, commercial, hotel, or resort type facilities. According to the National Restaurant Association, the average noise levels found at restaurants is around 70 decibels. Inclusion of the entertainment venue would increase noise levels during performance times to above 70 decibels. Typical concert levels can exceed 100 decibels. Noise levels at the live music venue are expected to be much lower than concert levels as the scale of the event is much smaller. These noise levels may be obscured by traffic noise on Ala Moana Boulevard or adjacent maritime activities (i.e., boat engines in the harbor).

4.1.9 Solid Waste

Solid waste on the island of Oʻahu is incinerated at the H-POWER waste-to-energy facility located in Campbell Industrial Park. According to the City and County of Honolulu, Department of Environmental Services website, Opala.org, Oʻahu recycling rates are above the national average and Honolulu ranks among the top cities in the country in landfill diversion. The H-POWER facility reduces the volume of waste entering the landfill by 90%. The remaining ash is deposited at the Waimanalo Gulch Sanitary Landfill. Construction and demolition wastes are handled separately and are disposed of at the PVT Landfill.

4.2 Social Environment

4.2.1 Land Use Considerations and Zoning

According to the State Land Use Commission district classifications, the project site is zoned urban.

4.2.2 Archaeological and Cultural Considerations

The following information was taken from the Kewalo Basin Repairs Project Draft EIS October 2010 document.

> Over the last century, the Kakaʻako area has been heavily modified by filling of the area for land reclamation. The act of adding fill to the area has also contributed to preserving the pattern of early Hawaiian life and the remains of nineteenth century Honolulu. Hawaiians used the lowland marshes, wetlands, salt pans, and coral reef flats of the area for salt-making and farming of fishponds. Land Commission Award documents reveal that much of Kakaʻako lands were used to produce salt. Kakaʻako has also served as a location for undesirable land uses such as a quarantine camp and cemetery for victims of the 1853 smallpox epidemic; hospital for victims of the 1895 cholera epidemic; quarantine camp for patients of 1899 bubonic plague; animal quarantine; and garbage incinerator.
>
> Kewalo Basin was later home to the commercial fishing industry, though this declined after World War II. Currently Kewalo Basin houses four items that may be considered cultural resources:
>
> - a statue at the harbor entrance enshrining the pueo (owl) as the protector of the Kakaʻako area;
> - an honorific statue of the Blessed Mother Marianne Cope for her historic efforts in battling Hansen's disease;
> - a Native Hawaiian garden associated with the Hālau Kū Māna public charter school (that leases space in the net shed next to Kewalo Basin Park);
> - and the net shed, a structure originally designed for the repair of the fishermen's nets.

In 2014, an archaeological literature review and field inspection (LR/FI) and a Cultural Impact Assessment (CIA) were conducted for the project by Cultural Surveys Hawaiʻi, Inc. (2014a and 2014b,

respectively). These reports included historical research and interviews with community members to construct a history of land use and determine if cultural and archaeological sites have been recorded in or near the area. The findings of the studies are summarized in this section; the full reports are included as Appendix A (LR/FI) and B (CIA).

LR/FI

A detailed historical, cultural, and archaeological background research and field inspection of the Site was performed to determine the likelihood of historic properties being affected by the proposed project. The LR/FI did not identify any property of cultural significance during the investigation. As such, an archaeological inventory survey will likely not be required by the State Historic Preservation Division (SHPD), nor were any mitigative requirements presented. The SHPD is being consulted. If any archaeological

CIA

Though the area is primarily fill land, there is much history noted for the area (as mentioned above). Research and interviews with Hawaiian community members knowledgeable of the project area and vicinity did reveal concerns regarding potential adverse impacts on cultural, historic, or natural resources, or practices and beliefs from the proposed multi-use facility project. These concerns, taken from the 2014 CIA, include the following:

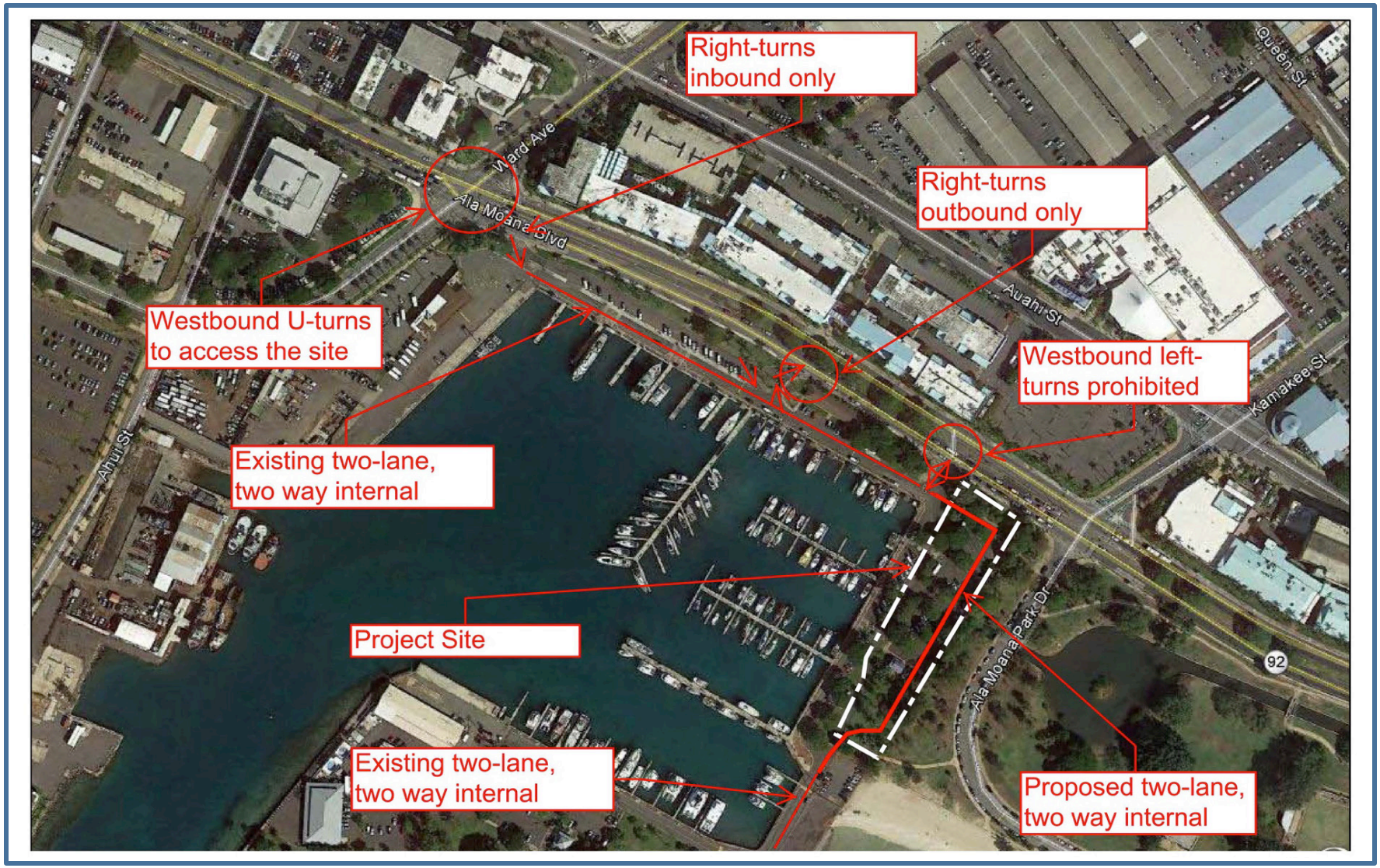
- Ala Moana Beach Park is designated as a historic property (SIHP # 50-80-14-1388). Concerns about historic integrity were raised and suggestions that the design and construction of the project area "should emphasize computability with the historic setting and views" and referenced the Secretary of the Interior's Standards for the Rehabilitation of Historic Properties to provide a framework and guidelines for new construction within a historic district.
- Historic Hawai'i Foundation recommended the surf break, Kewalos, be designated as a Traditional Cultural Property, which may be eligible to be listed on the Hawai'i Register of Historic Places. Contributing features could be accessed via land and sea, which should be integrated into development plans.
- Consultation with State of Hawai'i recognized descendants after the CIA is completed and prior to an archaeological inventory survey plan being developed.

4.2.3 Circulation and Traffic

Access to the site would mainly be from Ward Avenue/Ilalo Street and Ala Moana Boulevard. Ala Moana Boulevard fronts the Kewalo Basin property to the north, with Ward Avenue /Ilalo Streetintersecting Ala Moana Boulevard from the north. There are three entrances to the Kewalo Basin area. All are along Ala Moana Boulevard. Figure 10 depicts the vehicular traffic circulation and Figure 11 depicts the pedestrian circulation. The area surrounding the Site is densely populated, and traffic is usually moderate to heavy.

A transportation impact analysis report (TIAR) was conducted in 2014 for the proposed project (Fehr & Peers, 2014) and is provided in Appendix C. Traffic operations of seven (7) key intersections were evaluated with level of service calculations during the weekday evening (PM) and Saturday mid-day (Sat) peak periods for Existing, Existing plus Project, Cumulative Year 2017, and Cumulative Year 2017 plus Project conditions. The scenarios are as follows:

- Scenario 1: Existing Conditions: Existing volumes observed during the TIAR.
- Scenario 2: Existing Plus Project Conditions: Scenario 1 plus traffic estimated and anticipated from project build-out and full occupancy.



Environmental Risk Analysis

Vehicular Circulation
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 10

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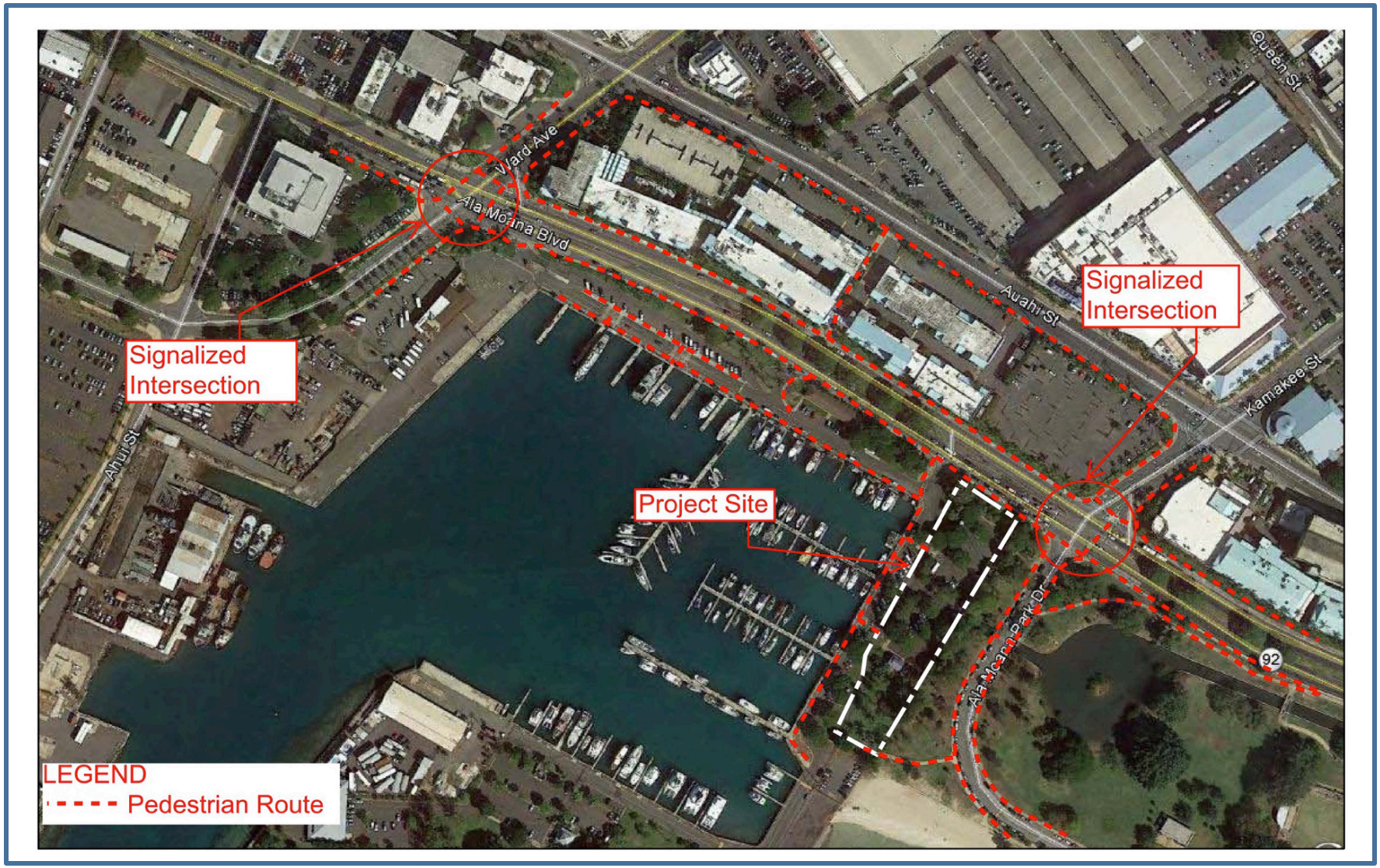

Pedestrian Circulation
Environmental Assessment for Kewalo Waterfront Partners , Inc.
Kewalo Basin, Honolulu, Hawaii

Figure 11

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- Scenario 3: Cumulative Year 2017 Conditions: Scenario 1 increase by an annual growth factor plus additional anticipated traffic from related projects in the study area expected to be constructed and occupied by the Cumulative Year 2017.
- Scenario 4: Cumulative Year 2017 Plus Project Conditions: Scenario 3 plus traffic estimated and anticipated from project build-out and full occupancy.

Due to the proposed mixed land use and information from prior traffic studies (see the 2010 study summary below), the TIAR focused on time periods that would be most impacted by the proposed development. The TIAR findings project an increase in delays at the seven study intersections; however no significant traffic impacts were identified at any of the study intersections. Generally, the proposed project is not expected to substantially increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities. The installation of bicycle racks is recommended to provide secure bicycle storage within sight of employees and customers.

A traffic study was performed for the area as part of the Kewalo Basin Repairs Project Draft EIS October 2010 document. The following information is excerpted from that document.

> Existing traffic conditions, as observed in the 2010 supporting study to the Kewalo Basin Repairs Project Draft EIS document, for the Ala Moana Boulevard and Ward Avenue/Ilalo Street intersection were found to be at acceptable levels of service for urban areas (Level of Service [LOS] D or better) during peak morning and afternoon hours.
>
> Existing traffic conditions, as observed in 2010, for the Ala Moana Boulevard and Kewalo Basin Access intersection were found to be at good levels of service for urban areas (LOS) during peak morning and afternoon hours.
>
> Traffic conditions projected into 2012, maintained the same LOS for both intersections.

Public transportation in Hawaiʻi is provided by the City and County of Honolulu, Department of Transportation Services. Oʻahu Transit Services (operator of TheBus) is contracted by the Department of Transportation Services to provide fixed route bus service. There are numerous bus stops in the area (within ½ mile) that service 23 fixed-route bus lines. Bus routes for the area include:

- Route 3
- Route 6
- Route 8
- Route 9
- Route 13
- Route 17
- Route 18
- Route 19
- Route 20
- Route 23
- Route 40
- Route 42
- Route 52
- Route 53
- Route 55
- Route 56
- Route 57, 57A
- Route 62
- Route 65
- Route 88A
- Route A
- Route C

The Oʻahu Bike Plan calls for bikeways to be added to most of the major streets in the Kaka'ako area. Multiple bicycle paths are proposed for the Kewalo area. Of these include a connection between the existing mauka and makai bike paths in Ala Moana Beach Park, as well as an extension to Kewalo Basin. Other projects include:

- Auahi Street between Ala Moana Boulevard and South Street (Route)
- Ward Avenue between Ala Moana Boulevard and Prospect Street (Route)
- Halekauwila Street between Ala Moana Boulevard and Ward Avenue (Route)
- Kamakee Street between Ala Moana Boulevard and McKinley High School (Lane)
- Ala Moana Boulevard between Kalakaua Avenue and Fort Street Mall (Lane)

The Honolulu Rail Project will also include the Kakaʻako area, with the rail system beginning in East Kapolei and ending at Ala Moana Center. A rail station is planned at the intersection of Halekauwila Street and Ward Avenue.

4.2.4 Social Factors and Community Identity

The Site is located in Kakaʻako across the Ward Shopping area. The area is comprised of retail, commercial, and residential enterprises.

According to the U.S. Census Bureau (Census, 2010), the Site falls within Census Tract 38 which has a population of 3,970 individuals.

4.2.5 Economic Considerations

Residents living within Census Tract 38 have an annual household median income between $75,001 - $100,000 (Census, 2010). This is in the range of Honolulu County's annual household mean income of $83,359 (Census, 2010).

4.2.6 Recreational and Public Facilities

Recreational activities in the area mainly consist of water or beach sports. Area water activities include netting, fishing, topical fish collecting, surfing, scuba diving, paddling, kayaking, and shelling.

4.2.7 Visual and Aesthetic Resources

Currently, buildings in the immediate vicinity of the Site all range between approximately one and four stories. There are high rise residential structures also in the area.

4.2.8 Infrastructure Systems and Utilities

Currently water, is being supplied by the Board of Water Supply. Sewer services are provided for by the City and County of Honolulu. Electricity is maintained by Hawaiian Electric Co, and gas maintained by Hawaiʻi Gas. Preliminary discussions with the City and County of Honolulu, Board of Water Supply, and Hawaiʻi Gas have indicated the existing systems (sewer, water, and gas, respectively) can accommodate the needs for this project (Appendix D).

SECTION 5 ENVIRONMENTAL CONSEQUENCES AND PROPOSED MITIGATION MEASURES

Potential impacts of Alternative I: No Action, and Alternative II: Proposed Action are described in this section of the report. Impacts are evaluated on whether they constitute a "significant effect" on a particular environmental setting. Impacts are described as having No Impact, Significant Adverse Impact or Beneficial Impact depending on the outcome to the environment. The terms impact and effect are used synonymously in this EA. Impacts may apply to the full range of natural, aesthetic, historic, cultural and economic resources. The following subsections define key terms used throughout Section 5.

Significance Criteria

A "significant effect" is defined by HRS Chapter 343 as "the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic welfare, social welfare, or cultural practices of the community and State."

Beneficial Versus Adverse

Impacts from the Proposed Action may also have beneficial or adverse affects to the environment. Beneficial impacts are those that would favorable outcomes and add value to the environment. Adverse impacts are those that produce detrimental effects and cause harm to the environment.

Cumulative Impacts

Cumulative impacts are two or more individual effects which, when considered together, compound or increase the overall impact. Cumulative impacts can arise from the individual effects of a single action or from the combined effects of past, present, or future actions. Thus, cumulative impacts can result from individually minor but collectively significant actions taken over a period of time. The cumulative impacts of implementing the Proposed Action along with past and reasonably foreseeable future projects proposed were assessed based upon available information. Cumulative impacts are discussed in Section 5.3.

Mitigative Measures

Mitigative measures are defined as measures taken to avoid, reduce and compensate for adverse impacts to a resource. Mitigative measures are identified and discussed for each alternative, where relevant. In this EA, mitigative measures are provided to reduce adverse impacts when levels of impact are more than minor and to ensure levels of impact are not significant. Only those mitigative measures that are practicable have been identified.

5.1 Physical Environment

5.1.1 Topography and Geology

Alternative I

No significant adverse impacts to the topography or geology are expected to result from Alternative I. The Site would remain the same as there would be no construction.

Alternative II

No significant adverse impacts to the topography or geology are expected to result from Alternative II. As the Site is currently flat, no significant changes to the topography are necessary for construction. Construction and operational activities would follow existing topography. Flood elevation mitigation may

be designed into the project, which could change the existing topography. This would be beneficial as it could provide flood mitigation for the immediate area.

5.1.2 Soils

Proposed Action

No significant adverse impacts are anticipated for Alternative I. Site conditions would remain the same.

Alternative II

Alternative II could have a potential significant adverse impact to soils as a result of construction activities (i.e., clearing, grubbing, excavation and trenching) that disturb the earth and soils. Exposed soils are susceptible to erosion during periods of heavy rain or wind. Short-term adverse impacts would be minimized to less than significant or avoided by implementing temporary erosion control measures during construction activities. Typical construction best management practices could be employed to minimize any impacts. A National Pollutant Discharge Elimination System (NPDES) Permit and Drainage Control Plan would be obtained due to the size of the area that will be disturbed.

In addition, the 2005 Makai Area Final EA noted the geology and quality of soils for the area as "average" and "poor". Most of the "poor" soil designated areas have been planned for park use where lighter weight structures can be constructed. Structures built in other areas would need to have the appropriate support systems installed and costs may be prohibitive. The Proposed Action will have the required foundation system for the structures proposed. Building design will be developed by a licensed engineer and building permits obtained from the City and County of Honolulu.

The 2005 Final EA also identifies construction activities may increase stormwater runoff due to erosion from exposed soils. Water quality in the nearshore areas could be affected. A NPDES Permit for construction stormwater discharges is required for areas where soil disturbance is greater than one area. As the Proposed Action covers an area of 2.1 acres, where most of the land will be developed, a NPDES is required. As part of the NPDES Permit, a Drainage and Erosion Control Plan, documenting best management practices to minimize runoff, is required.

5.1.3 Natural Hazard

Alternative I

No significant adverse impacts to natural hazard vulnerability would result from Alternative I as the Site will not change. The Army Corps of Engineers issued guidance on likely changes in sea level rise through the year 2100. This guidance is recommended in evaluating shoreline areas. The Army Corps of Engineers has developed a website to provide information and determine a sites vulnerability to sea level changes. The nearest National Oceanic and Atmospheric Administration gauge to the project area was determined to be Point Reyes, California. Sea level changes on the low and high estimations were less than a foot to over 4.5 feet, respectively, by 2100.

Alternative II

No significant adverse impacts to natural hazard vulnerability would result from Alternative II. The project area is located in the tsunami inundation zone. The proposed action is not anticipated to increase vulnerability to flooding. Additionally, flood elevation mitigation can be designed into the project for flood mitigation. As noted above, sea level rise in the area is an item of consideration. However, the Proposed Action would not be affected any more or less than the surrounding areas.

The 2005 Makai Area Final EA notes that all development in the Makai Area will be in accordance with regulatory shoreline setback requirements and flood hazard requirements. Planned uses and activities along the shoreline have considered the associated flood hazard potential and were identified in the park and open space uses. Additionally, Civil Defense sirens are located throughout the Makai Area in the event of an emergency. The Proposed Action has submitted for shoreline certification has been submitted to HCDA.

5.1.4 Flora and Fauna

Alternative I

No significant adverse impacts to flora/fauna are anticipated due to Alternative I as the site would remain undeveloped.

Alternative II

No significant adverse impacts to flora/fauna are anticipated due to Alternative II. No threatened or endangered species are known to exist in the project area. The area surrounding the Site are also quite developed which makes it less likely that there are threatened or endangered species in the immediate vicinity of the Site.

The 2005 Makai Area Final EA did not identify significant adverse impacts to flora and fauna. The Makai Area Plan anticipated a variety of park environments introducing native and non-native plants. Residential developments are anticipated to include landscaped areas that will include introduction of various plant species which may attract other fauna.

5.1.5 Wetlands

Alternative I

No significant adverse impacts to wetlands are anticipated due to Alternative I as the Site would remain in its current state of developed.

Alternative II

No significant adverse impacts are anticipated under Alternative II. Alternative II, the Proposed Action, would not result in loss or destruction of existing wetland resources. Additionally, best management practices would be employed during construction activities to ensure no significant adverse impacts would occur. A NPDES Permit and Drainage and Erosion Control Plan will be produced to document mitigative measures.

5.1.6 Water Resources

Alternative I

No significant adverse impacts to groundwater or surface water would result under Alternative I, the no action alternative. Site conditions would remain the same.

Alternative II

No significant adverse impacts are anticipated to groundwater resources assuming implementation of Alternative II, the Proposed Action. Hazardous substances that could adversely affect groundwater are not likely to be introduced or released into the soil given the proposed use of the Site. Precautions should be taken during construction to avoid significant impact to surface water.

The 2005 Makai Area Final EA noted during construction activities, stormwater runoff may occur. NPDES Permit and Drainage and Erosion Control Plan will be produced to document mitigative measures. Additionally, dewater activities may be required for construction of building foundations and

installation of subsurface utilities. A construction dewatering permit will be required if dewater activities are performed. Dewatering effluent will be treated prior to discharge.

5.1.7 Climate and Air Quality

Alternative I

Alternative I would not have a significant adverse impact to air quality as the existing conditions would remain unchanged.

Alternative II

Under Alternative II, potentially significant adverse impacts to air quality from earth moving and excavation activities during construction activities (i.e., fugitive dust emissions) are anticipated. Temporary increases in traffic during the construction phase of Alternative II are also anticipated to increase emissions from combustion as well as increase fugitive dust. An effective dust control plan for the construction phase should be prepared. Best management practices (i.e., watering of roads and trenches during project activities, use of a dust screen which surrounds the project area) would reduce any impacts to less than significant. Once project construction is complete, impacts to air quality would be seen as increased emissions from traffic vehicles. Mitigation by optimizing traffic flow would reduce buildup of vehicular emissions.

The 2005 Makai Area Final EA found short-term, construction air quality impacts due to dust from excavation activities, transportation, and emissions from construction and personal vehicles. Under normal conditions most of the emissions and dust would be blown toward the ocean, however on Kona wind days, emissions and dusts would be blown inland and may negatively impact air quality. Mitigative measures, as provided in the HAR, Chapter 11-60.1, can reduce these impacts.

Long-term impacts were found by the 2005 Makai Area Final EA to be mainly traffic related. Roadway improvements would help alleviate some of the impacts. Landscape and sidewalk improvements would also reduce impacts by providing a more pedestrian friendly environment, potentially reducing vehicle use. Residential use of the area was also identified to reduce traffic related emissions since residents would be able to walk to working, shopping, dining, and recreational destinations.

5.1.8 Noise

Alternative I

No significant adverse impacts to noise are expected to occur under Alternative I. Site conditions would remain unchanged.

Alternative II

Construction activities at the Site may increase noise levels during this project. Limiting those activities that may increase noise levels to daylight hours will help to minimize noise impacts during the renovation. HDOH Administrative Rules, Title 11, Chapter 46, "Community Noise Control" regulations will be complied with for the duration of the project. If noise levels are exceed allowable levels, stated in Chapter 46 rules, a noise permit will be obtained.

Once the project is completed, restaurant and entertainment venue activities are anticipated to be the primary sources of noise at the Site. Significant increases in noise from the proposed project are anticipated. While overall noise levels would increase due to an increase in activity, these levels would follow HDOH and Liquor Commission rules, and if required a noise permit will be obtained. No industrial processes or activities that would contribute to a significant adverse impact to the noise environment are planned under Alternative II.

According to the 2005 Makai Area Final EA, construction activities and equipment were anticipated to exceed allowable noise limits and a HDOH noise permit would need to be obtained. Mitigative measures

such as using equipment with noise dampening mechanism installed, or substitution of equipment with those that produce less noise and vibration were recommended. Residential use of the area was not anticipated to significantly impact noise. Ambient noise levels were also not anticipated to significantly impact residents. The residential structures were assumed to be constructed of concrete and include air conditioners, these items would help mitigate potential noise impacts. Additionally, if noise exceedances are anticipated, they will require a HDOH noise permit.

5.1.9 Solid Waste

Alternative I

No significant adverse impacts to noise are expected to occur under Alternative I. Site conditions would remain unchanged. No additional waste would be generated from the construction or operation of the additional facility.

Alternative II

Construction activities at the Site will increase solid waste and construction wastes. These wastes can be minimized by proper planning of building materials and recycling efforts.

Once the project is completed, solid waste generation will be increased over the current conditions. This increase in waste generation would not contribute to a significant adverse impact under Alternative II.

5.2 Social Environment

5.2.1 Land Use Considerations and Zoning

Alternative I

Alternative I would have a direct adverse impact to land use and zoning. The No Action Alternative would not be utilizing the land to its fullest potential.

Alternative II

Alternative II would have a significant beneficial impact on land use and zoning. Kakaʻako Community Development district is handled by the State of Hawaiʻi and not the city and county of Honolulu.

5.2.2 Archaeological and Cultural Considerations

Alternative I

No significant adverse impacts are associated with the No Action Alternative as no change to the current infrastructure would occur.

Alternative II

Alternative II would involve ground disturbing activities that could potentially have significant adverse impact on historical and archaeological resources. However, these impacts are considered unlikely. There are areas surrounding the Site which are already developed with no history of archeological resources. The 2014 archeological LR/FI did not observe any cultural significance for the Site. The proposed project area will entail groundwork. If human osteological remains or a potential archaeological site are uncovered during construction activities, mitigation measures will be implemented. Specifically, site work will cease and the SHPD would be contacted in compliance with Chapter 6E of the HRS. A cultural monitor would also be retained. These mitigation measures will ensure no loss or destruction of historic and archaeological resources, avoid adverse impacts to potential sites, and ensure compliance with State laws and regulations. Implementation of mitigation measures would reduce any potential impacts associated with Alternative II to less than significant.

The 2005 Makai Area Final EA noted historic resources were to be preserved and shoreline areas where cultural activities will be maintained. Additionally, SHPD had stated (in response to the 1998 Makai Area Plan Supplemental EIS) "because the area Makai of Ala Moana Boulevard is comprised of fill lands we believe that the development of the area will have "no effect" on subsurface cultural deposits because it is unlikely that nay are present". Should archaeological or cultural items be uncovered during construction, work activities must stop and SHPD shall be notified at once. Additional steps may be required to determine the proper course of action.

5.2.3 Circulation and Traffic

Alternative I

No significant adverse impacts are anticipated under Alternative I. Site conditions would remain the same.

Alternative II

No significant adverse impacts are anticipated under Alternative II. During construction activities, access and traffic are anticipated to increase compared to normal Site operations. If access and traffic are impacted as a result of construction activities, minimizing impact on traffic and access to less than significant levels can be accomplished by the following:

1) Mobilizing and de-mobilizing construction vehicles and equipment during non-peak traffic hours.
2) Utilizing off-street loading (during non-peak hours)
3) Use of temporary traffic control devices, such as signage, barricades, and cones, in accordance with City and County traffic standards; and
4) If necessary, utilize off-duty police to manage traffic.

Once operations commence, an increase in traffic will impact the area. Implementation of the Makai Area Plan includes improvements to infrastructure which will help alleviate some of the congestion. Access to the Site would be via Ala Moana Boulevard. In addition, a 200+ parking structure is included in this project. This would be beneficial to the area as additional parking will be available.

No significant impact to Public Transit is anticipated as a result of renovation activities. As part of standard Oʻahu Transit Services practice, theBus will continually monitor bus usage in the area and adjust their services accordingly. If a new bus stop is required at the location of proposed renovations, the Department of Transportation Services requires that the property owner pay for any sidewalk renovations necessary to ensure that the sidewalk and curb are ADA compliant. This is not expected to be a problem as there is currently a bus stop in front of the property. Additionally, planned bike paths/lanes/routes and the Honolulu Rail Project will add other means of transportation besides personal vehicles.

The 2005 Makai Area Final EA discussed the traffic analysis prepared for the Makai Area Plan. Traffic was evaluated for the years 2009, 2014, and 2025. Several mitigative measures were suggested for each of the years projected. These following are actions recommended for the respective years and is take from the 2005 Makai Area Final EA in full:

2009

1. Maintain adequate turning radii at all roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

2. Maintain adequate sight distances for motorists to safely enter and exit all roadways.

3. Extend Punchbowl Street from Ala Moana Boulevard to Ilalo Street. At the intersection with Ala Moana Boulevard, provide three northbound left-tum lanes.

4. Modify Ala Moana Boulevard west of its intersection with Punchbowl Street to provide an exclusive right-tum lane for vehicles turning right onto the new Punchbowl Street extension, as well as an additional westbound departure lane from the intersection. The additional departure lane will provide a free right-tum movement for the outer southbound right-turn lane along Punchbowl Street.

5. Restrict pedestrian crossings on the west side of the intersection of Ala Moana Boulevard and Punchbowl Street. Crossings will be allowed across the cast, north, and south sides of the intersection.

6. Modify the traffic signal timing and phasing at the Ala Moana Boulevard Punchbowl Street intersection to accommodate a four-way intersection.

7. Provide two lanes of traffic in each direction along llalo Street with through and turning lanes provided at each intersection along its length.

8. Restrict access along Ilalo Street from adjacent parcels. Access points adjacent parcels should be located along intersecting streets.

9. Prohibit parking along Ilalo Street.

10. Provide exclusive left-tum lanes on the northbound and southbound approaches the intersections along Ilalo Street.

11. Provide all-way stop intersection control at the following intersections along Ilalo Street: Forrest Avenue; Keawe Street; Cooke Street; Ahui Street.

12. Provide two-way stop intersection control at the following intersections along Ilalo Street: Coral Street; Ohe Street; Koula Street.

<u>2014</u>

1. Maintain adequate turning radii at all roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

2. Maintain adequate sight distances for motorists to safely enter and exit all roadways.

3. Prohibit north- and south-bound left-turn and through traffic movements at the following intersections along Ala Moana Boulevard: Keawe Street; Coral Street; Koula Street.

4. Prohibit eastbound and westbound left-turn traffic movements at the intersections along Ala Moana Boulevard: Keawe Street; Coral Street; Koula Street.

5. Prohibit eastbound and westbound left-turn traffic movements at the intersections along Ala Moana Boulevard: South Street/Forrest Avenue: Keawe Street; Coral Street; Koula Street.

6. Prohibit parking along Cooke Street between Ala Moana Boulevard and Ilalo Street to provide two lanes in each direction along that segment.

7. Modify the existing lane use along Cooke Street north of Ala Moana Boulevard to provide an exclusive south-bound left-tum lane and a shared through and right- tum lane.

8. Provide exclusive north-bound left-tum, through, and right-tum lanes along Cooke Street south of Ala Moana Boulevard.

9. Verify the length of the left-tum lanes along Ala Moana Boulevard at the intersection of Cooke Street to provide adequate storage for vehicles at that intersection.

10. Modify the existing lane use along Ward Avenue north of Ala Moana Boulevard to provide one north-bound departure lane, two exclusive south-bound left-tum lanes, and exclusive through and right-tum lanes.

11. Provide two exclusive north-bound left-tum lanes and exclusive through and right-tum lanes at the intersection of Ala Moana Boulevard and Ward Avenue/Ilalo Street.

12. Provide two westbound left-tum lanes along Ala Moana Boulevard for vehicles turning left onto llalo Street.

13. Modify the traffic signal timing and phasing at the intersections of Ala Moana Boulevard with Cooke Street and Ward Avenue to accommodate the modified lane configurations.

14. Conduct full traffic signal warrant studies for the intersections of llalo Street with Forrest Avenue, Keawe Street, Cooke Street, and Ahui Street after 2009. Install traffic signal systems where warranted. Preliminary application of the warrants indicate the potential need for a traffic signal system at the intersections with Forrest Avenue and Keawe Street.

<u>2025</u>

1. Maintain adequate turning radii at all roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

2. Maintain adequate sight distances for motorists to safely enter and exit all roadways.

3. Prohibit northbound and southbound left-turn movements at the intersection of Ala Moana Boulevard, South Street, and Forrest Avenue.

4. Reassess the traffic signal warrant studies previously conducted for the intersection along Ilalo Street where traffic signal systems were not warranted in 2014. Install traffic signal systems where warranted.

The 2005 Makai Area Final EA also discusses public transportation, bicycle use, and pedestrian activity. New developments in the Makai Area are anticipated to increase use of public transportation however, some of the impacts will be mitigated by the mixed use vision of the area which will allow for walking to retail, restaurant, and other destinations. Long-term plans include a potential for a shuttle service to the Makai Area from downtown Honolulu, and Aloha Tower. Bicycle facilities are also proposed in the Makai Area Plan which are consistent with the Honolulu Bicycle Master Plan. Bicycle racks, storage areas, and other accessories are requirements of HCDA in future development projects. The pedestrian network will continuously undergo improvement via proposed projects in the Makai Area.

5.2.4 Social Factors and Community Identity

Alternative I

Alternative I would have an adverse impact to the social and community identity. The area would remain the same, underutilized and not contributing to the growth Kakaʻako is experiencing in community and economics.

Alternative II

Construction of Alternative II is expected to have a significant beneficial impact on the social and community identity of the area. The proposed project will add additional commercial area to the district.

According to the 2005 Makai Area Final EA, upwards of 1,100 housing units could be built in the Makai Area. These units would be subject to the affordable housing requirements of Hawaii Administrative Rules 15-22-115. The Proposed Action would make available residences in a favorable location with many amenities.

5.2.5 Economic Considerations

Alternative I

No significant adverse impacts are anticipated under Alternative I. Site conditions would remain unchanged.

Alternative II

Adverse impacts to the economy in the vicinity of the Site are anticipated as a result under Alternative II as parking for harbor users will decline during construction of the proposed action. However, this is a short-term impact, the proposed renovations will result in long-term economic benefits for Kakaʻako, the City and County of Honolulu, and the State of Hawaii.

The 2005 Makai Area Final EA identified short-term favorable impacts due to the increase in construction jobs. Long-term benefits were identified as commercial, medical education and research, retail, restaurant, office and maritime industrial activities. It was anticipated the Makai Area could support over 9,000 employees. This economic growth would have a positive influence on the overall city and state economy.

5.2.6 Recreational and Public Facilities

Alternative I

No significant impacts are anticipated under Alternative I. Site conditions would remain unchanged.

Alternative II

Alternative II is expected to have significant adverse impact on the recreational and public facilities on the island. Water will continue to be provided to the existing recreational and public facilities and their operations will continue as they exist today. Access to parking and public facilities will decrease during construction, however these are short-term impacts. The proposed project will increase the number of parking stalls for the area, and access to public facilities will be restored at completion of construction.

The 2005 Makai Area Final EA anticipated an increase of recreational and public facilities. This increase was deemed to be sufficiently met by the Kakaako Waterfront Park, Makai Gateway Park, and the Kewalo Basin Park.

5.2.7 Visual and Aesthetic Resources

Alternative I

There would be no significant adverse impact on the visual resources and aesthetics in or around the project area anticipated with Alternative I as this alternative shall not bring about any changes in the existing conditions.

Alternative II

Significant adverse impacts to visual resources are not expected under Alternative II. Construction of the new building structure will not significantly impact the view of adjacent buildings as the Proposed Action will be less than the proposed developments mauka of Ala Moana Boulevard. Significant public views will also not be affected.

The 2005 Makai Area Final EA developments in the Makai Area my marginally affect view planes. However these impacts are not anticipated to be significant as existing views are already affected by existing structures. Any redevelopment of the area would have similar impact on view planes and corridors.

5.2.8 Infrastructure Systems and Utilities

Alternative I

No significant adverse impacts are anticipated under Alternative I. Site conditions would remain unchanged.

Alternative II

Alternative II is expected to have impact on the infrastructure and utilities in and around the project area. Implementation of the Makai Area Plan includes improvements to infrastructure which will help alleviate provide greater support to the area. Preliminary discussions with the City and County of Honolulu, Board of Water Supply, and Hawai‘i Gas have indicated the existing systems (sewer, water, and gas, respectively) can accommodate the needs for this project.

According to the 2005 Makai Area Final EA, the HCDA has implemented an Improvement District Program to systematically improve infrastructure in the Kaka’ako area. Improvements will be made to streetlights, curbs, gutters, and sidewalks. Also, drainage, sewer, water, communication, and electrical systems will be upgraded and placed below ground.

5.3 Cumulative Impacts

The 2005 Makai Area Final EA determined a Finding of No Significant Impact during their evaluation. The Makai Area EA is a supplemental document and was intended to address the previous programmatic EIS and subsequent revisions. All future projects were to be considered in the previous programmatic EIS. Cumulative effects are not anticipated to be significant as a result of implementing Alternative II and other revitalization work being performed along Ala Moana Boulevard (the Howard Hughes planned vision for the Kaka‘ako area mauka of Ala Moana Boulevard, the Kewalo Basin Repairs Project, Kupu Ho‘ahu Campaign, Vida at 888 Ala Moana Boulevard, the future Honolulu Emergency Services Department lifeguard response station, the current Kewalo Basin Harbor Master’s Office, Kamehameha Schools development projects). The action does not involve a commitment to larger actions as patrons of the proposed project would be transitory and not residing on the property. Alternatives II will likely not result in substantial secondary impacts, such as population changes or effects on public facilities. Alternative II involves the construction of a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin.

The Site and adjacent areas are already developed and major infrastructure and housing projects in the Kaka‘ako area are planned for in the near future. The Kaka‘ako Makai Master Plan outlines additional development phasing for the district.

SECTION 6 RELATIONSHIP TO PLANS, POLICIES, AND CONTROLS

The purpose of Section 6 is to identify plans and policies that may be applicable to this project and summarize the relationship of the plans and policies to project actions. Additionally, the intent is to revisit these plans and policies to qualify any significant effects from actions proposed in this EA.

6.1 State and County Land Use Plans and Policies

The current land use and zoning does not need to be adjusted for the proposed development of the multiuse facility.

6.1.1 Hawaiʻi State Plan

The Hawaiʻi State Plan, HRS Chapter 226, was enacted in 1978 and is intended to guide the long-range development of the State of Hawaiʻi, as excerpted:

The Hawaiʻi state plan that shall serve as a guide for the future long-range development of the State; identify the goals, objectives, policies, and priorities for the State; provide a basis for determining priorities and allocating limited resources, such as public funds, services, human resources, land, energy, water, and other resources; improve coordination of federal, state, and county plans, policies, programs, projects, and regulatory activities; and to establish a system for plan formulation and program coordination to provide for an integration of all major state, and county activities.

The sections of the State Plan that is most relevant to the proposed project excerpted as follows:

Planning for the State's facility systems in general shall be directed towards achievement of the objective of water, transportation, waste disposal, and energy and telecommunication systems that support statewide social, economic, and physical objectives.

To achieve the general facility systems objective, it shall be the policy of this State to:

§226-6 Objectives and policies for the economy--in general.

(a) Planning for the State's economy in general shall be directed toward achievement of the following objectives:

(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaiʻi's people.

(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

(b) To achieve the general economic objectives, it shall be the policy of this State to:

(1) Expand Hawaiʻi's national and international marketing, communication, and organizational ties, to increase the State's capacity to adjust to and capitalize upon economic changes and opportunities occurring outside the State.

(2) Promote Hawaiʻi as an attractive market for environmentally and socially sound investment activities that benefit Hawaiʻi's people.

(3) Seek broader outlets for new or expanded Hawai‘i business investments.

(4) Expand existing markets and penetrate new markets for Hawai‘i's products and services.

(5) Assure that the basic economic needs of Hawai‘i's people are maintained in the event of disruptions in overseas transportation.

(6) Strive to achieve a level of construction activity responsive to, and consistent with, state growth objectives.

(7) Encourage the formation of cooperatives and other favorable marketing arrangements at the local or regional level to assist Hawai‘i's small scale producers, manufacturers, and distributors.

(8) Encourage labor-intensive activities that are economically satisfying and which offer opportunities for upward mobility.

(9) Foster greater cooperation and coordination between the government and private sectors in developing Hawai‘i's employment and economic growth opportunities.

(10) Stimulate the development and expansion of economic activities which will benefit areas with substantial or expected employment problems.

(11) Maintain acceptable working conditions and standards for Hawai‘i's workers.

(12) Provide equal employment opportunities for all segments of Hawai‘i's population through affirmative action and nondiscrimination measures.

(13) Encourage businesses that have favorable financial multiplier effects within Hawai‘i's economy.

(14) Promote and protect intangible resources in Hawai‘i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

(15) Increase effective communication between the educational community and the private sector to develop relevant curricula and training programs to meet future employment needs in general, and requirements of new, potential growth industries in particular.

(16) Foster a business climate in Hawai‘i--including attitudes, tax and regulatory policies, and financial and technical assistance programs--that is conducive to the expansion of existing enterprises and the creation and attraction of new business and industry. [L 1978, c 100, pt of §2; am L 1986, c 276, §5; am L 1988, c 70, §4; am L 1993, c 213, §4]

6.1.2 O‘ahu General Plan

As described within the O‘ahu General Plan for the City and County of Honolulu, the O‘ahu General Plan is “a comprehensive statement of objectives and policies which sets forth the long-range aspirations of O‘ahu’s residents and the strategies of actions to achieve them.” The General Plan addresses eleven areas of concern:

1. Population
2. Economic activity
3. The natural environment
4. Housing
5. Transportation and utilities
6. Energy
7. Physical development and urban design
8. Public safety
9. Health and education
10. Culture and recreation
11. Government operations and fiscal management

Of these eleven categories, the three that directly relate to the proposed project is Economic activity, Physical development and urban design, and Culture and recreation. Within each of these areas of concern, the O‘ahu General Plan itemizes key objectives, followed by specific policies. Those most relevant to the proposed project are cited below along with an evaluation of consistency:

Economic activity

Objective A: To promote employment opportunities that will enable all the people of Oahu to attain a decent standard of living.

Policy 1 - Encourage the growth and diversification of Oahu's economic base.

Policy 2 - Encourage the development of small businesses and larger industries which will contribute to the economic and social well-being of Oahu residents.

Policy 3 -Encourage the development in appropriate locations on Oahu of trade, communications, and other industries of a nonpolluting nature.

Physical development and urban design

Objective A - To coordinate changes in the physical environment of O‘ahu to ensure that all new developments are timely, well-designed, and appropriate for the areas in which they will be located.

Policy 2 - Coordinate the location and timing of new development with the availability of adequate water supply, sewage treatment, drainage, transportation, and public safety facilities.

Policy 3 - Phase the construction of new developments so that they do not require more regional supporting services than are available.

Policy 5 - Provide for more compact development and intensive use of urban lands where compatible with the physical and social character of existing communities.

Policy 6 - Encourage the clustering of developments to reduce the cost of providing utilities and other public services.

Policy 7 -Locate new industries and new commercial areas so that they will be well related to their markets and suppliers, and to residential areas and transportation facilities.

Objective E -To create and maintain attractive, meaningful, and stimulating environments throughout O‘ahu.

Policy 1 - Prepare and maintain a comprehensive urban-design plan for the Island of O‘ahu.

Policy 2 - Integrate the City and County's urban- design plan into all levels of physical planning and developmental controls.

Policy 3 - Encourage distinctive community identities for both new and existing districts and neighborhoods.

Policy 4 - Require the consideration of urban-design principles in all development projects.

Policy 5 - Require new developments in stable, established communities and rural areas to be compatible with the existing communities and areas.

Policy 6 - Provide special design standards and controls that will allow more compact development and intensive use of lands in the primary urban center.

Policy 9 - Design public structures to meet high aesthetic and functional standards and to complement the physical character of the communities they will serve.

Culture and recreation

Objective A: To foster the multiethnic culture of Hawaii.

Policy 1 - Encourage the preservation and enhancement of Hawaii's diverse cultures.

Policy 2 - Encourage greater public awareness, understanding, and appreciation of cultural heritage and contributions to Hawaii made by the City's various ethnic groups.

Policy 3 - Encourage opportunities for better interaction among people with different ethnic, social, and cultural backgrounds.

Objective B: To protect Oahu's cultural, historic, architectural, and archaeological resources.

Policy 1 - Encourage the restoration and preservation of early Hawaiian structures, artifacts, and landmarks.

Policy 2 - Identify, and to the extent possible, pre- serve and restore buildings, sites, and areas of social, cultural, historic, architectural, and archaeological significance.

Policy 3 - Cooperate with the State and Federal governments in developing and implementing a comprehensive preservation program for social, cultural, historic, architectural, and archaeological resources.

Policy 4 - Promote the interpretive and educational use of cultural, historic, architectural, and archaeological sites, buildings, and artifacts.

Objective C: To foster the visual and performing arts.

Policy 1 - Encourage and support programs and activities for the visual and performing arts.

Policy 2 - Encourage creative expression and access to the arts by all segments of the population.

Objective D: To provide a wide range of recreational facilities and services that are readily available to all residents of Oahu.

Policy 1 - Develop and maintain community-based parks to meet the needs of the different communities on Oahu.

Policy 3 - Develop and maintain urban parks, squares, and beautification areas in high density urban places.

Policy 5 - Encourage the State to develop and maintain a system of natural resource-based parks, such as beach, shoreline, and mountain parks.

Policy 6 - Provide convenient access to all beaches and inland recreation areas.

Policy 7 - Provide for recreation programs which serve a broad spectrum of the population.

Policy 12 - Provide for safe and secure use of public parks, beaches, and recreation facilities.

Policy 13 - Encourage the safe use of Oahu's ocean environments.

Policy 14 - Encourage the State and Federal governments to transfer excess and underutilized land to the City and County for public recreation use.

6.1.3 State Land Use

The purpose of the State of Hawaiʻi Land Use Commission is to preserve and protect lands and ensure appropriate uses of those lands. It is the intent that the Land Use Commission oversee development to maximize the potential to the impacted areas.

The Site is designated as urban. "The Urban District generally includes lands characterized by "city-like" concentrations of people, structures and services. This District also includes vacant areas for future development. Jurisdiction of this district lies primarily with the respective counties. Generally, lot sizes and uses permitted in the district area are established by the respective county through ordinances or rules."

6.1.4 Primary Urban Center Development Plan

The Primary Urban Center Development Plan was adopted in 2004 and is codified as Ordinance No. 04-14, Revised Ordinances of Honolulu envisions a Honolulu that is attractive in many facets to residents and visitors. Key elements for the Primary Urban Center Development Plan are:

- Protects and enhances Honolulu's natural, cultural and scenic resources, through the active management and improvement of coastal waters and the enhancement of culturally- and historically- important sites.
- Identifies significant panoramic views, including mauka view corridors from the shoreline such as at Kewalo Basin, that should be preserved.
- Maintains the Primary Urban Center as Oʻahu's primary employment center and center for many commercial, industrial and transportation-related functions.
- Supports attractions that are of interest to both residents and visitors in the Ala Moana/Kakaʻako/ Downtown corridor, such as opportunities for State-sponsored waterfront commercial and cultural attractions around the Kewalo Basin area.

- Recognizes the recommendation of the Oʻahu Commercial Harbors 2020 Master Plan for Kewalo Basin to gradually transition to ocean-based tourist activities, and HCDA's role in the development of shoreside land uses.

The proposed project would most compliment promotion of neighborhoods which have business districts, parks and plazas, and pedestrian-friendly streets.

6.1.5 City and County of Honolulu Land Use Ordinance (LUO)

The purpose of the City and County of Honolulu LUO is to regulate land use in a manner that will encourage orderly development in accordance with adopted land use policies, and to promote and protect the public health, safety, and welfare. It is the intent that the LUO provide reasonable development and design standards for the location, height, bulk and size of structures, yard areas, off-street parking facilities, and open spaces, and the use of structures and land for agriculture, industry, business, residences or other purposes.

The Site is designated as Kakaʻako Community Development District and is administered by the State of Hawaiʻi, not the City and County of Honolulu. Special Management Area Use Permit and Shoreline Setback permits will be submitted to the State of Hawaiʻi Office of Planning.

6.1.6 Kakaʻako Community Development Plan

The HCDA was created to initiate and guide redevelopment and revitalization of underdeveloped urban communities. Work within the area will conform to the Kakaʻako Community Development District Rules for the Makai Area (HAR, Title 15, Subtitle 4, Chapter 23), the Makai Area Plan and Design Guidelines. The Kakaʻako Community Development District Plan to serve as the basis for public and private development in Kakaʻako and includes the Kakaʻako waterfront area. The plan is currently comprised of two documents that discuss the development objectives and rationale for future redevelopment of the area: the Kakaʻako Mauka Area Plan covering the area mauka of Ala Moana Boulevard) and the Kakaʻako Makai Area Plan (covering the lands makai of Ala Moana Boulevard).

6.1.7 Kakaʻako Makai Area Plan

The 2005 Kakaʻako Makai Area Plan presents the overall vision for the Makai Area as:

"to create an active, vibrant area through a variety of new developments, including an expansive waterfront park, maritime uses along the harbor, restaurants, markets and entertainment along Kewalo Basin, a children's museum, educational and research facilities, residential and commercial developments".

The Site area is designated as a Mixed Use District in the Kakaʻako Special Design District. The proposed project is in line with the commercial uses stated for that designation. Under the Makai Area Plan, the Site is designated as Waterfront Commercial. The Waterfront Commercial zone is intended to allow for residential and commercial uses, with restaurants, shops, and entertainment as businesses that would best compliment the area from an urban design and market standpoint. The proposed project will adhere to building envelope definitions as stated in the plan. Buildings will be no more than 45 feet in height, and parking will be located within the interior sections of the development. A HCDA Development Permit will be secured prior to project commencement.

6.1.8 Hawaiʻi Coastal Zone Management Program

The National Coastal Zone Management Program was created by the Coastal Zone Management Act of 1972. Hawaiʻi's Coastal Zone Management (CZM) Program (Chapter 205A, HRS) provides a basis for protecting, restoring and responsibly developing coastal communities and resources. The objectives and

policies of the Hawai‘i CZM Program encompass broad concerns such as impact on recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. Each of these previous items have been discussed within this EA. The Proposed Action seeks to increase public access to recreational and coastal scenic resources and open space. Design of the Proposed Action will address coastal hazards and include mitigative measures for natural hazards. If historic or archeological resources or coast resources are identified that may be impacted from actions of the proposed project, proper evaluation will be conducted to determine appropriate mitigative measures to protect these resources. Lastly, all required permits and approval will be obtained for the Proposed Action.

6.2 Necessary Permits and Approvals

The following approvals will be required for the implementation of the project. All approvals will be obtained in accordance with approving agency guidelines.

- Environmental Assessment
- Special Management Area Permit
- HCDA Development Permit
- Grading Permit
- Building Permit
- SHPD Approval
- Industrial Wastewater Discharge Permit (may be required)
- Noise Permit (may be required)
- NPDES Permit

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SECTION 7 FINDINGS AND REASONS SUPPORTING ANTICIPATED DETERMINATION

In accordance with the provisions set forth in Chapter 343, HRS, this EA has preliminarily determined that the project will not have significant adverse impacts on the environment. As such, a Finding of No Significant Impact (FONSI) is anticipated for the Proposed Action. Anticipated impacts will be temporary and will not adversely impact the environmental quality of the area.

A review of the "Significance Criteria" used as a basis for the above determination is presented below. An action is determined to have a significant impact on the environment if it meets any one of the thirteen (13) criteria.

(1) Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;

Alternatives I and II will not provide irrevocable commitment to loss or the destruction of any natural or cultural resources. The adjacent areas have already been developed. The site area has been paved and landscaped, subsurface soils at the Site have been previously disturbed. Mitigative measures have been provided that would identify and minimize any impacts to natural or cultural resources if discovered.

(2) Curtails the range of beneficial uses of the environment;

Alternative II will not curtail the range of beneficial uses of the environment. In fact, the implementation of the Proposed Action would increase beneficial uses of the Site by utilizing an area that has been neglected for a long period of time.

(3) Conflicts with the State's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;

Alternatives I and II will be in conformance with the Chapter 344, HRS, State Environmental Policy, to enhance the quality of life. The Proposed Action would foster economic development in a growing community.

(4) Substantially affects the economic, social welfare, and cultural practices of the community or State;

Alternatives I and II would have beneficial effects to the economic and social welfare of the community and State. The construction phase of the proposed alternatives would create jobs. The operation of the proposed alternatives would create jobs and venues for businesses. A LR/FI was performed and no cultural practices would be impacted by the Alternatives proposed.

(5) Substantially affects public health;

Alternatives I and II will not have significant effects on public health. The proposed project may have beneficial impacts to public health by maintaining and keeping clean an area that has not been used in sometime.

(6) Involves substantial secondary impacts, such as population changes or effects on public facilities;

Alternatives I and II will likely not result in substantial secondary impacts, such as population changes or effects on public facilities. Population changes would not be incurred and effects on public facilities would be minimal. The change in population and demand for public facilities would be readily met by existing infrastructure, as identified in preliminary consultation with utility providers.

(7) Involves a substantial degradation of environmental quality;

Alternatives I and II are not likely to result in a substantial degradation of environmental quality. Impacts associated with the Proposed Action have been assessed to be minimal.

(8) Is individually limited but cumulatively has considerable effect on the environment, or involves a commitment for larger actions;

Cumulative effects are not anticipated as a result of implementing Alternatives I or II. The actions themselves do not involve a commitment to larger actions. The Site and surrounding areas are already developed. Infrastructure and housing projects are planned for in the near future. However, the multi-use facility would not add significant use of resources.

(9) Substantially affects a rare, threatened, or endangered species, or its habitat;

Alternatives I and II are not anticipated to have substantial effects on rare, threatened, or endangered species, or any critical habitat. There is little potential for encountering such resources as there are no rare, threatened, or endangered species or critical habitats at the Site. Additionally, the Site and surrounding areas are currently developed.

(10) Detrimentally affects air or water quality or ambient noise levels;

No significant impacts on the area's long-term air or ambient noise environments are anticipated to result from Alternatives I and II. During the construction and operational phases of the proposed project, these parameters will be monitored. Any exceedances in local, state, or federal rules or regulations will be mitigated to minimize their effects to the area. Water quality impacts are not anticipated and do not require mitigation measures.

(11) Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters;

The Site is not located in an environmentally sensitive area, such as a beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters. The Site is located near the harbor, best management practices will be employed to mitigate any potential affects to non-significant levels. Site structures will be constructed to account for tsunami inundation.

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies; or,

Alternatives I and II will not adversely affect the visual aesthetics of the areas identified in the county or state plans and studies. The proposed structures are no more than 45 feet in height. The area mauka of Ala Moana Boulevard will be renovated to include structures that are taller than the proposed projects. Coastal view planes will not be impacted by the Site.

(13) Requires substantial energy consumption.

Alternatives I and II would not require substantial energy consumption. The multi-use facility would not increase permanent residents to the area. The demand for energy would be readily met by existing infrastructure and planned upgrades.

The 2005 Makai Area Final EA determined a Finding of No Significant Impact during their evaluation. The Makai Area EA is a supplemental document and was intended to address the previous programmatic EIS and subsequent revisions. All future projects were to be considered in the previous programmatic EIS. This environmental assessment has determined that the project will not have significant adverse impacts to the natural, built, or social environment. Therefore, it is determined that an Anticipated FONSI be issued for this project.

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SECTION 9 AGENCIES AND ORGANIZATIONS CONSULTED

The following agencies and organizations were contacted during the pre-consultation period. Pre-consultation comment letters and response letters have been reproduced and included in Appendix E.

Federal Agencies

United States Department of the Interior, Fish and Wildlife Service

State Agencies

Center for Conservation Research and Training (formerly Hawaiʻi Biodiversity and Mapping Program)
Department of Business, Economic Development and Tourism (DBEDT)
Department of Education
Department of Land and Natural Resources (DLNR)
DLNR Historic Preservation Division
Department of Transportation
Hawaiʻi Community Development Agency
HDOH
HDOH, Office of Environmental Quality Control
Hawaiʻi Housing Finance and Development Corporation
Office of Hawaiian Affairs
Office of Planning
University of Hawaiʻi at Manoa, Environmental Center

County Agencies

Board of Water Supply
Department of Design and Construction
Department of Parks and Recreation
Department of Planning and Permitting
Department of Transportation Services
Honolulu Fire Department
Honolulu Police Department

Other

Hawaiian Electric Company

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APPENDIX A

ARCHAEOLOGICAL LITERATURE REVIEW AND
FIELD INSPECTION REPORT

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Draft

Archaeological Literature Review and Field Inspection Report for the Kewalo Basin Retail Project, Honolulu Ahupuaʻa, Honolulu (Kona) District, Oʻahu TMK: [1] 2-1-058:128 por.

Prepared for
Good Luck International Corporation

Prepared by
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Management Summary

Reference	Archaeological Literature Review and Field Inspection for the Kewalo Basin Retail Project, Honolulu Ahupua‘a, Honolulu (Kona) District, O‘ahu TMK: [1] 2-1-058:128 por.
Date	October 2014
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: KAKAAKO 138
Investigation Permit Number	CSH completed the fieldwork component of this study under archaeological permit number 14-04, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) §13-13-282.
Agencies	State Historic Preservation Division/Department of Land and Natural Resources (SHPD); Hawaii Community Development Authority (HCDA)
Land Jurisdiction	Hawaii Community Development Authority (HCDA).
Project Location	This project area lies on the east side of Kewalo Basin and the most western portion of Ala Moana Beach Park. To the north of the project area lies Ala Moana Boulevard.
Project Description	The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin. The project is located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The multi-use facility consists of four buildings and a parking structure. The buildings are two levels, most with open deck viewing spaces on the second level. • Building 1, located adjacent to Ala Moana Boulevard, is approximately 16,900 sq ft and will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants. • Building 2 (moving southwest) is approximately 5,400 sq ft and similarly to Building 1, will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants. • Building 3 is approximately 19,800 sq ft and will offer commercial uses including a live entertainment venue and a restaurant and bar on the ground floor, and office space and open decks on the second floor. • Building 4 is separated from the other buildings by a 24-ft wide drive aisle and is located east of Building 3. Buildings 3 and 4 are connected by a bridge spanning the drive aisle on the second level. Building 4 is approximately 7,800 sq ft and will offer commercial uses which include a café on the ground floor and a multipurpose hall on the second level.

	• The 250-stall garage is a two-level structure and is approximately 28,500 sq ft. The parking garage is located between Buildings 1 and 3, adjacent to Building 2.
Acres	Project area is an approximately 2.5-acre portion of the parcel
Document Purpose	This investigation was designed—through detailed historical, cultural, and archaeological background research and a field inspection of the project area—to determine the likelihood that historic properties may be affected by the project, and based on findings, to consider cultural resource management recommendations. This document is intended to facilitate the project’s planning and support the project’s historic preservation and environmental review compliance. This investigation does not fulfill the requirements of an archaeological inventory survey investigation, per HAR §13-13-276. Consequently, this report cannot be used to make formal recommendations for SHPD review and acceptance.
Fieldwork Effort	Fieldwork was accomplished on 29 August 2014 by William Folk B.A., under the general supervision of principal investigator Hal Hammatt, Ph.D.
Results Summary	CSH conducted a field inspection and traditional and historical background research for the project area. This field inspection did not observe any property of cultural significance in the surface survey.
Recommendations	It appears certain that no archaeological inventory survey will be required by the regulatory SHPD. No discussion of options to address the likelihood of historic preservation mitigation requirements is presented.

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Section 1 Introduction

1.1 Project Background

At the request of Good Luck International Corporation, Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this literature review and field inspection report (LRFI) for the Kewalo Basin Retail Project, Honolulu Ahupua‘a, Honolulu (Kona) District, O‘ahu TMK: [1] 2-1-058:128 por. The project area is depicted on a portion of the 1998 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin. The project is located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The multi-use facility consists of four buildings and a parking structure. The buildings are two levels, most with open deck viewing spaces on the second level.

- Building 1, located adjacent to Ala Moana Boulevard, is approximately 16,900 sq ft and will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants.
- Building 2 (moving southwest) is approximately 5,400 sq ft and similarly to Building 1, will offer commercial uses including waterfront retail consisting of various retail stores and small restaurants.
- Building 3 is approximately 19,800 sq ft and will offer commercial uses including a live entertainment venue and a restaurant and bar on the ground floor, office space, and open decks on the second floor.
- Building 4 is separated from the other buildings by a 24-ft wide drive aisle and is located east of Building 3. Buildings 3 and 4 are connected by a bridge spanning the drive aisle on the second level. Building 4 is approximately 7,800 sq ft and will offer commercial uses which include a café on the ground floor and a multipurpose hall on the second level.
- The 250-stall garage is a two-level structure and is approximately 28,500 sq ft. The parking garage is located between Buildings 1 and 3, adjacent to Building 2.

1.2 Document Purpose

The proposed project is subject to Hawai‘i State environmental and historic preservation review legislation (Hawai‘i Revised Statutes [HRS] §343 and §6E-8/Hawai‘i Administrative Rules [HAR] §13-275, respectively).

This LRFI provides an overview document that synthesizes the work previously performed in this project area. This study includes an analysis of previous work, available information, and limited site inspections. This LRFI is intended to facilitate planning and budgeting considerations, and to convey any possible archaeological constraints to proposed development(s) or improvements. Although the primary purpose of this investigation is planning, the investigation and its associated report can, in some instances, be used by project proponents to consult with the State Historic Preservation Division/Department of Land and Natural Resources (SHPD) regarding the need for an archaeological inventory survey of the proposed project area.

Please be advised that the proposed literature review and field inspection will not meet the requirements of an archaeological inventory-level survey per the rules and regulations of the SHPD

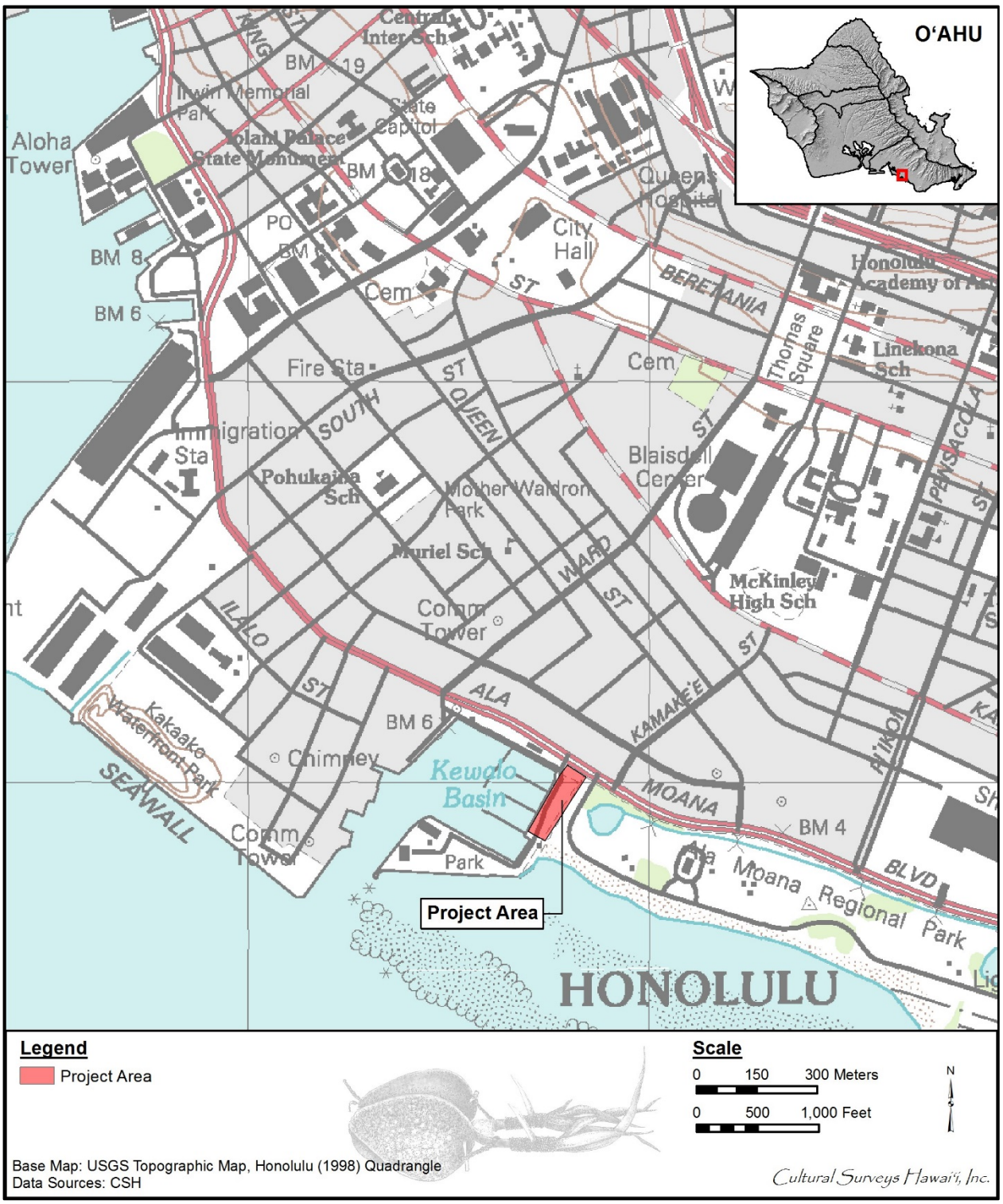

Figure 1. Portion of the 1998 Honolulu USGS Topographic Quadrangle showing the location of the project area

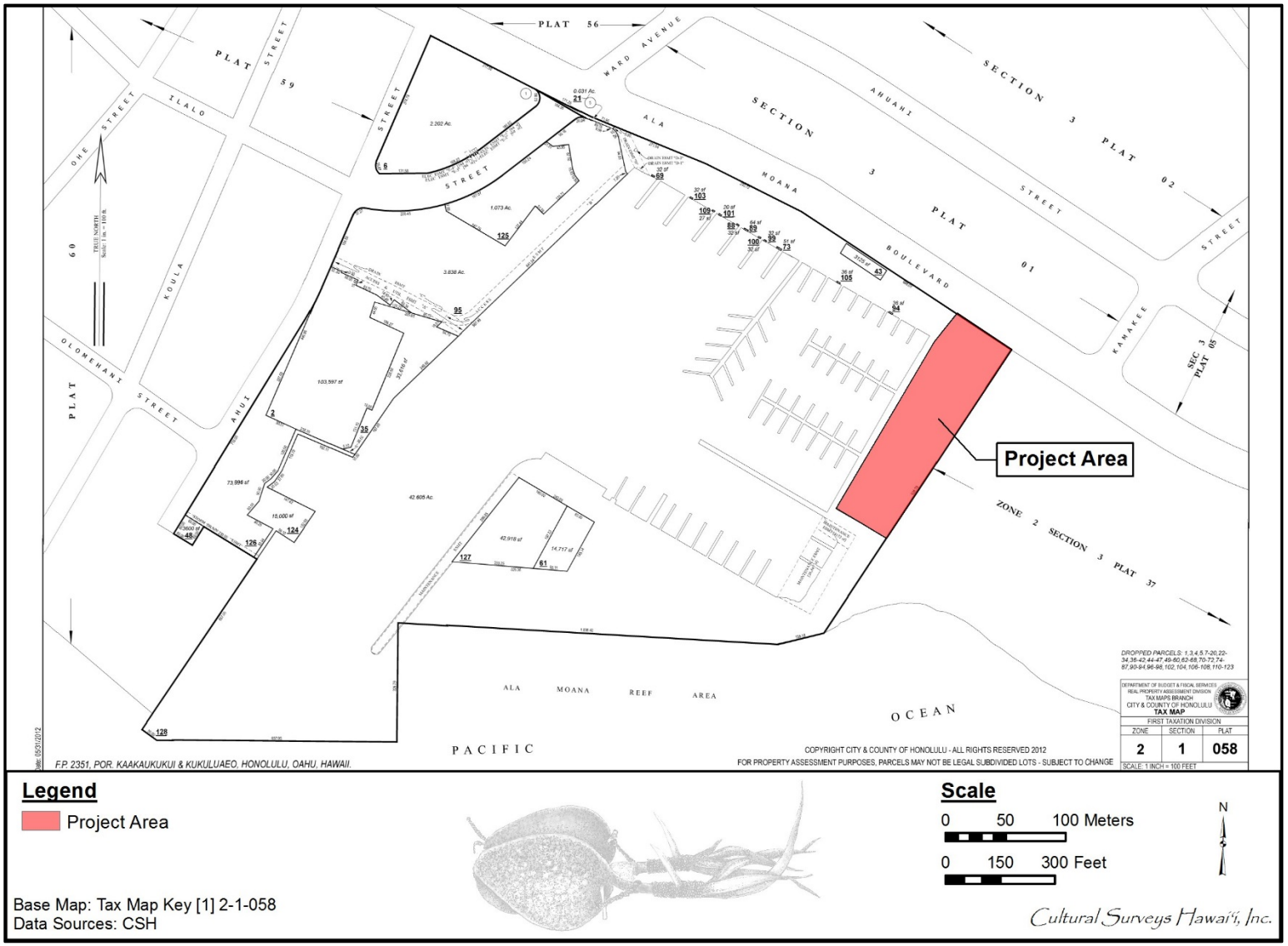

Figure 2. Tax Map Key (TMK) [1] 2-1-058 showing the location of the project area (Hawai‘i TMK Service)

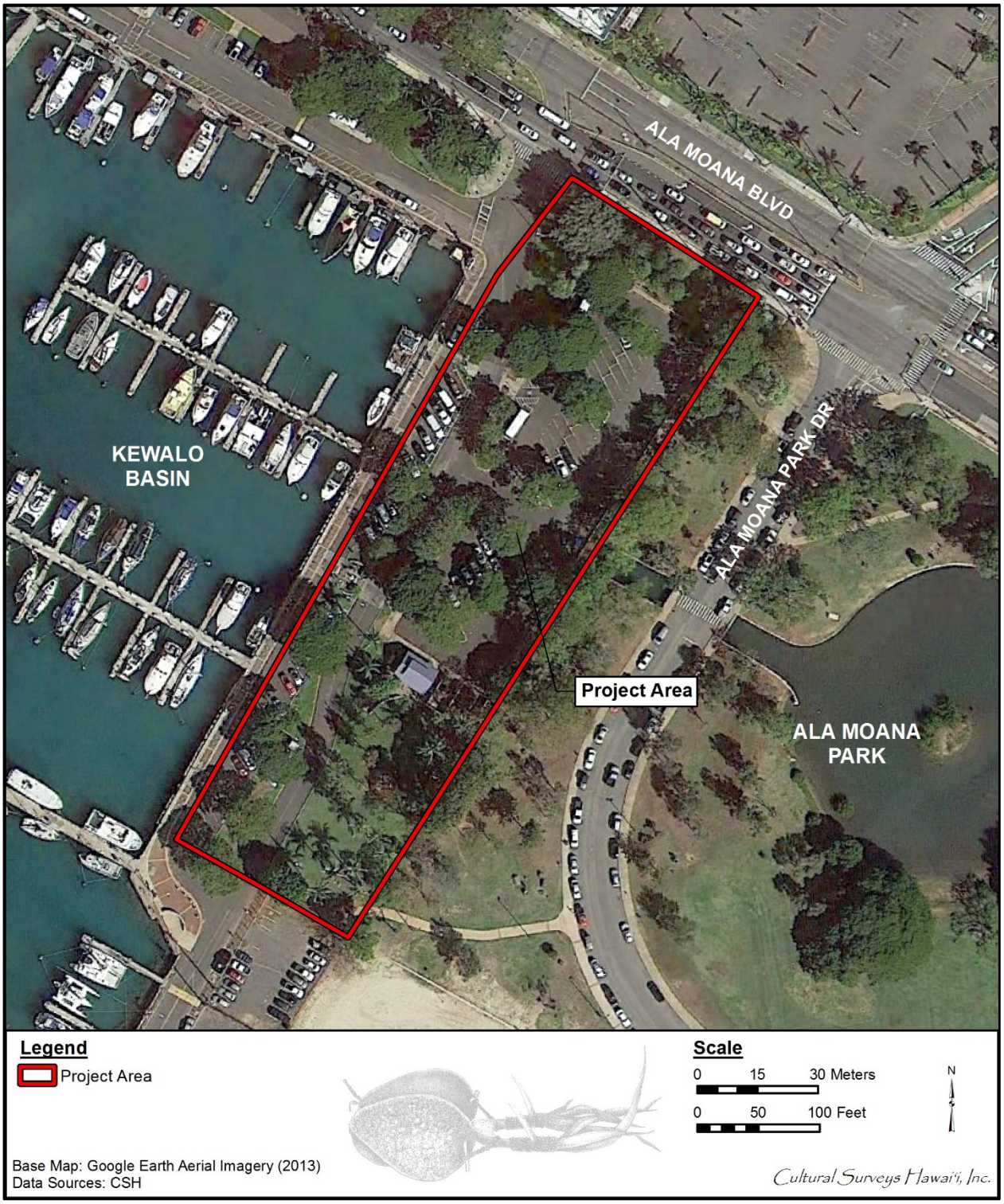

Figure 3. Aerial photograph (Google Earth 2013) showing the location of the project area

(HAR §13-276). Additionally, based on background research and field inspection results, the report may recommend that an archaeological inventory survey be completed for the proposed project. Based on their review of the project’s potential impacts, SHPD can independently determine that an archaeological inventory survey is required for the project, regardless of CSH’s recommendations.

1.3 Environmental Setting

1.3.1 Natural Environment

O‘ahu island’s coastal areas formed from coral reefs and alluvial sediment and generally have smooth and gentle slopes. This land is used most often for farming and ranching or for urban development (Foote et al. 1972:6). In the Honolulu District, rainfall averages less than 30 inches per year (Armstrong 1983:62). Northeasterly trade winds prevail throughout the year, although their frequency varies from more than 90% during the summer months to 50% in January; the average annual wind velocity is approximately 10 miles per hour (Wilson Okamoto & Associates 1998:2–1).

According to the U.S. Department of Agriculture (USDA) Soil Survey Geographic (SSURGO) database (2001) and soil survey data gathered by Foote et al. (1972), the project area’s soils consist of two types of soil series, Fill Land (FL) and Beaches (BS) as shown in Figure 4.The primary soil series in the area is Fill Land, “areas filled with material from dredging, excavation from adjacent uplands, garbage, and bagasse and slurry from sugar mills . . . Generally these materials are dumped and spread over marshes, low-lying areas along the coastal flats, coral sand, coral limestone, or areas shallow to bedrock” (Foote et al. 1972:31). The second soil series is the coastal Beaches, occurring “as sandy, gravelly, or cobbly areas . . . consist[ing] mainly of light-colored sands derived from coral and seashells . . . Beaches have no values for farming. Where accessible and free of cobblestones, they are highly suitable for recreational uses and resort development” (Foote et al. 1972:28).

1.3.2 Built Environment

The project area is positioned along the coastal region of central Honolulu, surrounded by modern urban development including the commercial boat harbor, commercial buildings, public beach access, paved streets, sidewalks, utility infrastructure, and landscaped parking lot and roadway medians. The project area is only accessible from two entranceways, one located at the western end of the harbor closer to Ward Avenue; the second entrance is located near the Ala Moana Park Drive.

Figure 4. Aerial photograph (Google Earth 2013) showing the project area with soil overlay (Foote et al. 1972)

Section 2 Methods

2.1 Field Methods

CSH completed the fieldwork component of this study under archaeological permit number 14-04, issued by the SHPD pursuant to HAR §13-13-282. Fieldwork was conducted between 29 August 2014 and 2 September 2014 by CSH archaeologists William Folk, B.A. under the general supervision of principal investigator Hallett H. Hammatt, Ph.D. All accessible portions of the property were surveyed on foot and photographs were taken. This work required approximately one person-day to complete.

2.1.1 Pedestrian Survey

A 100%-coverage pedestrian inspection of the project area was undertaken for the purpose of historic property identification and documentation.

2.2 Research Methods

Background research included a review of previous archaeological studies on file at the SHPD; review of documents at Hamilton Library of the University of Hawai‘i at Mānoa, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Bishop Museum Archives; study of historic photographs at the Hawai‘i State Archives and the Bishop Museum Archives; and study of historic maps at the Survey Office of the Department of Land and Natural Resources. Historic maps and photographs from the CSH library were also consulted. In addition, Māhele records were examined from the Waihona ‘Aina database (Waihona ‘Aina 2000).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected types and locations of historic properties in the project area.

Section 3 Background Research

3.1 Traditional and Historical Background

The project area is located on the island of O‘ahu in the Kona *moku* (district), within the *ahupua‘a* (larger land division) of Honolulu, in the coastal *‘ili* (traditional land unit within an *ahupua‘a*) of Kukuluāe‘o. The project area is associated with and often confused for a number of other *‘ili* in the area including Kewalo, which many people refer to as the boat harbor, and Kaka‘ako, another *‘ili* often used interchangeably with the project area. Ka‘ākaukukui is an adjacent *‘ili* associated with the project area. The *‘ili* of Kukuluāe‘o, where the project area is, was traditionally known for its fishponds, salt pans, *pili* grass (*Heteropogon contortus*), and trails that connected the two major centers of population of ancient Honolulu (Kou) and Waikīkī.

3.1.1 Mythological and Traditional Accounts

3.1.1.1 *Wahi Pana* (Place Names)

Kukuluāe‘o translates as the Hawaiian stilt bird (*Himantopus himantopus*). Kukuluāe‘o also means “to walk on stilts.” Pukui et al. (1974:123) described the area as “formerly fronting Kewalo Basin” and “containing marshes, salt ponds, and small fishponds,” an environment well-suited for this type of bird (Griffin et al. 1987:36). Kekahuna (1958:4) described the *‘ili* as “the land on the upland side of Ka‘ākaukukui. Salt was formerly made there.”

In *Place Names of Hawaii*, Pukui defines the literal translation of Kewalo as “the calling (as an echo)” (Pukui et al. 1974:109). Pukui et al. (1974:71) do not give a meaning for Kaka‘ako, but the Hawaiian word *kākā‘āko* can be translated as “dull, slow” (Pukui and Elbert 1986:110). Thrum (1922:639) translated the word as “prepare the thatching” (*kākā* = to chop, beat, or thresh; *ako* = thatch). If Thrum’s translation is correct, it could be related to the fact that salt marshes such as areas like Kaka‘ako were excellent places to gather tall *pili* grass, which the Hawaiians traditionally used to thatch their houses.

According to Kekahuna (1958:4), the *‘ili* of Ka‘ākaukukui was “a beautiful sand beach that formerly extended along Ala Moana Park to Kewalo Basin, a quarter mile long reef extended along the shore.” Pukui et al. (1974:59) describe Ka‘ākaukukui as a “filled-in reef” and literally translate the name as “the right (or north) light,” possibly referring to a maritime navigation landmark. Thrum (1922:635) translates it as “radiating place for lamp.” In the early twentieth century, it was translated as “to the right of the lighthouse” by the squatters who lived in the area (Gessler 1938:187). This would have been an accurate description of the area at that time as Ka‘ākaukukui was east, or “to the right” of the Honolulu Lighthouse in the harbor. However, this is probably a historic, not an ancient, interpretation as the Honolulu Lighthouse was not built until 1869 (Dean 1991:7).

The barrenness of the Kaka‘ako area is also illustrated in two sketches, one made in 1834 when Kawaiaha‘o Church was still a long grass-thatched building (Figure 5), and one made in 1850 after the grass hut had been replaced by a large coral stone structure with a steeple (Figure 6). Between Kawaiaha‘o Church and the sea, which is the Kaka‘ako area, only a few scattered huts along the shore and aligned along the inland trail are shown (now covered by King Street).

Figure 5. Portion of an 1834 sketch by anonymous illustrator entitled “Town of Honolulu: Island of Woahoo: Sandwich Islands” (original sketch at Bernice Pauahi Bishop Museum; reprinted in Grant 2000:64-65)

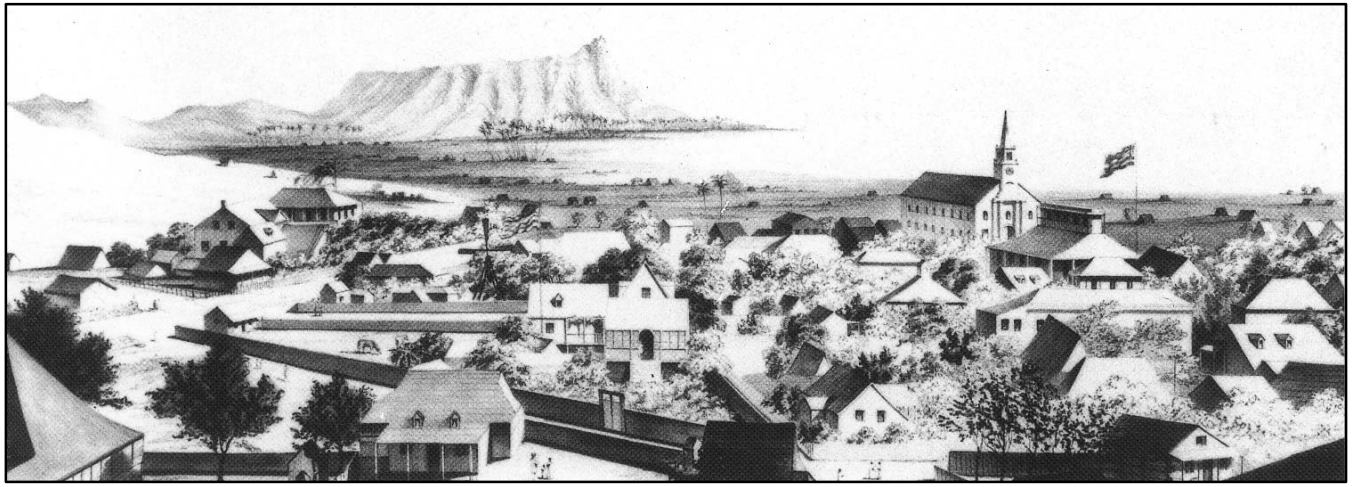

Figure 6. Portion of an 1850 sketch by Paul Emmert (original sketch at Hawaiian Historical Society; reprinted in Grant 2000:5)

3.1.1.2 *Mo‘olelo* Associated with *Wahi Pana*

There are no legends that specifically mention the small *‘ili* of Kukuluāe‘o. There are some traditional accounts of Ka‘ākaukukui and Kaka‘ako. From traditional accounts, it can be seen that Kukuluāe‘o and surrounding lands were customarily noted for their fishponds and salt pans, the marsh lands where *pili* grass and other plants could be collected, and trails that allowed transport between the more populated areas of Waikīkī and Honolulu. *Maka‘āinana* (commoners) traveled to the area to procure food and other resources. Some *maka‘āinana* probably also lived in the area, possibly adjacent to the *kai ho‘olulu* (salt ponds), *loko i‘a* (fishponds), and the *ala hele* (trails).

The district known as Kaka‘ako is significantly larger than the traditional area of the same name. In addition to the *‘ili* of Kaka‘ako, the modern Kaka‘ako area also includes lands once known as Kukuluāe‘o, Kewalo, and Ka‘ākaukukui, and even smaller traditional Hawaiian land areas called *lele*, including Kawaiaha‘o, Honuakaha, Pu‘unui, Ka‘ala‘a, ‘Āpua, and ‘Auwaiolimu.

3.1.1.3 *Mo‘olelo* of Kaka‘ako

Kaka‘ako is mentioned in Manu’s (1998:230-249) version of the legend of Kū‘ula, the god presiding over all fish. His son ‘Ai‘ai was the first to teach the Hawaiians how to make various fishing lines and nets, the first to set up a *ko‘a kū‘ula* (rock shrine) on which the fishermen would place their first catch as an offering to Kū‘ula, and the first to set up *ko‘a i‘a* (fishing stations) where certain fish were known to gather. Leaving his birthplace in Maui, ‘Ai‘ai traveled around the islands, establishing *ko‘a kū‘ula* and *ko‘a i‘a*. On O‘ahu, he landed first at Makapu‘u in Ko‘olaupoko, then traveled clockwise around the island.

> Aiai came to Kalia [Waikīkī] and so on to Kakaako. Here he was befriended by a man named Apua, with whom he remained several days, observing and listening to the murmurs of the chief named Kou. This chief was a skillful aku [*Katsuwonus pelamis*; bonito] fisherman, his grounds being outside of Mamala until you came to Moanalua. There was none so skilled as he, and generous withal, giving akus to the people throughout the district. [Manu 1998:242]

3.1.1.4 *Mo‘olelo* of Kewalo

Kewalo was famous for freshwater springs, as seen in the proverb “Ka wai huahua‘i o Kewalo,” which translates as “the bubbling water of Kewalo.” Two springs are mentioned in a traditional story of the “Waters of Ha‘o.” This legend tells of two children of the chief Ha‘o who ran away from their cruel stepmother. They stayed a time with the caretakers of Kewalo Spring, which may have been located close to the trail that connected Waikīkī and Honolulu. The children then left when they heard that the chiefess had sent men to look for them. The two children followed the moonlit trail across the plain toward Kou (ancient name for Honolulu), but finally collapsed from weariness and thirst. In a dream, the boy’s mother told him to pull up a plant close to his feet. When he did, he found a spring under the plant, which was called the Water of Ha‘o, or Kawaiaha‘o. This spring was located at the western end of the trail, near Kawaiaha‘o Church in Kaka‘ako (Pukui 1988:87-89).

Kewalo also once had a famous fishpond that was used to drown members of a pariah caste (*kauwā*) or *kapu* (taboo) breakers as the first step in a sacrificial ritual known as Kānāwai Kaihehe‘e (Kamakau 1991:6) or Ke-kai-he‘ehe‘e, which translates as “sea sliding along,”

suggesting the victims were slid under the sea (Westervelt 1963:16). Kewalo is described as follows:

> A fishpond and surrounding land on the plains below King Street, and beyond. It contains a spring rather famous in the times previous to the conversion to Christianity, as the place where victims designed for the Heiau of Kanelaau on Punchbowl slopes, was first drowned. The priest holding the victim's head under water would say to her or him on any signs of struggling, 'Moe malie i ke kai o ko haku.' 'Lie still in the waters of your superiors.' From this it was called Kawailumalumai, 'Drowning waters.' [Sterling and Summers 1978:292]

Kewalo is mentioned in legend as a place resorted to for thatch. A man named Kapoi "went to the Kewalo marsh near the beach, where tall pili grass was growing, to get a bundle of the grass to use as thatching." (Westervelt 1963:133). While there, Kapoi found seven owl eggs and took them home to cook for his supper. An owl perched on the fence surrounding his house cried out, "O Kapoi, give me my eggs!" After several such pleas, Kapoi eventually returned the eggs. In return, the owl became his *‘aumakua* (family god) and instructed him to build a *heiau* (pre-Christian place of worship) named Mānoa. Kapoi built the *heiau*, placed some bananas on the altar as a sacrifice, and set the *kapu* days for its dedication. The king of O‘ahu, Kākuhihewa, who was building his own *heiau* in Waikīkī, had made a law that if any man among his people erected a *heiau* and set the *kapu* before him, that man should die. Kapoi was seized and taken to the *heiau* of Kūpalaha, at Waikīkī. Kapoi's *‘aumakua* owl asked for aid from the king of the owls at Owl's Hill (Pu‘u Pu‘eo) in Mānoa, who gathered all of the owls of the islands. They flew to Kūpalaha and battled the king's men, who finally surrendered. From this time, the owl was considered a powerful *akua* (god). The battle area was known as Kukaeunahio-ka-pueo, which means "the confused noise of owls rising in masses" (Westervelt 1963:135-137; Thrum 1998:200-202).

3.1.1.5 *Mo‘olelo* of Ka‘ākaukukui

Ka‘ākaukukui is briefly mentioned in the legend of Hi‘iaka, who was the beloved sister of the Hawaiian volcano goddess, Pele. Hi‘iaka and her companions had been traveling around O‘ahu on the *ala hele*, but decided to travel from Pu‘uloa (on Pearl Harbor in ‘Ewa) to Waikīkī by canoe. At Pu‘uloa, Hi‘iaka met a party who were planning on traveling to the house of the chiefess Pele‘ula in Waikīkī. Hi‘iaka recited a chant, telling the people although they were going by land and she was going by sea they would meet again in Kou. One portion of the chant mentions the place Ka‘ākaukukui, with reference to a pool, possibly a reference to the salt ponds of the area:

A pehea lā au, e Honoka‘upu, ku‘u aloha	And what of me, O Honoka‘upu, my love
I ka welelau nalu kai o Uhi, o ‘Ōa	Upon the crest of the surf at Uhi and ‘Oā
‘O nā makai ke ao (pō) o poina	Eyes in the living realm (night) of oblivion
Ma hea lā wau, e ke aloha lā	Where am I, O my love
‘O Kou ka papa	Kou is the coral flat
‘O Ka‘ākaukukui ka loko	Ka‘ākaukukui is the pool
‘O ka ‘alamihi a‘e nō	Some *‘alamihi* indeed
‘O ka lā a pō iho	Wait all day until night

Hui aku i Kou nā maka. Friends shall meet in Kou.

[Ho‘oulumāhiehie 2006a:297; Ho‘oulumāhiehie 2006b:277]

The exact meaning of the word *‘alamihi* within this chant is unknown. *‘Alamihi* is the name of a native Hawaiian small black crab (*Metopograpsus thukuhar*), a scavenger often associated in Hawaiian sayings with corpse-eating (Pukui and Elbert 1986:18). *Alamihi* is also used as a place name that can be broken down into *ala* (path) *mihi* (remorse) the “path [of] regret” (Pukui et al. 1974:9).

It does not appear that the current project area was in an area of dense or permanent settlement in traditional times. Most of the pre-Contact and early post-Contact population was clustered in the village of Honuakaha, northwest of the current project area along Queen Street. However, in later post-Contact times (post-1850), this changed as population pressure in Honolulu and urban expansion led to the infilling of marshes and wetlands on the outskirts of Honolulu, leading to the subsequent development of the Kaka‘ako area.

An 1887 photograph of the area also shows the marshy nature of the area, with only scattered houses near the ponds or near the shore *makai* of Kawaiaha‘o Church (Figure 7).

Figure 7. 1887 photograph of Honolulu and Waikīkī; Kawaiaha‘o Church in left foreground; the Kaka‘ako area is within the marshlands seen in the right upper background (original photograph at Hawai‘i State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

3.2 Early Historic Period

The modern urban area known as Kaka‘ako is located between two longtime centers of population, Honolulu, known as Kou in ancient times, and Waikīkī. In Waikīkī, a system of *taro lo‘i* (irrigated terraces) fed by streams descending from Makiki, Mānoa, and Pālolo valleys covered the coastal plain, and networks of fishponds dotted the shoreline. Similarly, Kou previously had fishponds and irrigated fields watered by streams descending from Nu‘uanu and Pauoa valleys. The pre-Contact population and land use patterns of the Kaka‘ako area may have derived from its relationship to these two densely populated areas. Thus, the attempt to reconstruct the region as it existed for Hawaiians during the centuries before Western Contact must begin with accounts of Kou.

3.2.1 Honolulu (Kou)

A description of Honolulu is given by E.S. Craighill Handy and Elizabeth G. Handy:

> What is now Honolulu was originally that flatland area between the lower ends of Nu‘uanu and Pauoa Valleys and the harbor. Westervelt (1915, p. 1) wrote that ‘Honolulu’ was probably a name given to a very rich district of farm land near what is now . . . the junction of Liliha and School Streets, because its chief was Honolulu, one of the high chiefs at the time of Kakuhihewa . . . It is probable that the chief referred to by Westervelt took his name from the harbor and adjoining land. The original name of the land where the town grew when the harbor became a haven for foreign ships was Kou (Pukui and Elbert, 1957, p. 154). The number of heiau in this area indicates that it was a place of first importance before the era of foreign contact. [Handy and Handy 1972:479]

Rev. Hiram Bingham, arriving in Honolulu in 1820, described Honolulu as a still predominantly native Hawaiian environment—still a “village”—on the brink of western transformations:

> We can anchor in the roadstead abreast of Honolulu village, on the south side of the island, about 17 miles from the eastern extremity . . . Passing through the irregular village of some thousands of inhabitants, whose grass thatched habitations were mostly small and mean, while some were more spacious, we walked about a mile northwardly to the opening of the valley of Pauoa, then turning southeasterly, ascending to the top of Punchbowl Hill, an extinguished crater, whose base bounds the northeast part of the village or town . . . Below us, on the south and west, spread the plain of Honolulu, having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of *kalo* (*arum esculentum*) in its various stages of growth, with its large green leaves, beautifully embossed on the silvery water, in which it flourishes. [Bingham 1847:92-93]

3.2.2 Kaka‘ako

The Pu‘unui and Ka‘ākaukukui area would have been in Bingham’s view as he stood atop “Punchbowl Hill” looking toward Waikīkī to the south; it would have comprised part of the area

he describes as the “plain of Honolulu” with its “fishponds and salt making pools along the seashore.”

Another visitor to Honolulu in the 1820s, Captain Jacobus Boelen, hints at the possible pre-Contact character of Honolulu and its environs, including the Ka‘ākaukukui area:

> It would be difficult to say much about Honoruru. On its southern side is the harbor or the basin of that name (which as a result of variations in pronunciation [*sic*] is also written as Honolulu, and on some maps, Honoonoono). The landlocked side in the northwest consists mostly of taro fields. More to the north there are some sugar plantations and a sugar mill, worked by a team of mules. From the north toward the east, where the beach forms the bight of Whytetee, the soil around the village is less fertile, or at least not greatly cultivated. [Boelen 1988:62]

Boelen’s description implies that the Pu‘unui and Ka‘ākaukukui area is within a “not greatly cultivated” region of Honolulu, perhaps extending from Pūowaina (Punchbowl Crater) at the north, through Kaka‘ako, to the Kālia portion of Waikīkī in the west.

An early, somewhat generalized, depiction of the pre-Contact native Hawaiian shaping of Waikīkī, Honolulu, and the Kaka‘ako area was made by Otto von Kotzebue (1821), commander of the Russian ship *Rurick*, who had visited O‘ahu the previous year. His descriptions and map show *taro lo‘i* massed around the streams descending from Nu‘uanu and Mānoa valleys. Early historic population patterns were influenced by the post-Contact shift of population to the area around Honolulu harbor—the only sheltered landing for large western-sized vessels on O‘ahu and the center of increasing trade with visiting foreign vessels. Kamehameha himself had moved from Waikīkī to Honolulu in 1809.

A clearer picture of Pu‘unui and Ka‘ākaukukui develops with accounts of other visitors to, and settlers of, Honolulu during the first half of the nineteenth century. Gorman D. Gilman, who arrived in Honolulu in 1841, recalled in a memoir the limits of Honolulu during the early 1840s:

> The boundaries of the old town may be said to have been, on the makai [seaward] side, the waters of the harbor; on the mauka [inland] side, Beretania street; on the Waikīkī [east] side, the barren and dusty plain [i.e., the area just beyond Punchbowl Street], and on the Ewa [west] side, the Nuuanu Stream. [Gilman 1903:97]

Gilman further describes the “barren and dusty plain” beyond (east of) Punchbowl Street:

> The next and last street running parallel [he had been describing the streets running *mauka-makai*, or from the mountains to the shore] was that known as Punchbowl Street. There was on the entire length of this street, from the makai side to the slopes of Punchbowl, but one residence, the two-story house of Mr. Henry Diamond, mauka of King Street. Beyond the street was the old Kawaiahao church and burying ground. A more forsaken, desolate looking place than the latter can scarcely be imagined. One, to see it in its present attractiveness of fences, trees and shrubbery, can hardly believe its former desolation, when without enclosure, horses and cattle had free access to the whole place. [Gilman 1903:89]

That the environs of the missionary enclave and Kawaiaha‘o Church were indeed “forsaken” and “desolate looking” in the 1820s when the missionaries first settled there is also noted in the

memoirs of the American missionary C.S. Stewart who, arriving on Maui after living at the mission, declared Lahaina to be “like the delights of an Eden” after “four weeks residence on the dreary plain of Honoruru” (Stewart 1970:177).

3.3 The Māhele and the Kuleana Act

Among the first descriptions of Kukuluāe‘o, Kewalo, and Ka‘ākaukukui by the Hawaiians themselves are testimonies recorded during the 1840s in documents associated with land awards and awardees of the Great Māhele. A portion of a modern tracing of an 1884 map by S.E. Bishop shows the disposition of LCAs granted in the environs of the study area (Figure 8). The tracing includes some modern streets not present in 1884. These additions, however, permit an accurate positioning of the study area on the 1884 map. This general depiction is believed to be quite accurate, with the annotated “Beach Road” that runs along the edge of the sea becoming the present Ala Moana Boulevard/Nimitz Highway alignment.

The *‘ili* of Kukuluāe‘o (LCA 387) was awarded to the American Board of Commissioners for Foreign Missions (ABCFM). Initially this land was associated with Punahou School in Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiaha‘o Church in 1829 (DeLeon 1978:3). In the Māhele, however, this sea land became “detached” from the Mānoa award and was instead given to the pastor of the Kawaiaha‘o Church, as noted in a history of the Punahou School (Punahou School 1866). Curtis Perry Ward, a native of Kentucky, came to the Hawaiian Islands in 1853, and soon established a livery and draying business. In 1865, he bought a large 12-acre estate *mauka* (toward the mountain) of King Street. Sometime before 1875, Ward added to his property with the purchase of 77 acres and 3,000 ft of ocean frontage in the *‘ili* of Kukuluāe‘o, *makai* (towards the sea) of Queen Street. [Hustace 2000:21-38]

The *‘ili* of Kewalo (LCA 10605) was awarded to Kamake‘e Pi‘ikoi, wife of Jonah Pi‘ikoi (awardee of Pualoalo ‘Ili), as part of LCA 10605, *‘āpana* (lot) 7. The award was shared between husband and wife (Kame‘eleihiwa 1992:269). Kewalo was a large 270.84-acre land section extending from Kawaiaha‘o Church to Sheridan Street. This land section had numerous large fishponds, which were awarded as part of the claim to Pi‘ikoi.

The *‘ili* of Ka‘ākaukukui (LCA 7713) was awarded to Victoria Kamāmalu, sister of Kamehameha IV and Kamehameha V. There were no awards to *maka‘āinana* in this *‘ili*, which seems to have consisted entirely of land used for salt making. No residences are shown in this area until the twentieth century. Ka‘ākaukukui consisted of three non-contiguous sections, a type of *‘āina* (land) called a *lele*. An early surveyor for the Hawaiian Government Survey office explains about *lele* in general, and Ka‘ākaukukui in particular:

> There were two features of the ili, referred to by the terms lele . . . the ili often consisted of several distinct sections of land—one, for instance, on the seashore, another on dry, open land, or kula, another in the regularly terraced and watered kalo patch or aina loi district, and another still in the forest, thus again carrying out the equable division system which we have seen in the ahupuaa.
>
> These separate pieces were called, lele, i.e., ‘jumps,’ and were most common on O‘ahu . . . Kaakaukukui held Fisherman’s Point and the present harbor of Honolulu; then kalo land near the present Kukui street, and also a large tract of forest at the head of Pouoa [Pauoa] Valley . . .

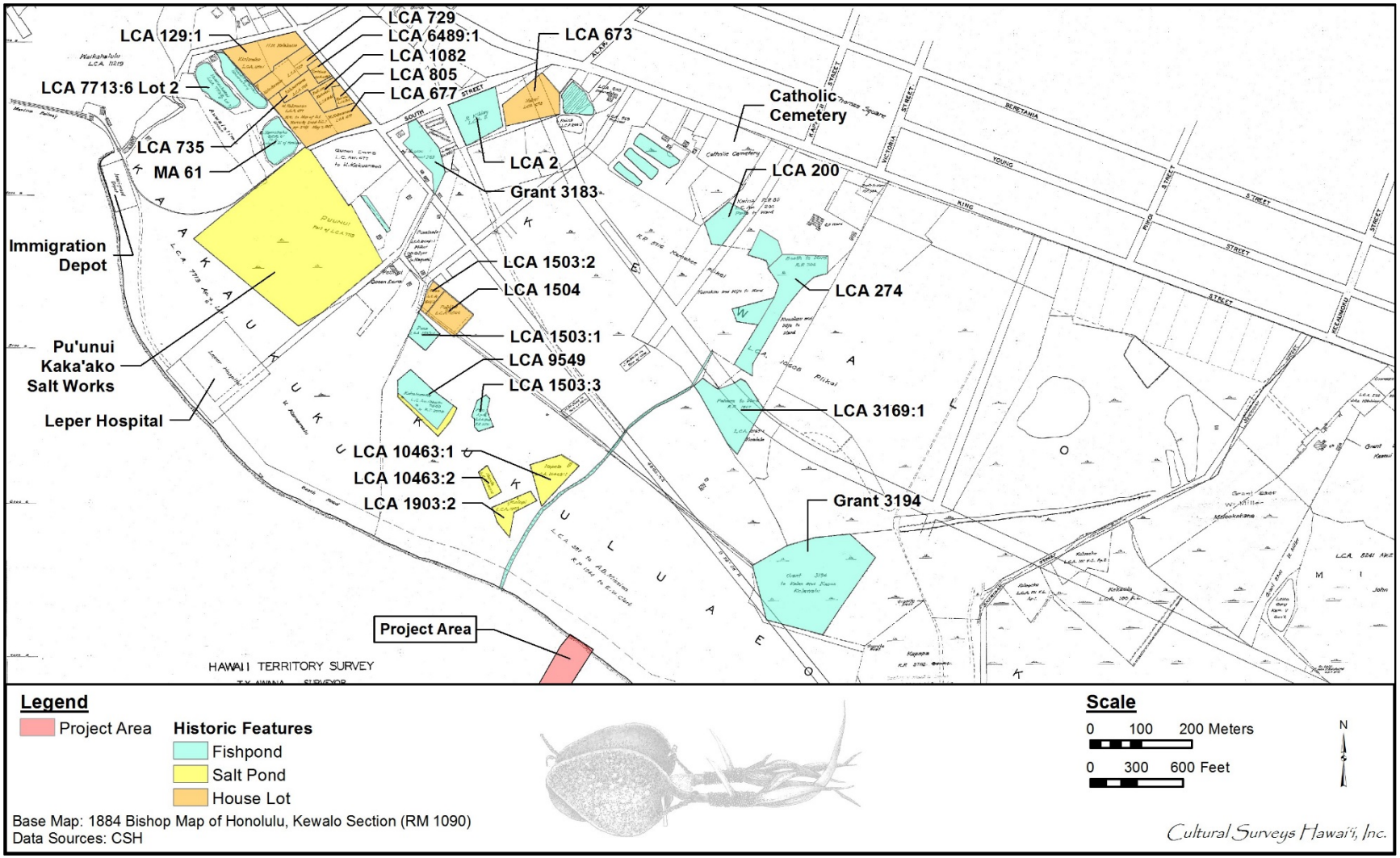

Figure 8. 1884 Bishop map of Honolulu, Kewalo Section showing the locations of LCA parcels, fishponds, salt lands, and house lots *surrounding the project area*

> These different pieces were called variously, either by their own individual name or by that of the whole ili, thus puzzling one sadly when attempting to obtain information with respect to them. [Lyons 1894:1697]

The *mauka* portion of Koalele's claim, which includes the *taro* patches, is not shown on the 1884 map; it is likely somewhere immediately *mauka* of King Street. The *makai* portion—the "*Lokos*" or fishponds—is shown located northeast of the present study area.

The LCA records thus help clarify both the pre-Contact and mid-nineteenth century pictures of the study area vicinity. They suggest traditional Hawaiian usage of the Kewalo region and its environs may have been confined to salt making and farming of fishponds, with minimal wetland agriculture in those areas *mauka* or toward Waikīkī at the very limits of the field system descending from Makiki and Mānoa. The characterization by a native Hawaiian of the expanse within the present study area as the "salt plains of Honolulu" itself suggests the environmental limitations that would have made the general region less desirable for long-term permanent habitation by any sizeable population. However, the testimonies do indicate the area was lived on and was shaped by Hawaiians before the nineteenth century.

There are no LCA parcels within or in the vicinity of the project area due to the fact that the area was filled in. As indicated in Figure 8, the project area was previously in the ocean. In addition, LCA records also reveal that midway through the nineteenth century taro cultivation and the traditional salt making and fishpond farming activities continued within the environs *mauka* of the present study area. These activities and the land features that supported them would be eliminated during the remainder of the nineteenth century by the increasing urbanized expansion of Honolulu

3.4 . Mid- to Late 1800s

3.4.1 Kaka‘ako Salt Works and the Salt Pans of Kewalo and Kukuluāe‘o

As noted in the Land Commission Award testimony, much of the land in Ka‘ākaukukui was used to produce salt. The Hawaiians used *pa‘akai* (salt) for a variety of purposes: to flavor food, to preserve fish by salting, for medicines, and for ceremonial purposes. David Malo described the traditional method of making salt:

> *O ka paakai kekahi mea e pono ai, he mea e ono ai, ka ia, a me ke koekoe o ka paina ana, he mea hana ia ka paakai, ma kekahi aina, aole i hana a ma kekahi aina, o ke kai makai, e kii aku no ka wahine, a lawe mai ma ke poi, a ke kai hooholo ia mai kekahi ma kauwahi mai.*
>
> *E waiho kela kai ma kekahi poho paha, he ekaha paha, he kahe ka paha, a liu malaila, alaila lawe ana kauwahi e, a paakai iho la no ia, o ka papa laau ka mea kui poi.* [Malo 2006:73]

Translation

> Pa‘akai (salt) is another beneficial item. It is used to make fish delicious and tasteless foods edible. Pa‘akai is made at a particular place, [but] it [salt] is not actually made from this spot, rather it [salt water] came from the sea. A woman went to get some when the sea crashed [upon the rocks] and she ran back [the salt water] to this particular spot.

> That salt water (kai) is placed in, perhaps, a depression (poho) or a ‘Bird’s nest’ (ēkeha) or rock basin (kāheka) and allowed to evaporate (liu). Then it is taken to another spot and is formed into pa‘akai. Wooden boards (papa lā‘au) are used to pound poi (mashed cooked kalo corms) on. [Malo 2006:95]

In 1903, Nathaniel Emerson translated David Malo’s articles on early Hawaiian life. In his publication, the translations are not literal, but include information that Emerson added to clarify the accounts. In Emerson’s translation,

> Salt was one of the necessities and was a condiment used with fish and meat, also as a relish with fresh food. Salt was manufactured in certain places. The women brought sea-water in calabashes, or conducted it in ditches to natural holes, hollows and shallow ponds (kekaha) on the sea-coast, where it soon became strong brine from evaporation. Thence it was transferred to another hollow or shallow vat, where crystallization into salt was completed. [Malo 1951:123]

Captain Cook was the first to note the method of making salt in prepared “saltpans”:

> Amongst their arts, we must not forget that of making salt, with which we were amply supplied, during our stay at these islands, and which was perfectly good of its kind. Their saltpans are made of earth, lined with clay; being generally six or eight feet square, and about eight inches deep. They are raised upon a bank of stones near the high-water mark, from whence the salt water is conducted to the foot of them, in small trenches, out of which they are filled, and the sun quickly performs the necessary process of evaporation . . . Besides the quantity we used in salting pork, we filled all our empty casks, amounting to sixteen puncheons, in the Resolution only. [Cook 1784:151]

The export of salt declined in the late nineteenth century. Thrum (1923:116) states that the apex of the trade was in 1870, but by 1883 he noted that “pulu, salt and oil have disappeared entirely” from the list of yearly exports (Thrum 1884:68). By 1916, only one salt works, the Honolulu Salt Company, was still in operation. However, salt continued to be manufactured for local use. The Kaka‘ako Salt Works appears on maps as late as 1891 and a page in Victoria Ward’s ledger for 1883 notes a yearly income of $651.50 received from her “Salt Lands” in Kukuluāe‘o (Hustace 2000:50). As noted above, Thrum (1923:116) said the Honolulu Salt Company was the only salt producer on O‘ahu in 1916. A 1916 Commerce Report (Taylor 1916:723) states that the Honolulu Salt Company operates “salt beds at Puuloa, Kalihi, and Waikiki, on the island of O‘ahu . . . ” No mention is made of Kaka‘ako, suggesting that the Kaka‘ako salt works had closed before 1916.

The traditional method of salt production was gradually replaced by the more labor intensive Chinese method, as the Chinese immigrants began to take over the traditional salt and fish ponds of Honolulu in order to grow rice, to raise ducks, and to make salt. In a 1906 article, Rev. Westervelt (1906:43-46) explained the Chinese method of salt evaporation for the Honolulu salt beds. The Chinese worker first used a water pump to draw the seawater from the larger ditch below to the salt evaporation beds above. The man moved the two handles back and forth to work the pump. The evaporation beds were lined with clay, wet with sea water, and tramped and pounded down. Each pan was about 20 ft square, covered with about two inches of water, and bound by an earth dyke. On early historic maps, the area of salt pans is often marked out as a large grid of contiguous squares.

After allowing the sun to evaporate some of the water, the worker stepped into the evaporation pan and scraped the salt into a pile in the center with a simple wooden scraper. The worker then threw a large basket-shaped scoop into the brine and used a tin dipper to move the salt to the basket. Two baskets, one on each side of a pole, were then carried on the worker’s back across the thin earth dykes between the salt pans. The baskets were dumped into large drying piles, where the remaining water seeped out into the ground. The salt was then sewn into gunny sacks and sent to the market for sale.

By 1901, most of the fishponds and salt pans *makai* of King Street were reported as abandoned. In that year, the Hawai‘i Legislature proposed to build a ditch to drain away the “foul and filthy water that overflows that district at the present time.”

> The district makai of King St. and the Catholic Cemetery, Ewa of Mrs. Ward’s (the Old Plantation), mauka of Clayton St., and Waikiki of the land from King St., leading to the Hoomananaauao Church, consists of six large abandoned fish ponds and a large number of smaller ones, all in filthy condition, fed by springs and flowing into Peck’s ditches. Just makai of these ponds, at the end of Clayton street, The rear portion of Mrs. Ward’s property down to Waimanu St. used to be fish ponds all connecting to the sea by a ditch which is fed by an artesian well. These ponds, with the exception of three, are abandoned next to Mr. Ward’s, is Peck’s place. An artesian well flushing the wash houses flows into two foul ditches, thence to the big pond which is Waikiki of what used to be Cyclomere and next to Mrs. Ward’s line [ditch] extending down to Waimanu St. [Hawaii Legislature 1901:185].

3.4.2 Honolulu Iron Works

In the 1850s, Hawaiian sugar planters became interested in a type of centrifugal machine that could separate sugar from molasses. An engineer named David Weston installed his version of this machine in a Maui sugar mill in 1851. With backing from Hawaiian businessmen, Weston returned to the Islands in 1853 and founded the Honolulu Iron Works (Figure 9), which he set up in a building already occupied by a flour mill (Kuykendall 1938:326-327). The flour mill was at first the most successful part of the business, where wheat from Maui and as far away as Chile was ground into flour and then exported to California. However, as the sugar industry became more prominent in the Hawai‘i economy, the Iron Works began to build the machinery needed to operate the new sugar mills, not only in Hawai‘i but all over the world. At one point, the Iron Works employed 1,500 workers, many who lived in the Kaka‘ako area (Nicol 1998:510).

Business began to decline in the 1950s, and in 1973 the works were closed (Nicol 1998:510). At first the old buildings were converted to retail space, but eventually all were torn down; the last warehouse was demolished in 1982 (Kawasaki 2005:2). The main lot for this complex is now covered by One Waterfront Plaza, west of the current project area.

3.4.3 The 1874 Transit of Venus Observatory at ‘Āpua

The project area was used to house a large portable observatory in 1874, an event of so much interest that the lot continued to be labeled as the Transit of Venus yard many years after the portable observatory had been dismantled (Figure 10 and Figure 11).

In 1874, several astronomical teams from Great Britain traveled to different parts of the world to observe a rare transit of the planet Venus across the sun. The “purpose of the observations was

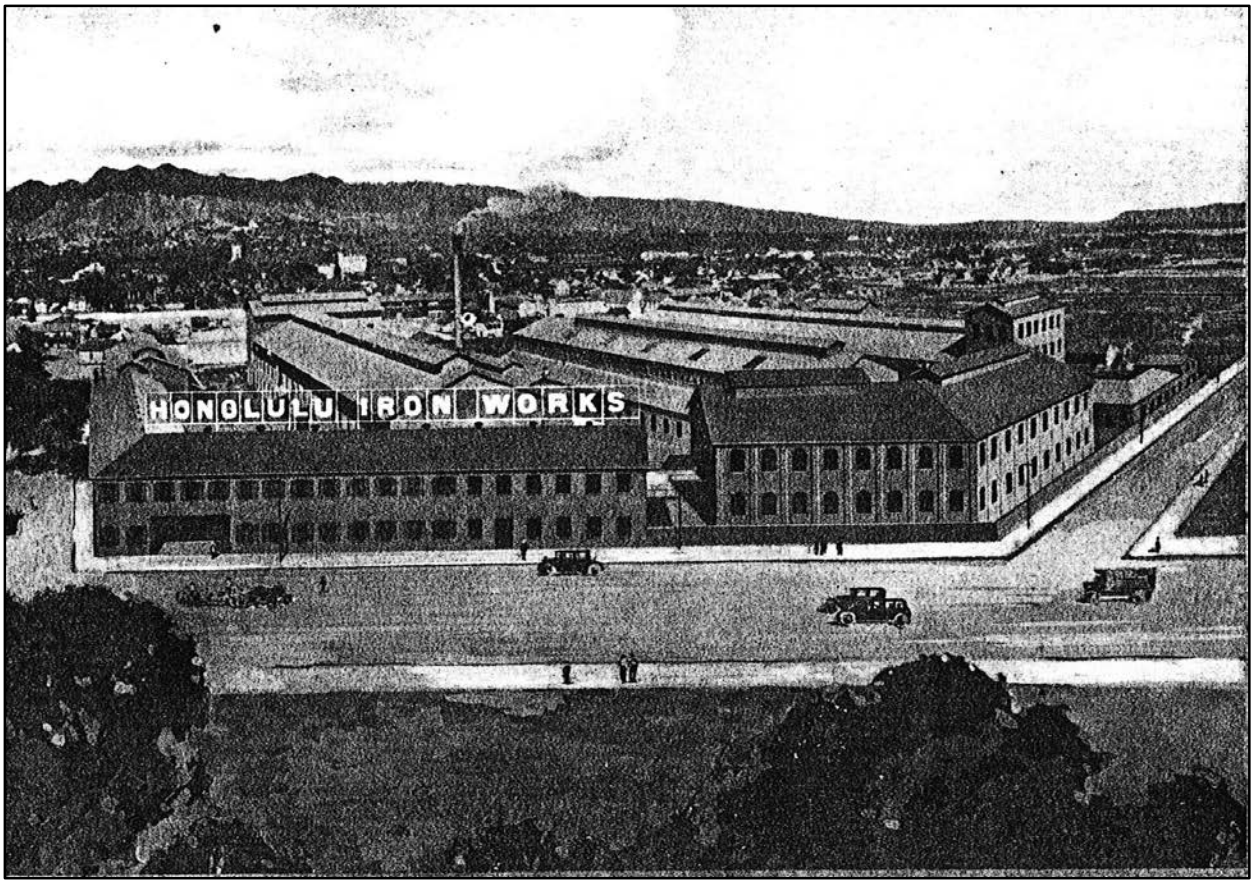

Figure 9. Photograph of Honolulu Iron Works, n.d. (Hawai‘i State Archives)

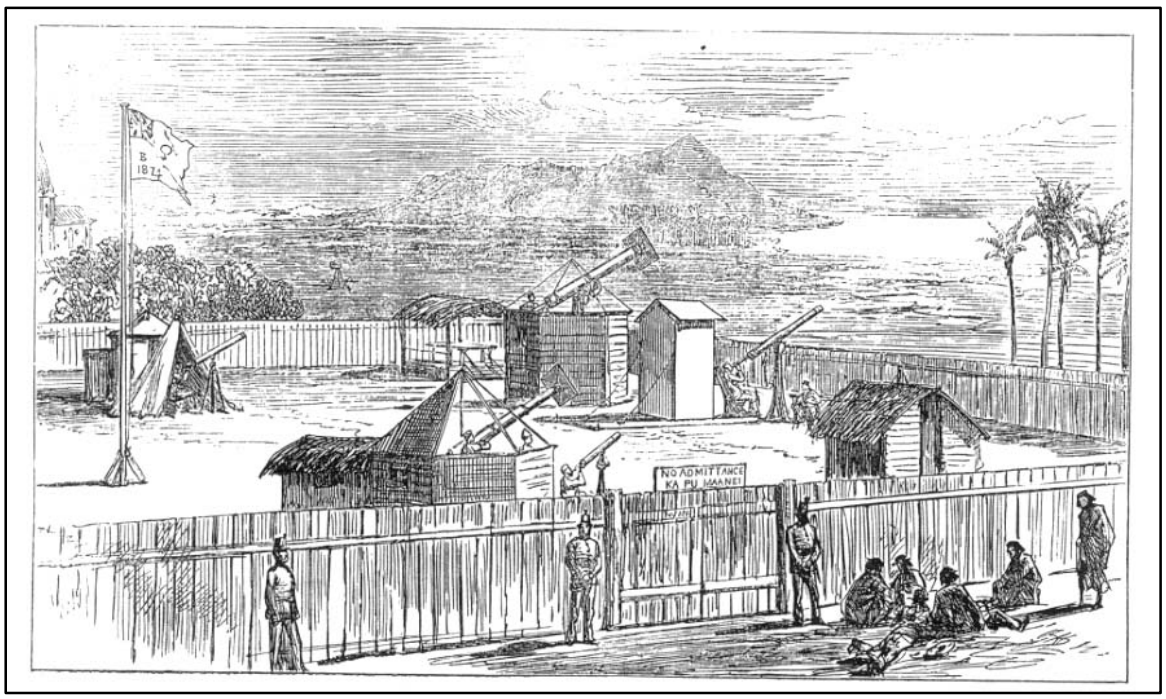

Figure 10. Sketch of the Transit of Venus station at ‘Āpua near Honolulu, view to east (sketch from *Illustrated London News*, 23 January 1875; reprinted in Chauvin 2004:108); note armed guards keeping curious onlookers outside the fenced enclosure

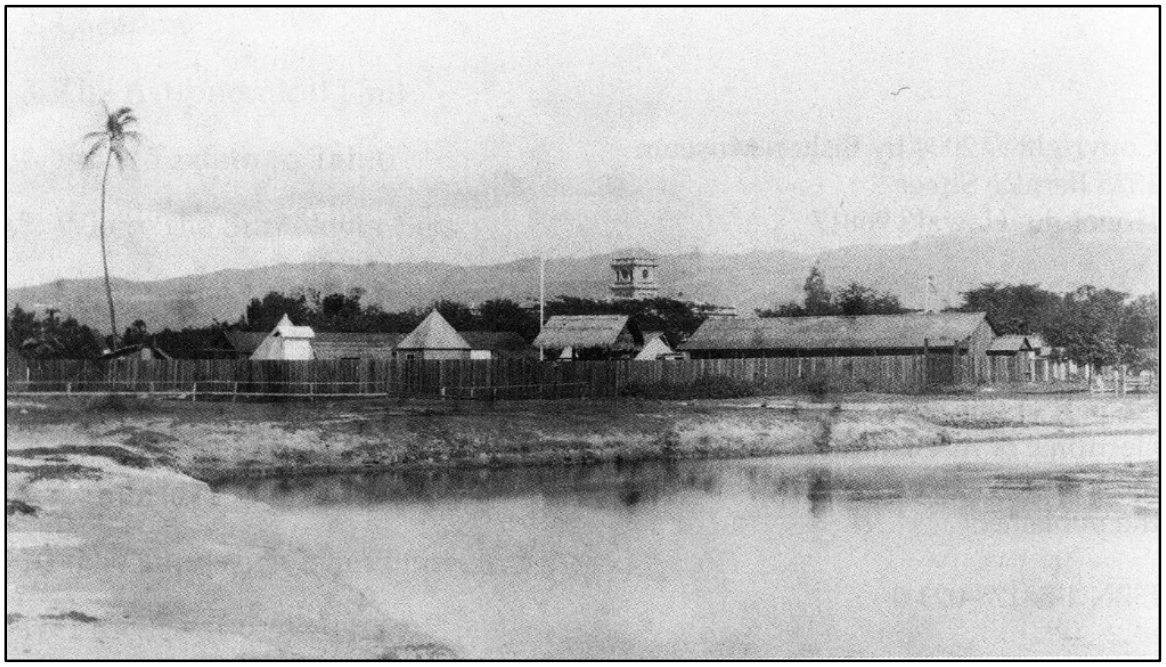

Figure 11. 1874 photograph of Transit of Venus station at ‘Āpua near Honolulu, view to north (Bishop Museum Archives, reprinted in Chauvin 2004:iii); note pond (part of ‘Auwaiolimu) in the foreground, the long barracks/workshops and other buildings of the station in the mid-ground, and the spire of Kawaiaha‘o Church in the background

to better determine the value of the astronomical unit (AU)—the Earth-sun distance—and thereby the absolute scale of the solar system" (Chauvin 2004:xii). This project attracted enormous interest in Hawai‘i, and members of the Hawaiian Government Survey worked with the British team, who set up observatories on Hawai‘i, Kaua‘i, and O‘ahu islands. Each station needed an equatorial telescope, other telescopes, a transit instrument, an altazimuth (surrounded by a portable wooden observatory with a revolving dome), and several clocks, chronometers, compasses, micrometers, reflecting circles, and artificial horizons (Chauvin 2004:51, 60).

Upon reaching Honolulu, the British team of seven astronomers temporarily moved into the Hawaiian Hotel in downtown Honolulu, and began to look about for a proper place to set up their O‘ahu observatory. King Kalākaua, who strongly supported the project, gave them permission to use a piece of land in the *‘ili* of ‘Āpua. Captain Tupman, head of the expedition wrote the following:

> Difficulty was experienced in finding a suitable place of observation, as I considered it of great importance that the observers should be lodged very close to the instruments; and house accommodation is rather limited. However we have been enabled to rent a cottage belonging to the Princess Ruth, Governess of Molokai, capable of accommodating the Head Station observers, and adjoining some land owned by His Majesty the King who had kindly given us permission to erect our instruments Etc. and enclose as much land as may be necessary. [Chauvin 2004:76-77]

The land in question was a 0.3-acre "open piece of grass land in the district called Apua. South of Punchbowl street, and west of Queen Street." Several buildings were erected, including a barracks and workshop, a cookhouse, a photo hut thatched with grass, the stages (platforms) for the instruments, and a wooden palisade to enclose the lot. The observations of the Transit of Venus on 8 December 1874 in Honolulu were a great success, and the British party was feted by the king and other prominent families of Hawai‘i. All that was left was to dismantle the temporary buildings at ‘Āpua. Tupman wrote the following:

> Mar. 13. The sale. Our household goods sold well, many friends desiring to obtain a memento of our visit. The long shed, Cook house, walls of huts, transit hut complete, water pipes & taps, 6-foot fencing and a large pile of lumber were knocked down to His Majesty the King for a very small sum, as no one would bid against him. We were not altogether sorry for this as His Majesty has given us the land rent free & had aided us in many ways tending to save expense to the British Government. [Chauvin 2004:124]

3.5 **1900s**

Prior to dredging, Kewalo Basin was a natural deep pocket in the reef seaward of Ala Moana Boulevard between Ward Avenue and Kamake‘e Street. It had been used as a canoe landing in pre-Contact times. In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo for the aim of "harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper" (Thrum 1920:147). As the area chosen for the harbor area was adjacent to several lumber yards, the basin was initially made to provide docking for lumber schooners, but by the time the wharf was completed in 1926, this import

business had faded, so the harbor was used mainly by commercial fishermen. The dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate in the coastal area east of Ward Avenue (U.S. Department of Interior 1920:52). The new basin and the coral fill, used to fill inland areas and make new land offshore, can be seen in a 1933 oblique aerial photograph of Kaka‘ako and Waikīkī. In 1941, the basin was dredged and expanded to its current 55 acres. In 1955, dredged material was placed along the *makai* side to form an 8-acre land section protected by a revetment, now part of the Kewalo Basin Park (Kewalo Basin Harbor 2013).

In the case of Kewalo Basin, most of the land between it and Fort Armstrong to the northwest had been previously filled (ca. 1900–1920). The area between Kewalo Basin and Fort Armstrong, *makai* of Ala Moana became a part of Kaka‘ako called “Squattersville.” “All Squattersville, like Gaul, is divided into three parts. There is the original settlement at Kewalo Basin Point, there is a tiny offshoot of this and there is the later settlement along Ala Moana” (Johnson 1991:111). The later (ca. 1925–1930) dredging and filling created Ala Moana Beach Park and commercial dock space at the Ala Wai and Kewalo basins.

During the monarchy, the point at Kaka‘ako was the location for a battery, with three cannons used to salute visiting naval vessels, which responded with their own cannon salutes. Other saluting batteries were at the top of Punchbowl Crater and at the Honolulu Fort (Dukas 2004:163). The Hawaiian Annual and Almanac for 1887 (Thrum 1886:37) reported that $4,500 had been spent to build the battery. It was used for gun salutes up to at least the time of the overthrow of the monarchy in 1893 (Judd 1975:57).

After the annexation of the Islands by the United States in 1899, the U.S. Congress began to plan for the coastal defenses of their new islands. Major batteries were placed at Pearl Harbor and in Waikīkī, but a small reservation named Fort Armstrong was also set up on the Ka‘ākaukukui Reef as a station for storing underwater mines. Fort Armstrong (1899 to 1950s) was named after General Samuel Chapman Armstrong (1839–1893) who was born on Maui and graduated from Punahou, and was a hero of the Union defense of Cemetery Ridge at Gettysburg. Battery Tiernon, with two 3-inch M1903 Springfield rifles, was built at this site in 1911, and took over the job of saluting visiting naval vessels once performed by the Kaka‘ako battery (Williford and McGovern 2003:15).

In the 7 December 1941 attack on the Islands, the fort escaped relatively unscathed; only one motor pool structure was hit. Antiaircraft shells were fired from the fort, but were ineffective; at least one hit the town rather than any aircraft (Richardson 2005:34). In the 1950s, the federal government returned most of Fort Armstrong to the Territory of Hawai‘i, which used the area to expand the shipping piers of the harbor.

The region of Kaka‘ako/Kewalo surrounding the project area contains historic properties of both pre-Contact and post-Contact origin. McAllister (1933:80), in his report on the survey of O‘ahu sites conducted in the early 1930s, says of Honolulu, “Information regarding former sites within the present limits of Honolulu must come entirely from literary sources.” The Kaka‘ako/Kewalo area became a focus of archaeological work during the 1980s, impelled by the construction of local and federal government buildings and by state-planned redevelopment.

3.6 Contemporary Land Use

3.6.1 Kaka‘ako Reclamation

The first efforts to deepen Honolulu Harbor were made in the 1840s. The idea to use the dredged material, composed of sand and crushed coral, to fill in low-lying lands was quickly adopted. From 1857 to 1870, the “Esplanade” between Fort Street and Alakea Street was created on 22 acres of former reef and tideland. By 1874, Sand (Quarantine) Island, site of the first immigration station, had been created over “reclaimed” land on reefs.

By the 1880s, infilling of the mud flats, marshes, and salt ponds in the Kaka‘ako area had begun. This infilling was driven by three separate, but overlapping, improvement justifications. The first directive was for the construction of new roads and improving older roads by raising the grade so the improvements would not be washed away by flooding during heavy rains. A report by the Hawaii Board of Health noted the following:

> I beg to call attention to the built-up section of Kewalo, ‘Kaka‘ako,’ where extensive street improvements, filling and grading have been done. This, no doubt, is greatly appreciated and desirable to the property owners of that locality, but from a sanitary point of view is dangerous, inasmuch as no provision has been made to drain the improved section, on which have been erected neat cottages occupied for the greater part by Hawaiian and Portuguese families, now being from one to three feet below the street surface, and which will be entirely flooded during the rainy season. Unless this is remedied this locality will be susceptible to an outbreak [of cholera] such as we experienced in the past. [Hawaii Board of Health 1908:80]

As mentioned in the above section, the justification for infilling low-lying areas most frequently cited was public health and sanitation, the desire to clean up rivers and ponds that were reservoirs for diseases such as cholera and acted as breeding places for rats and mosquitoes. Thus, as early as 1902, it is reported that,

> The Board has paid a great deal of attention to low-lying stagnant ponds in different parts of the city, and has condemned a number of them. The Superintendent of Public Works has given great assistance to seeing that the ponds condemned by the Board are filled. In September a pond on South Street was condemned as deleterious to the public health. [Hawaii Board of Health 1902:80]

The first areas to be filled were those closest to Honolulu, then moving outwards to Kaka‘ako (Griffin et al. 1987:13). The first fill material may have been set down in 1881 for the Kaka‘ako Leper Branch Hospital, which had been built on a salt marsh. Laborers were hired to “haul in wagonloads of rubble and earth to fill up that end of the marsh” (Hanley and Bushnell 1980:113). In 1903, five more lots in Kewalo, on Ilaniwai, Queen, and Cooke streets, were condemned and ordered to be filled (Hawaii Board of Health 1903:6).

Although public health and safety were prominently cited, according to Nakamura (1979:43), the main desire (and third justification) for infilling Honolulu, Kewalo, and then Waikīkī lands was to provide more room for residential subdivisions, industrial areas, and finally tourist resorts. In the early part of the twentieth century, Kaka‘ako was becoming a prime spot for large industrial complexes such as iron works, lumber yards, and draying companies, which needed large spaces

for their stables, feed lots, and wagon sheds. In 1900 the Honolulu Iron Works, which produced most of the large equipment for the Hawaiian plantation sugar mills, moved from their old location at Queen and Merchant Street near downtown Honolulu to the shore at Kaka‘ako, on land that had been filled from dredged material during the deepening of Honolulu Harbor (Thrum 1900:172). Other businesses soon followed. Thrum (1901:168) noted the following:

> The Union Feed Co. is another concern whose business has outgrown the limits of its old location, corner of Queen and Edinburgh streets. Like the Iron Works Co. they have secured spacious premises at Kakaako, erecting buildings specially adapted to the needs of their extensive business at the corner of Ala Moana (Ocean Road) and South Street. [Thrum 1901:168]

Private enterprises were not the only new occupants of Kaka‘ako. A sewer pumping station, an immigrant station, and a garbage incinerator were also built on “reclaimed land.” Thrum noted,

> The dredging of Honolulu harbor and its channel is completed as far as planned for the present . . . the material there from being used to fill in a large area of Kakaako and the flats in the vicinity of the sewer pumping station and garbage crematory. [Thrum 1907:148-149]

For the incinerator, Thrum noted,

> The new station is built on piles on reclaimed land that is being filled in from the coral dredgings that is going on, and is gradually taking on a tropical appearance. . . . Adjoining its premises on the mauka side is the new building designed for the Planters’s Association for their labor bureau. [Thrum 1907:148-149]

3.6.2 Kewalo Reclamation Project

Although the Board of Health could condemn a property and the Department of Public Works could then fill in the land, the process was rather arbitrary and piecemeal. In 1910, after an epidemic of bubonic plague, the Board of Health condemned a large section of Kewalo (including areas in Pu‘unui and Ka‘ākaukukui), consisting of 140 land parcels which had numerous ponds (Hawaii Department of Public Works 1914:196).

In 1914, the entire

> . . . locality bounded by King street, Ward avenue, Ala Moana and South street, comprising a total area of about two hundred acres, had been found by the board of health of the Territory to be deleterious to the public health in consequence of being low and below ‘the established grades of the street nearest thereto’ and at times covered or partly covered by water and improperly drained and incapable by reasonable expenditure of effectual drainage, and that said lands were in an insanitary and dangerous condition. [Hawaii Supreme Court 1915:329]

The superintendent then sent a letter to all of the property owners, informing them that they must fill in the lands to the grade of the street level within 60 days. Only a few of the landowners complied, infilling their land with a variety of materials. Most of the landowners did not comply with the notice, and in 1912 the bid was given to Lord-Young Engineering Company to fill in the land with “sand, coral, and material dredged from the harbor or reef and the depositing of the same upon the land by the hydraulic method” (Hawaii Supreme Court 1915:331). The affected

landowners sued to stop the work, and in the suit the method of hydraulic filling is described as follows:

> By this [hydraulic] method the material dredged is carried in suspension or by the influence of water which is forced through large pipes and laid upon the lands and intervening streets, and afterwards is distributed and leveled, the water having drained off through ditches provided for the purpose. The work is done in large sections around which bulkheads have been constructed. A section can be filled in about thirty days, the dredger working about fifteen hours per day. And in about two months after a section has been filled the ground will have dried out so as to be fit for use as before . . . The character of the material varies from very fine sand to coarse bits of coral . . .
>
> It appears in evidence that through the method employed the finest of the material which is carried upon the land settles when the water which transports it becomes quiet and as the water runs off a sludge or mud remains which forms a strata more or less impervious to water. This strata, however, is covered by the coarser and more porous material . . . it appears that by mixing in to a depth of a few inches ordinary soil small plants will grow without difficulty . . . The character of the locality must be considered. It is not adapted to agriculture, but is suited more particularly to such business purposes as it is now partly used for, such as stables, laundries, warehouses, mills, etc., and for cottages with small yards for the accommodation of laborers engaged in connection therewith. Upon the whole, we are of the opinion that the material proposed to be used in the fill-in of the lands of the complainants is not of a character as should be held to be improper for any of the reasons urged. [Hawaii Supreme Court 1914:351]

The first land to be filled was the portion of the Ward Estate property west of Ward Avenue, which was completely filled in by June 1913. In July, “25,000 cubic yards of sand and ground-up coral were deposited on the Bishop Estate property in the vicinity of Ala Moana and Keawe Street, the reason for shifting operations to this part of the district being that the Hawaiian Sugar Planter’s Association had erected a reinforced concrete building there and wished to have the lot brought to grade” (Hawaii Department of Public Works 1914:198). By August, the remaining Ward Estate lands west of Ward Avenue had been completely filled in. By February 1914, all of the land from South Street to Ward Avenue, and from Ala Moana Boulevard to Queen Street had been filled, including the current project area.

3.6.3 Urban Expansion in the Kaka‘ako Area

Kaka‘ako was considered outside the Honolulu town boundary and was used in the mid- to late nineteenth century as a place for cemeteries, burial grounds, and for the quarantine of contagious patients. Then, in the beginning of the twentieth century, the area was used as a place for sewage treatment and garbage burning, finally becoming an area for cheap housing and commercial industries (Griffin et al. 1987:13).

Late nineteenth century maps show the emerging traces of future development in Kaka‘ako as the grid of roads extending southeast from Honolulu toward Waikīkī. Queen Street, which was planned to connect to the beach road near Waikīkī, appears to follow the route of the traditional trail from Honolulu to Waikīkī, as described by John Papa ‘Ī‘ī (1959:93). This trail likely traversed

a sand berm raised above the surrounding marshlands and coral flats, probably near Queen Street. Late nineteenth century maps indicate the vicinity of the current project area remained marshland with fishponds and salt ponds. At this time, the project area was *mauka* of the Kaka‘ako Salt Works, which probably ceased its operations sometime before 1916.

As previously discussed, the current project area and vicinity were completely filled by 1914, during road improvement projects and the Kaka‘ako/Kewalo Reclamation projects. All of the ponds and low-lying areas in the vicinity of the current project area were filled, and new land, including the vicinity of Fort Armstrong, was created from dredged material.

3.7 Historic Maps

The 1810 map (Figure 12) by Gerald Ober (1959), describes what John Papa ‘Ī‘ī mentions of the previously described place names while discussing early nineteenth century trails in the Honolulu/Waikīkī area. The fact that a trail traversed this region—characterized by ponds, marshlands and *lo‘i*—suggests the trail, especially as it neared the coastline at Kālia, must have run on a sand berm raised above surrounding wetlands and coral flats.

The 1817 map (Figure 13) by Otto von Kotzebue (1821), commander of the Russian ship *Rurick* who had visited O‘ahu the previous year, shows *taro lo‘i* (illustrated as rectangles representing irrigated fields) massed around the streams descending from Nu‘uanu and Mānoa valleys. An early, somewhat generalized depiction of the pre-Contact Native Hawaiian shaping of Waikīkī, Kou (Honolulu), and the Kaka‘ako area.

The 1825 Malden map (Figure 14) shows the project area is still in the ocean; the map is labeled as saying “coral reef on which the sea is always breaking.”

The 1855 map (Figure 15) of Honolulu by Joseph de LaPasse, a lieutenant aboard the French vessel *L’Eurydice*, pictures the project parcels within an area labeled “reef.”

The 1883 Baldwin General Water Works map (Figure 16) depicts the project area. Adjacent to the project area is a grid pattern showing salt pans, used to produce the primary resource from the area.

The 1884 Honolulu Kewalo Section map (Figure 17) and a W.A. Wall 1887 Government Survey Map (Figure 18) show the emerging traces of future development in the grid of roads stretching *mauka* of the project area. Until late in the 1800s, this road grid remained focused north of King Street and west of Punchbowl Street owing to the low-lying marshy nature of the land.

The 1887 W.A. Wall map (Figure 18) shows the brand new, in-progress layout of streets in the area between Richards and Punchbowl streets (near the Prince Kūhiō Federal Building). Thus circa 1886–1887 the filling of the shallow seas in the vicinity of the project area had begun.

An 1897 Monsarrat map (Figure 19) indicates there had been very little filling of the coastal shallows in the previous decade. This map shows development of the coastal area, with commercial wharfs and recreational boathouses built out over the low reef. In 1884–1887, a “Marine Railway” was developed by Lyle and Sorenson that facilitated the haul out of ships for bottom scrapping and propeller checks.

The 1911 Podmore map (Figure 20) shows this area being rapidly developed through land fill (largely filled with sand and coral from Honolulu Harbor dredging operations) to accommodate a

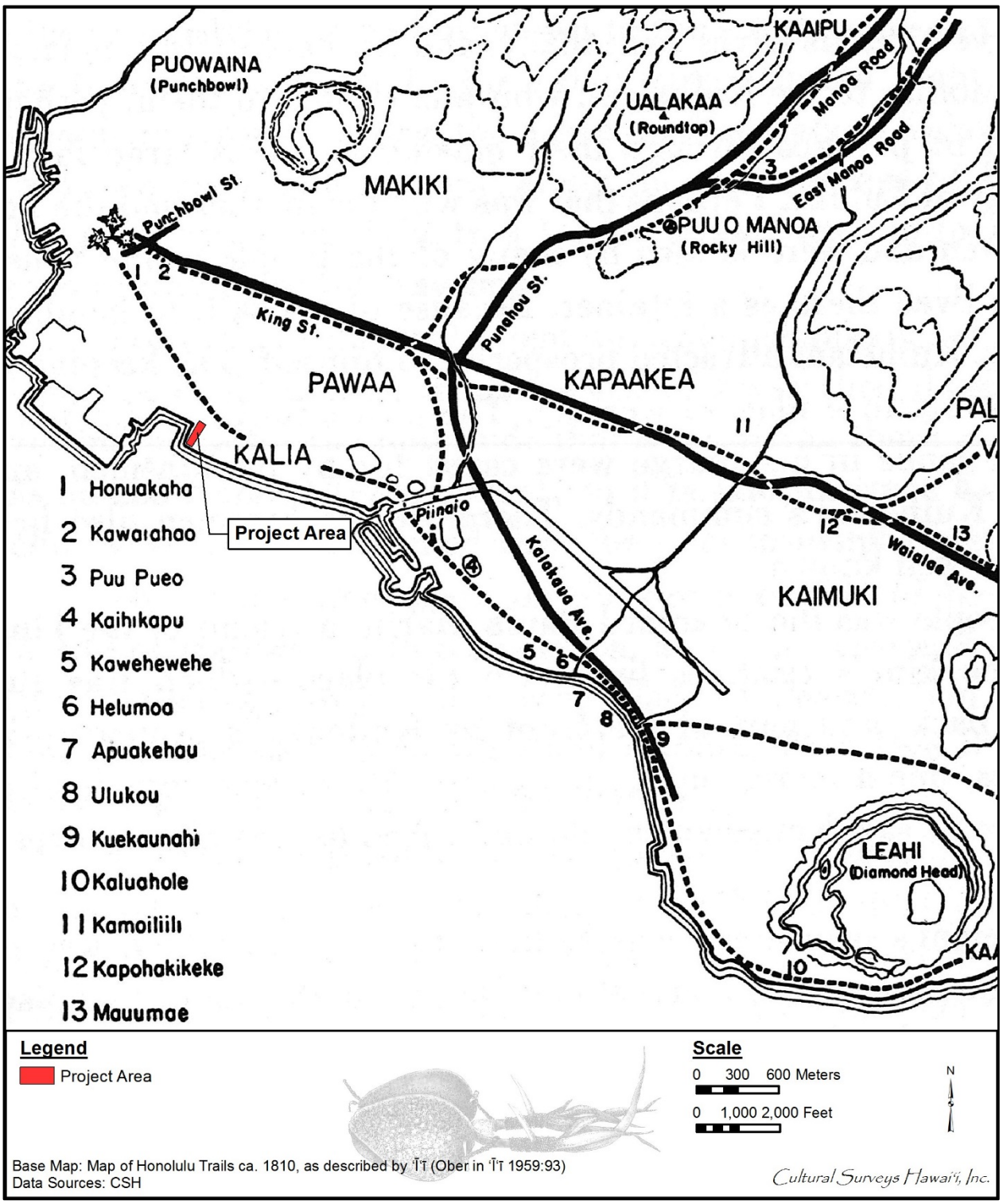

Figure 12. 1810 map showing trails in the Honolulu/Waikīkī area (Gerald Ober illustration from ‘Ī‘ī 1959:93)

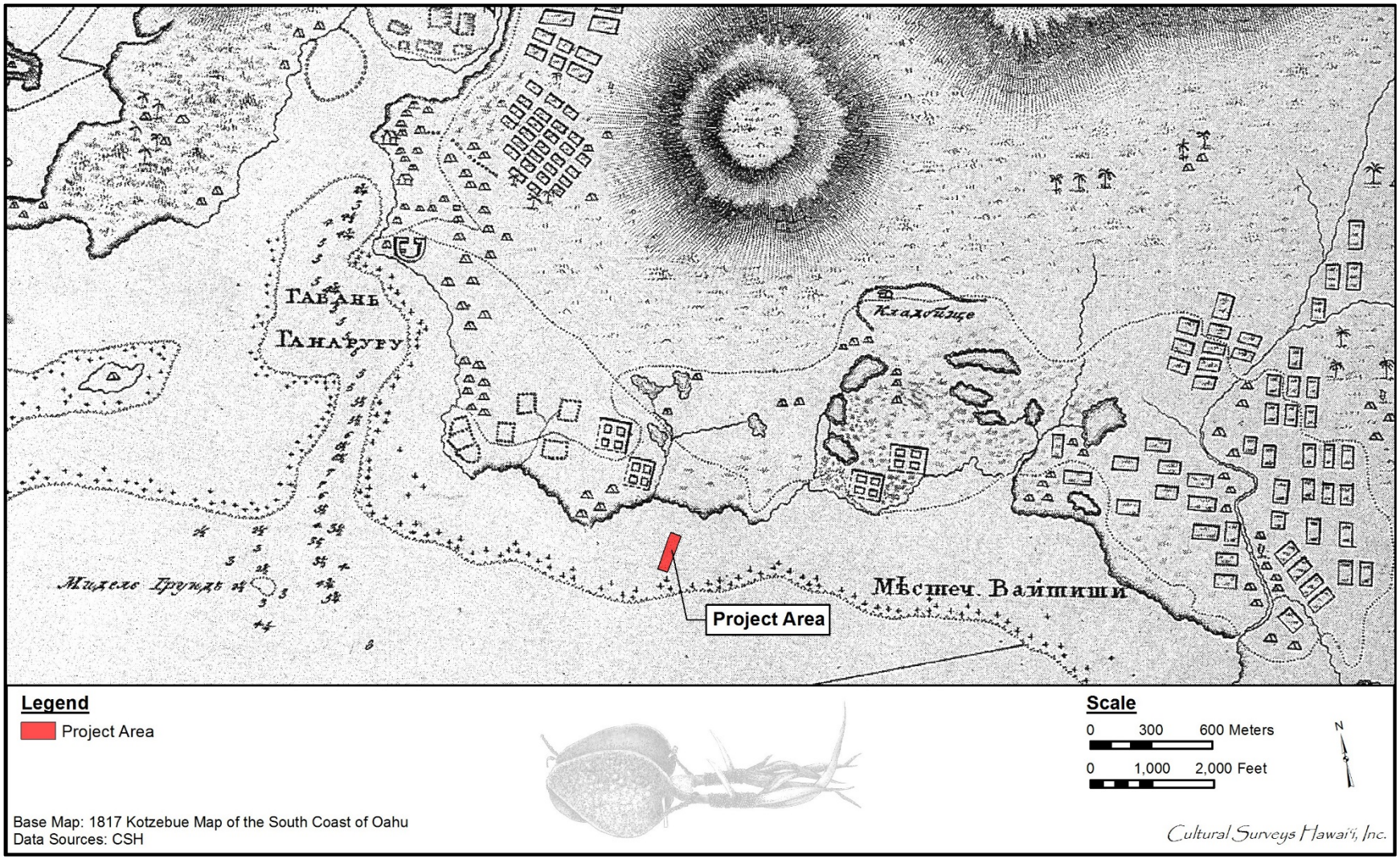

Figure 13. 1817 map of the South Coast of O‘ahu by Otto von Kotzebue, showing taro *lo‘i*, fishponds, and salt pans in Honolulu and Waikīkī, depicting the location of the project area

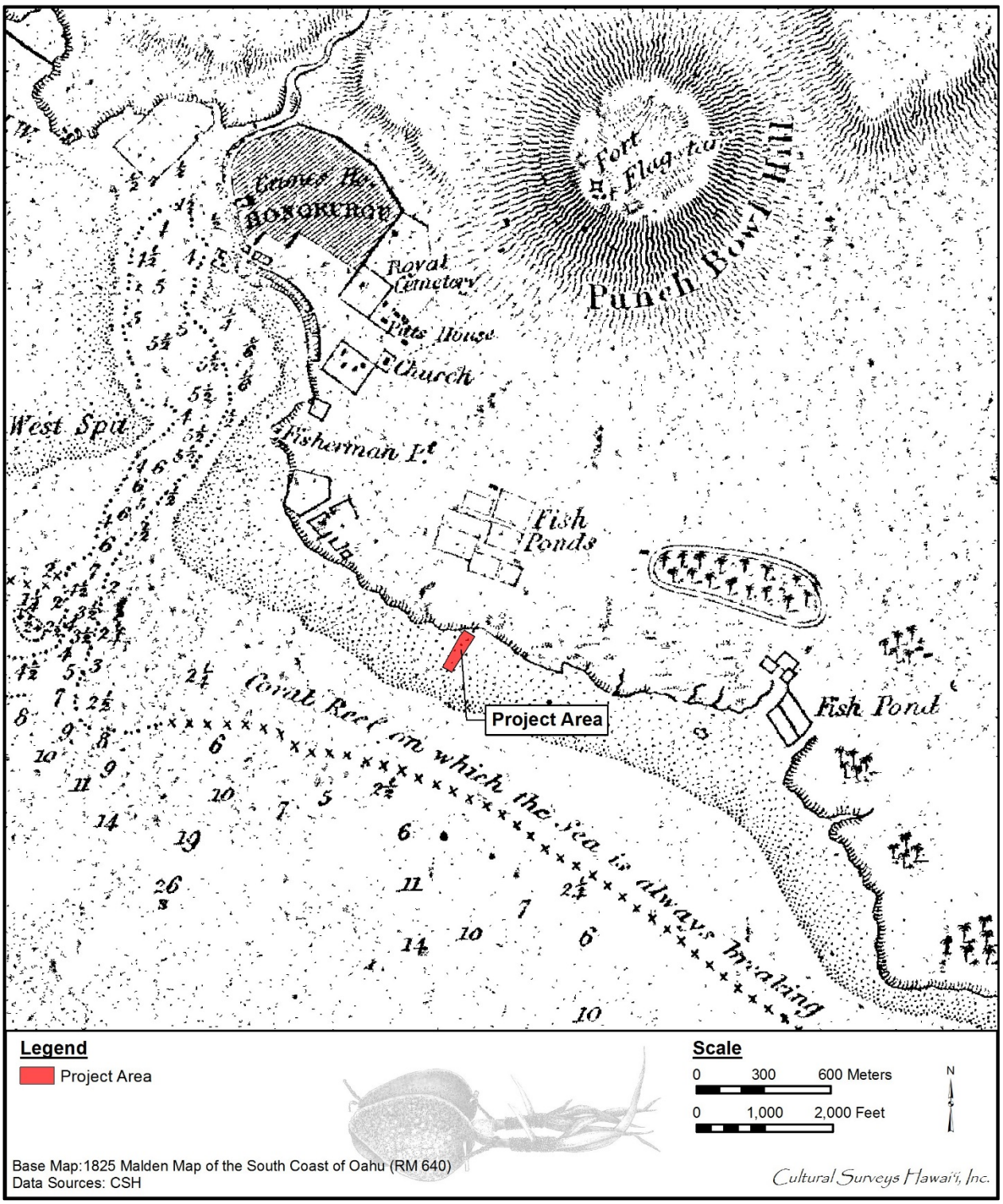

Figure 14. 1825 Malden map of the south coast of O‘ahu depicting the location of the project area

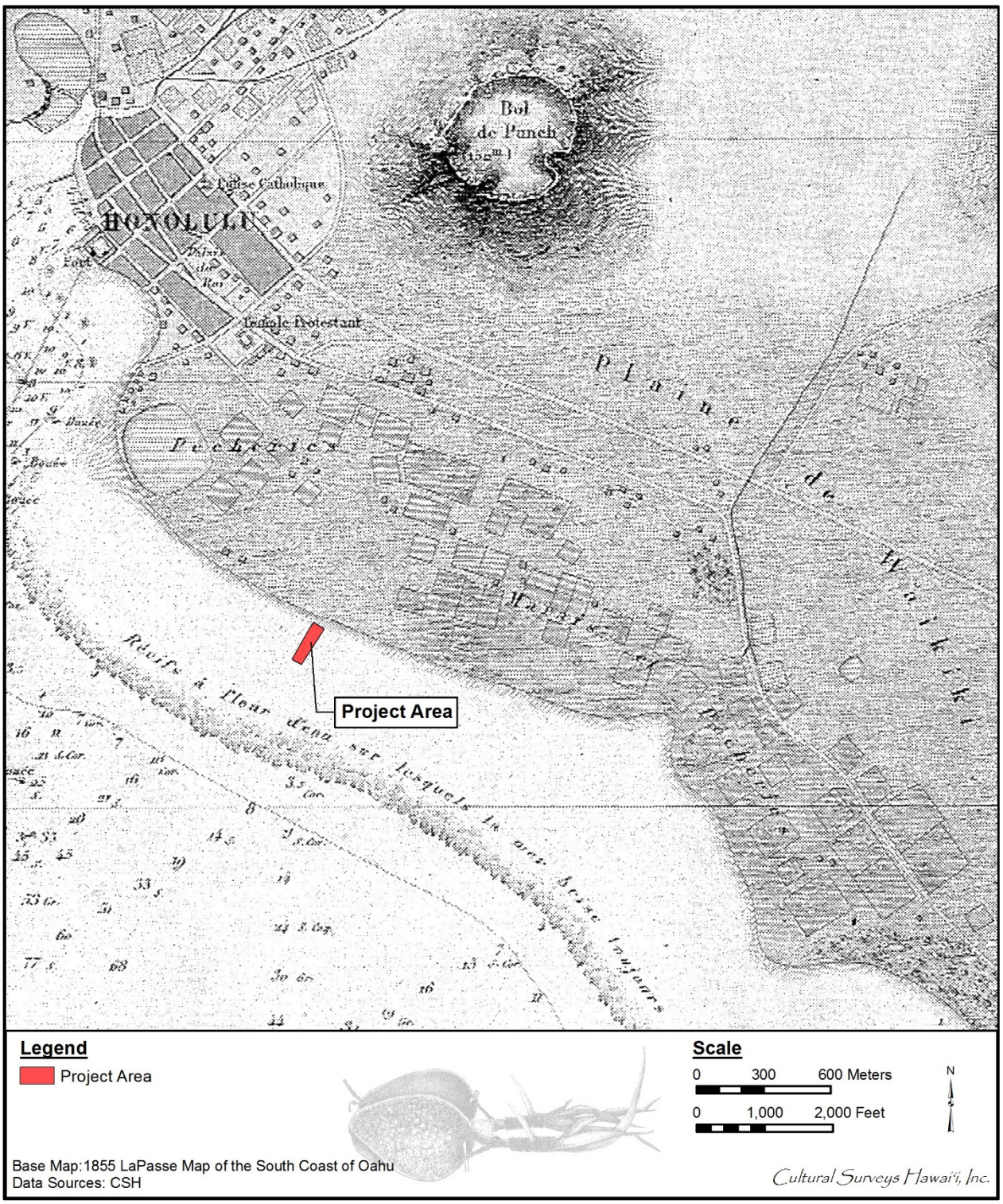

Figure 15. 1855 map of Honolulu by Lt. Joseph de LaPasse of the French vessel, *L'Eurydice* (map reprinted in Fitzpatrick 1986:82-83), depicting the location of the project area.

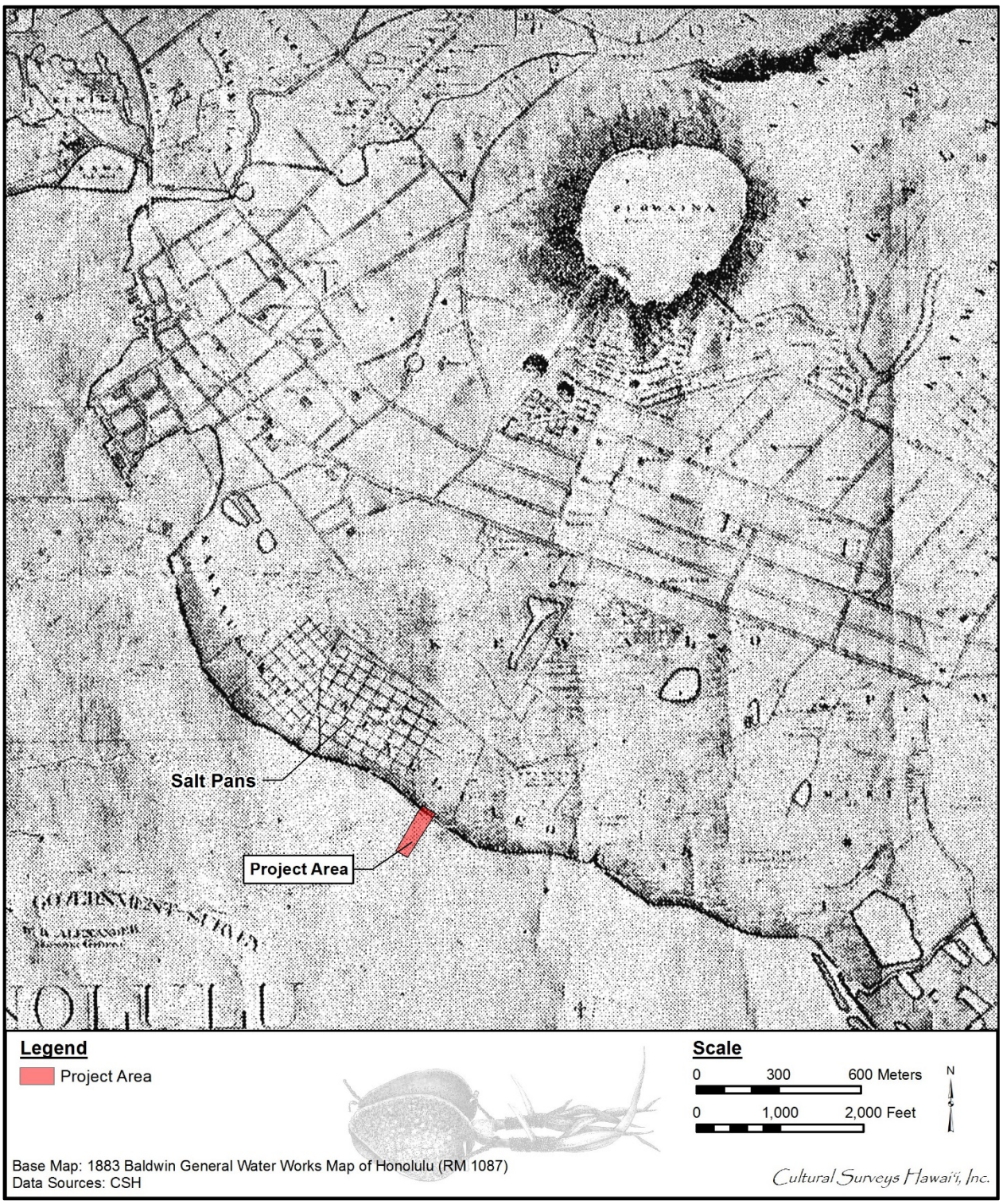

Figure 16. 1883 Baldwin General Water Works map of Honolulu depicting the location of the project area

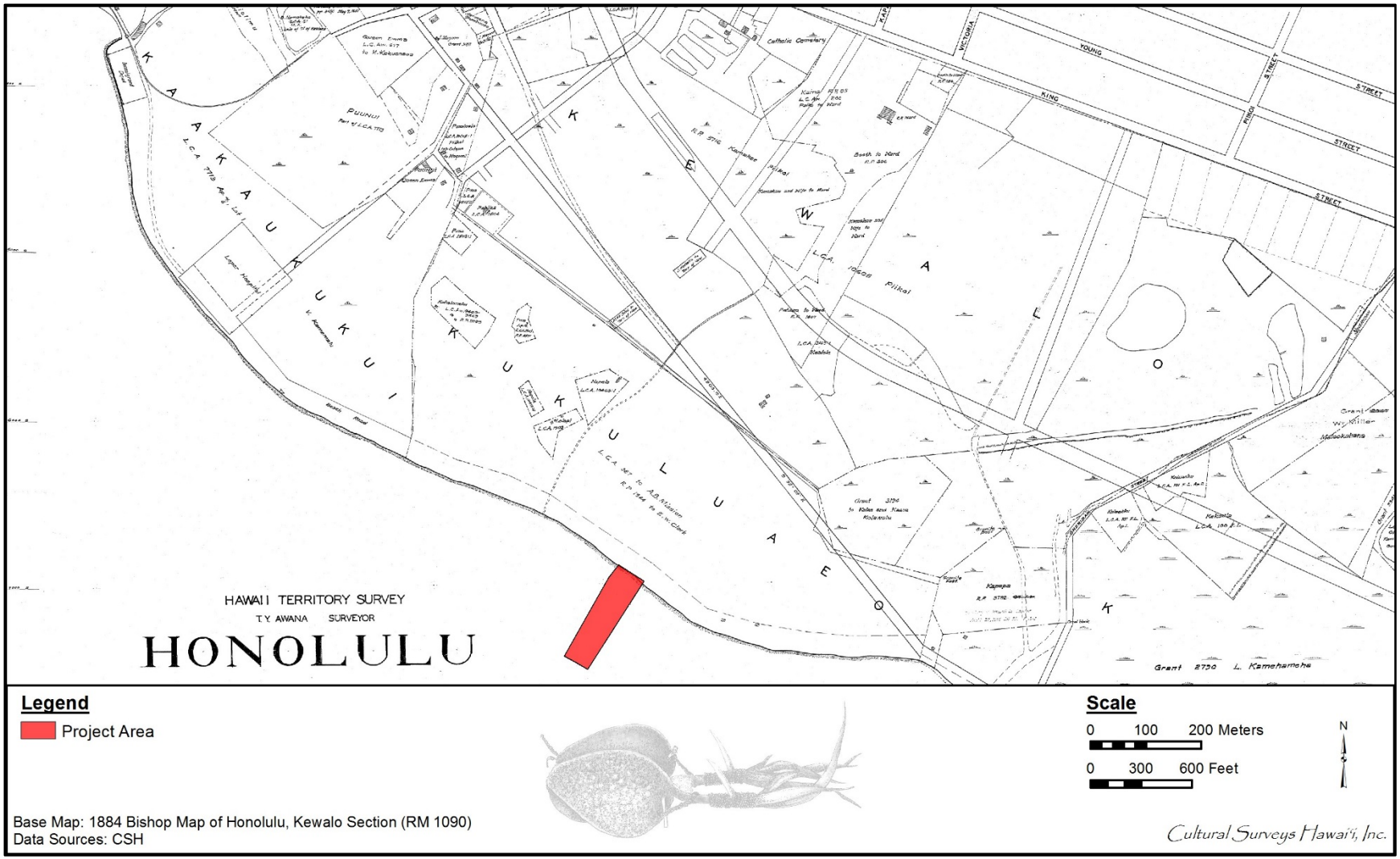

Figure 17. 1884 Bishop map of Honolulu, Kewalo section, depicting the location of the project area

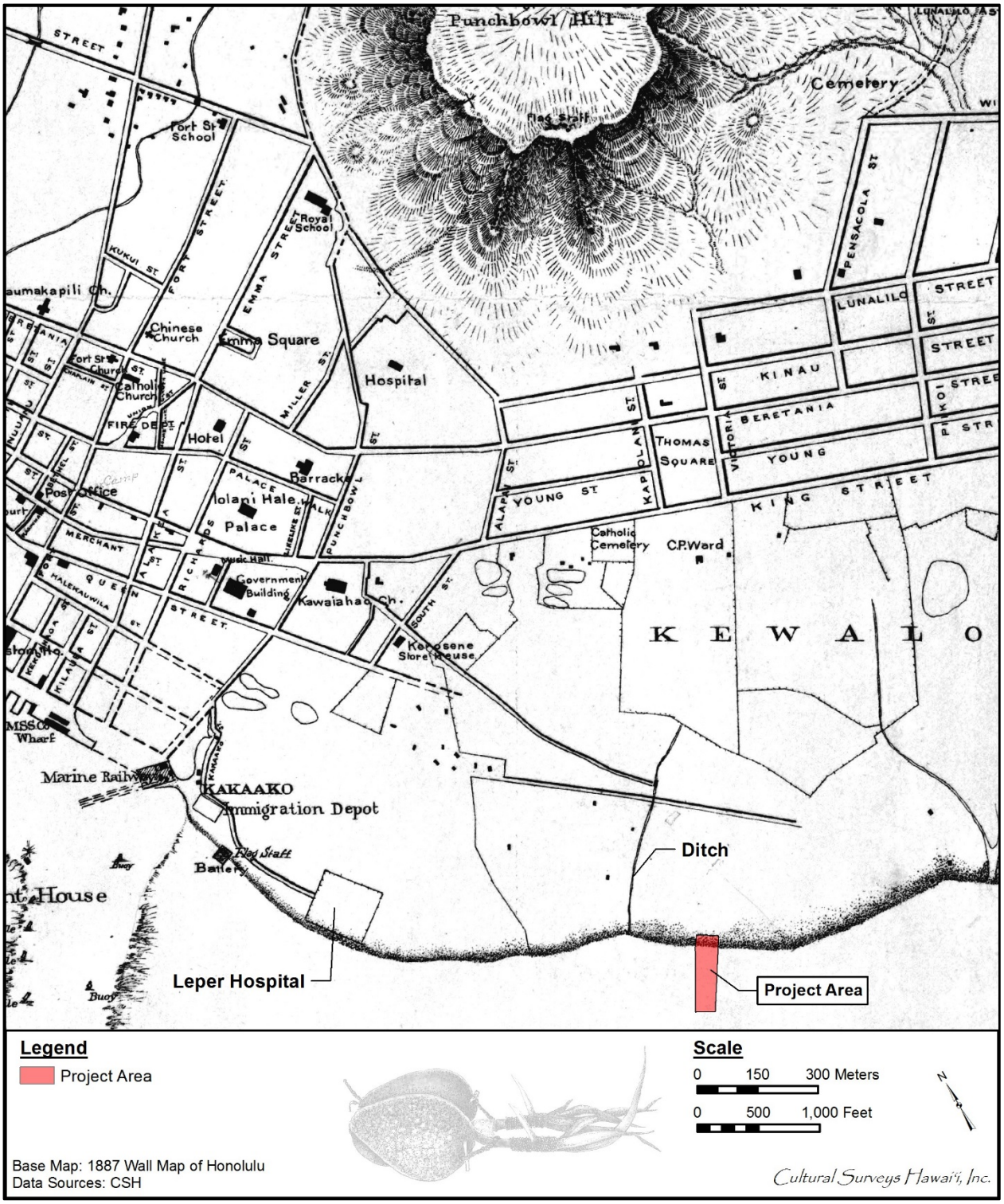

Figure 18. 1887 W.A. Wall map of Honolulu depicting the location of the project area

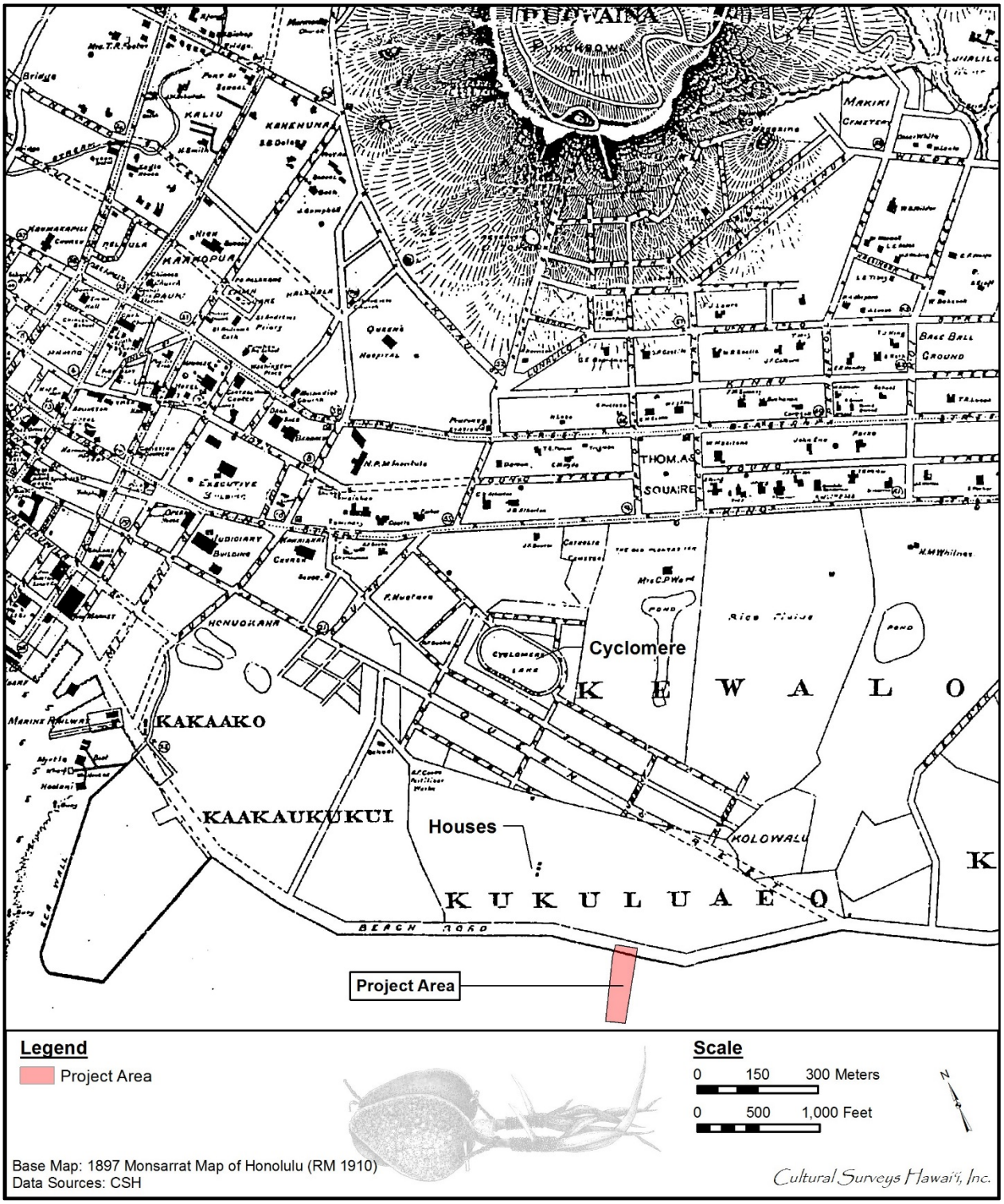

Figure 19. 1897 Monsarrat map of Honolulu depicting the lactation of the project area

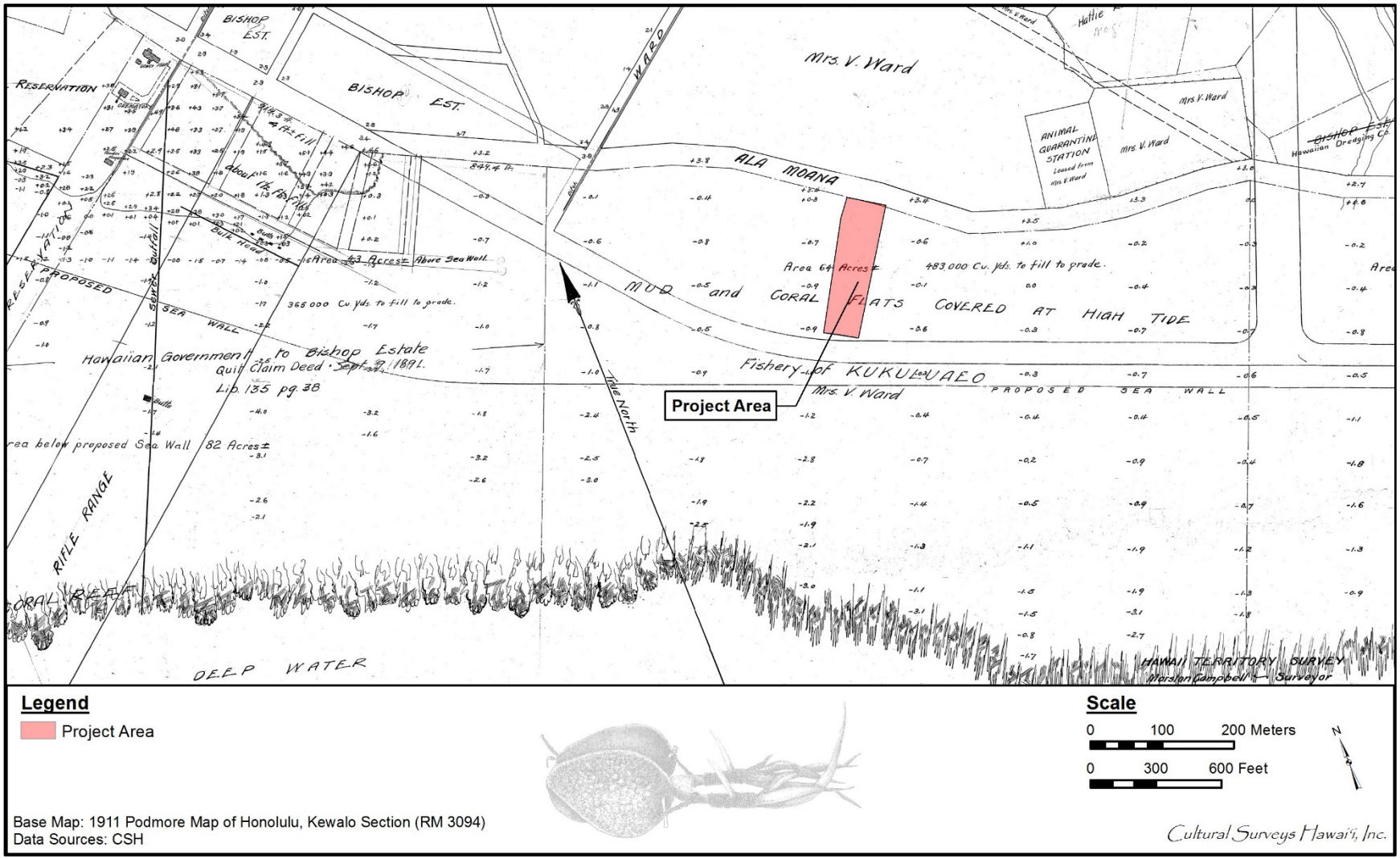

Figure 20. 1911 Podmore map of Honolulu, Kewalo section showing the location of the project area

new U.S. Naval Reservation, U.S. Immigration Depot, and Fort Armstrong Military Reservation. The Podmore map indicates a “proposed sea wall” extension running southeast from the initial seawall and roughly parallel to the coast. Virtually all of the fill in the project area is thus understood to post-date 1911.

A 1919 Fire Control Map (Figure 21) by the U.S. Army Corps of Engineers indicates that into the 1920s large portions of Kewalo including the study area were yet developed.

A 1927 University of Hawaii School of Ocean and Earth Science and Technology (UH SOEST) map (Figure 22) shows much of the present Kaka‘ako Makai area land filled in west of Kewalo Basin but the fill is so recent that the layout of streets is on-going. Kewalo Basin has been dredged by this time but the east side is still in reef flats. Whereas much of the fill in the northwest portion of Kaka‘ako Makai is understood to have been relatively clean coral and sand dredge material, much of the fill in the southeast portion of Kaka‘ako Makai is understood to have been from decades of open trash burning.

The 1933 War Department quad map (Figure 23) shows remarkably little urban development of the Kaka‘ako Makai study area in the preceding 5 years (compare with the Figure 22 1927/1928 map) but we do see the completion of part of the east side of Kewalo Basin as a result of the creation of Ala Moana Park. Barely discernable on the west side of Kewalo Basin is the City & County incinerator built in 1930 (and replaced in 1946; the surf break is still called “Incinerators”). It is understood that the products from incineration were generally used right there as land fill.

The 1939-1941 Kaka‘ako Coast aerial photograph (Figure 24) shows the project area. The surrounding area remains relatively undeveloped aside from the harbor across the way. The artificial water feature created in Ala Moan park has a causeway which empties into the harbor.

The 1943 U.S. Army War Department Terrain Map of Honolulu (Figure 25) shows the downtown area development and the subdivisions around the Ward area as developers prepare to turn the Ala Moana area into a commercial urban district.

The 1952 Kaka‘ako Coast aerial photograph (Figure 26) shows the commercial development of most of the surrounding Ward area. The artificial lake created inside Ala Moana park has been reconfigured to no longer empty into Kewalo Basin.

The 1953 USGS map (Figure 27) clearly shows that the infilling behind the new (present day) seawall was actively on-going at statehood. The present land configuration on the southeast side of Kewalo Basin appears to have been completed in the 1956-1959 timeframe with filling in of a portion of the dredge channel that had formerly been continuous from the dredge channel fronting Ala Moana Beach Park to the dredged Kewalo Basin. As late as this 1959 map there is no indication of the landfill seaward of Fort Armstrong having been initiated.

The 1970 UH SOEST map (Figure 28) is the first in the series that shows the current layout of the project area. The connecting section of Ala Moana has been filled in and the boat harbor is enclosed for the first time since being dredged.

The 1982 UH SOEST map (Figure 29) shows the development of the surrounding shopping centers of Ward and Ala Moana.

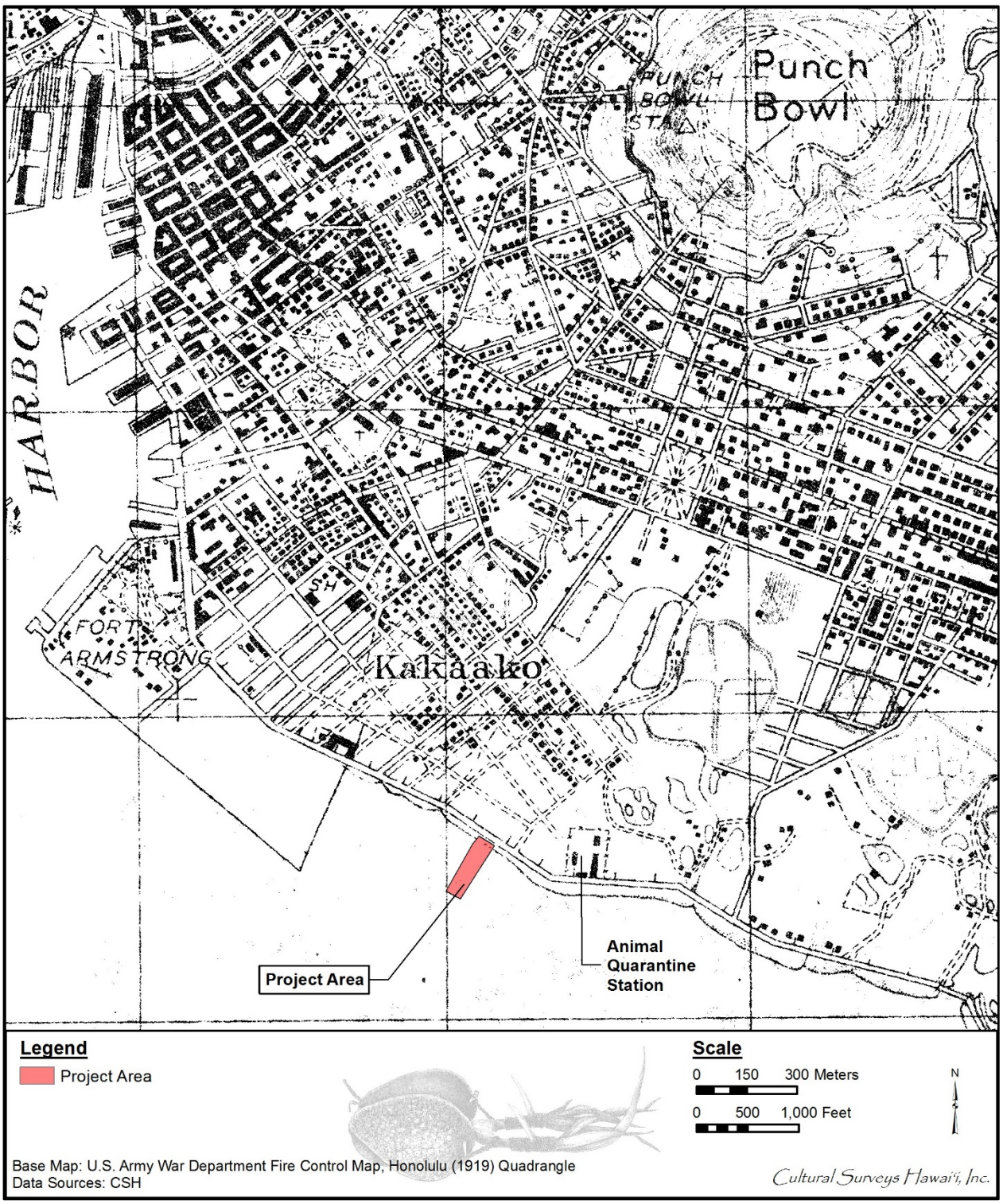

Figure 21. 1919 U.S. Army War Department Fire Control Map of Honolulu showing the location of the project area

Figure 22. 1927 Kaka‘ako Coast aerial photograph showing the location of the project area (UH SOEST)

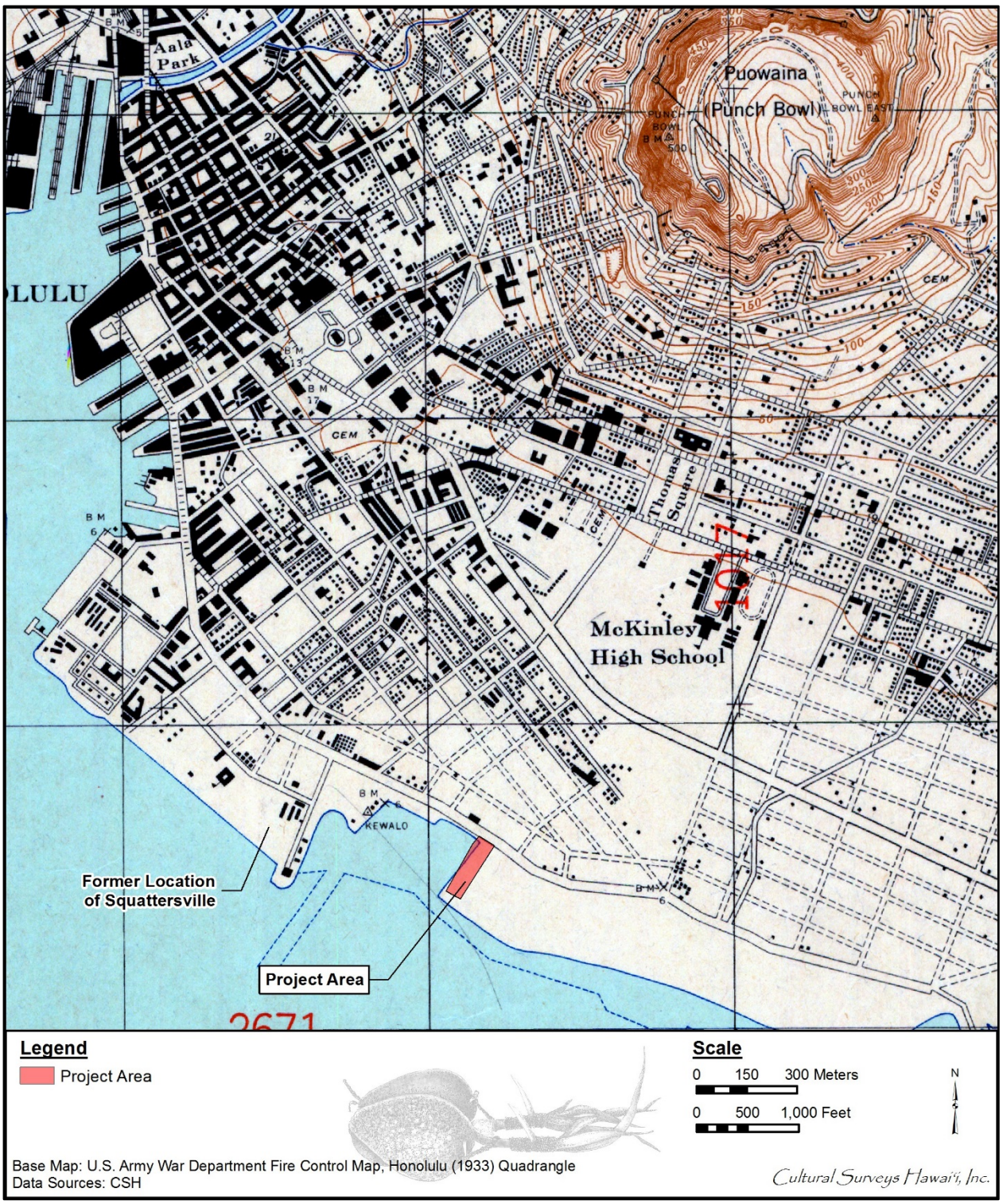

Figure 23. 1933 U.S. Army War Department Fire Control Map of Honolulu showing the location of the project area

Figure 24. 1939-1941 Kaka‘ako Coast aerial photograph showing the location of the project area (U.S. Army Air Corps)

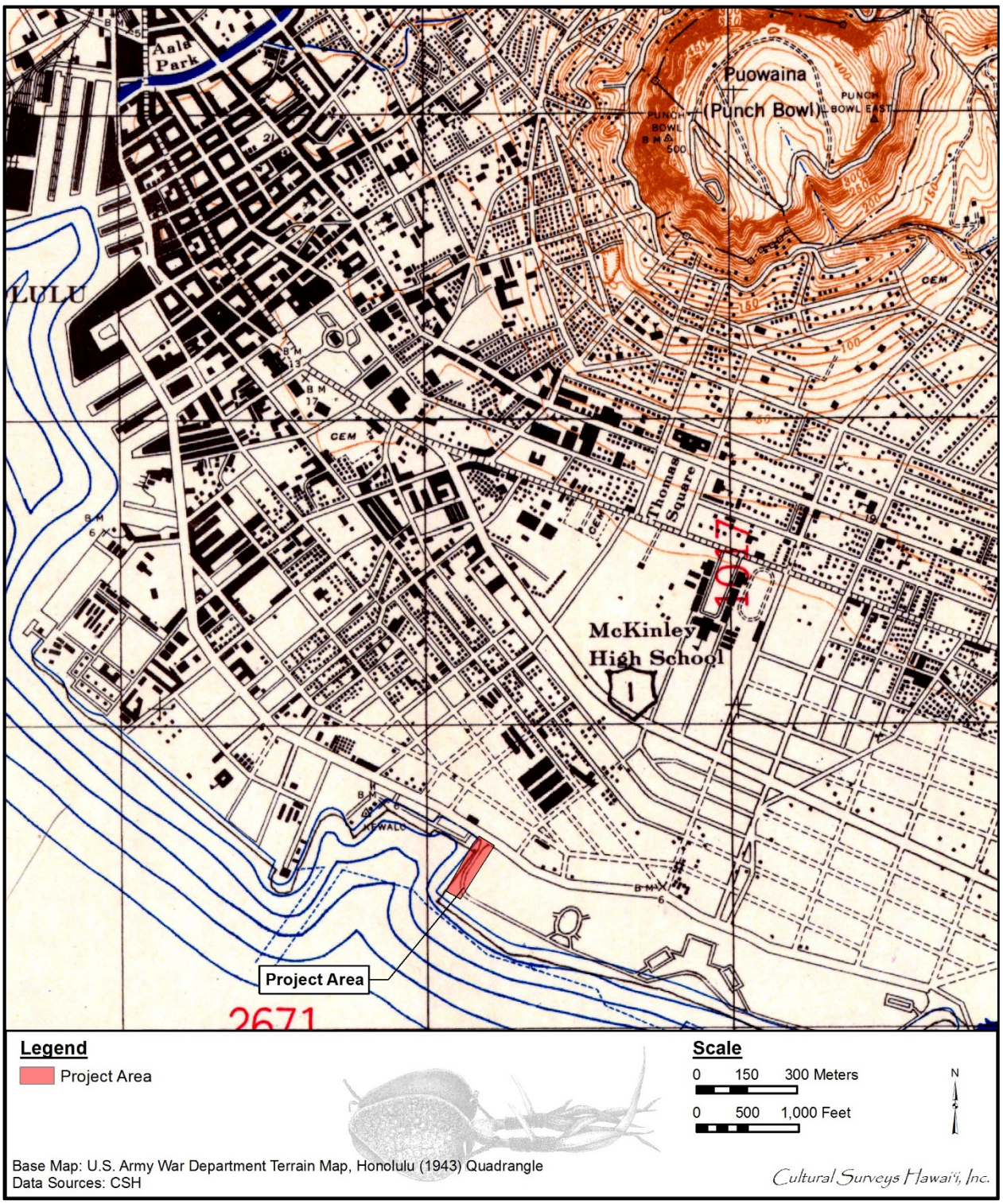

Figure 25. 1943 U.S. Army War Department Terrain Map of Honolulu showing the location of the project area

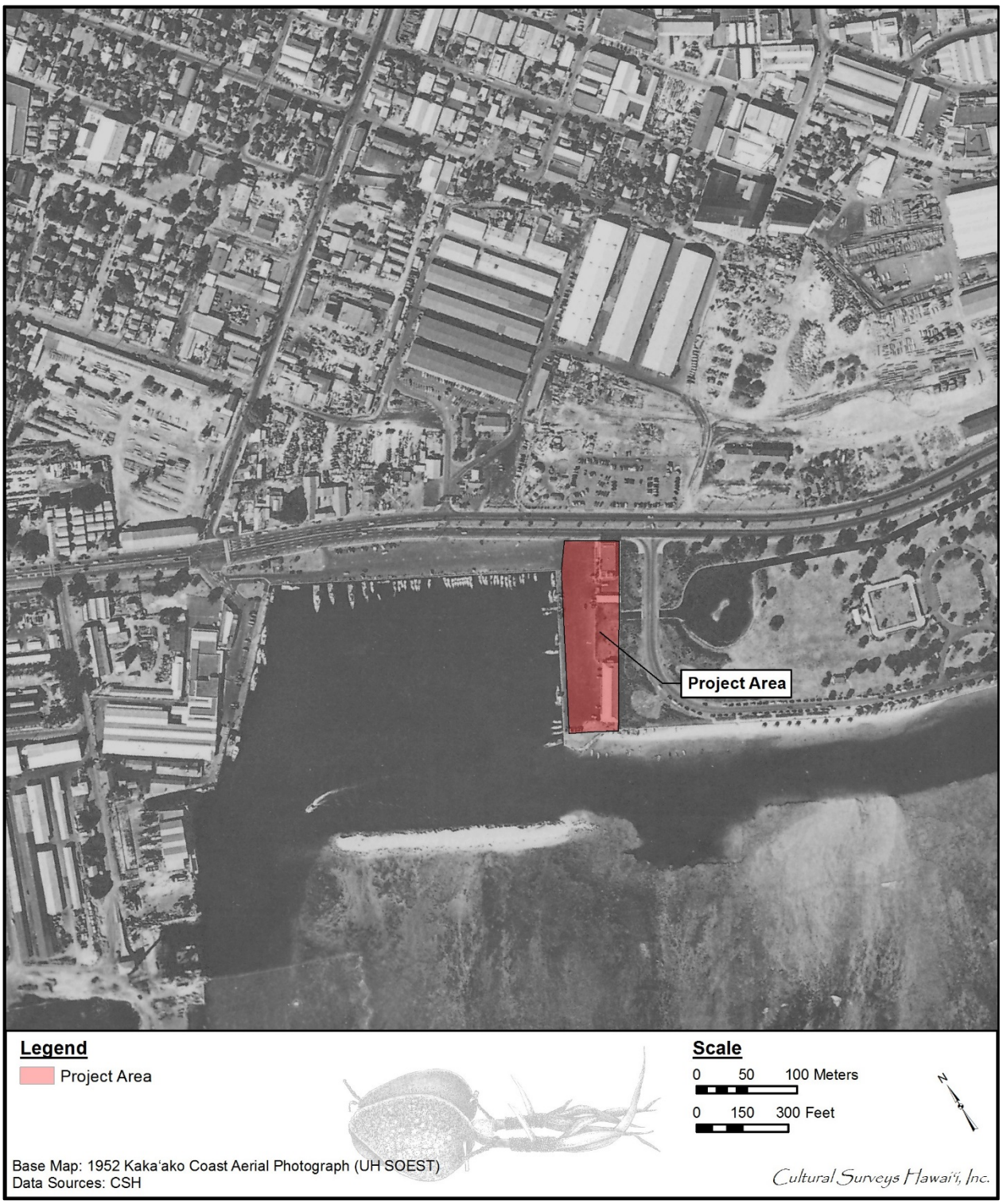

Figure 26. 1952 Kaka‘ako Coast Aerial Photograph showing the location of the project area (UH SOEST)

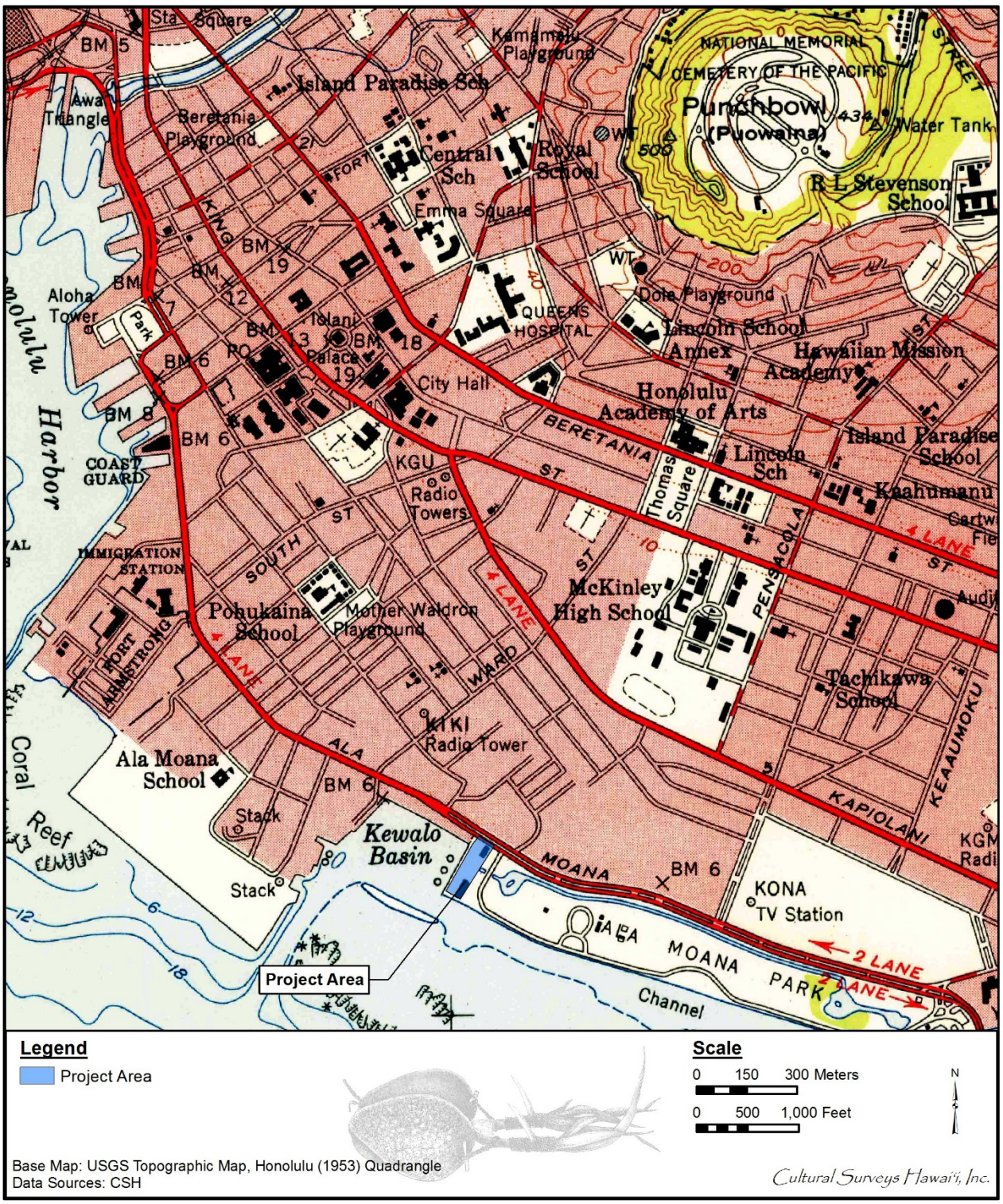

Figure 27. 1953 Honolulu USGS Topographic Quadrangle showing the location of the project area

Figure 28. 1970 Kaka‘ako Coast aerial photograph showing the location of the project area (UH SOEST)

Figure 29. 1982 Kaka‘ako Coast aerial photograph showing the location of the project area (UH SOEST)

Section 4 Previous Archaeological Studies

Archaeological studies conducted within the vicinity of the project area are presented in Table 1. Previous archaeology conducted within and in the vicinity of the project area is shown in Figure 30. In addition, State Inventory of Historic Properties (SIHP) sites found within and in the vicinity of the project area are depicted in Figure 31.

4.1.1 Winieski and Hammatt 2000

In 2000, archaeological monitoring for the Kaka‘ako Improvement District (ID) 4 project was conducted by CSH (Winieski and Hammatt 2000). The project documented two isolated historic coffin burials (SIHP # 50-80-14-5598) on Kamake‘e Street, between Kawaiaha‘o and Waimanu streets. The two burials, adjacent to one another, were within an undisturbed beach sand deposit, directly underlying an A horizon, which itself was beneath approximately 50 cm of construction fill and pavement. Well-defined burial pits were present, as well as staining from the deteriorated coffin wood. No associated artifacts, other than the coffins, were discovered during disinterment. Additionally, during excavation for a manhole hookup approximately 2 m west of Kamake‘e Street on Waimanu Street, a horse or mule skeleton was discovered within the undisturbed sand layer, approximately 1 m below the surface. No other materials were observed during the Kaka‘ako ID 4 project, except for randomly scattered bottles and bottle fragments of modern provenience discovered within fill materials. One “Star Soda Works” bottle was dated to ca. 1900.

4.1.2 Borthwick and Hammatt 2001

In 2001, CSH conducted archaeological monitoring for the Kaka‘ako ID 6 Project (Borthwick and Hammatt 2001). The project area was seaward of the pre-Contact and early historic shoreline; therefore, it was highly unlikely intact or in situ cultural materials or burials were present. It was considered possible that scattered cultural materials, partial burials, and historic trash could have been transported to the area during the period when fill materials were placed in this area. No burials, traditional Hawaiian or early historic cultural layers, or large historic to modern trash pits were observed during archaeological monitoring. The finds were, as anticipated, fill materials over tidal flats strata.

4.1.3 Winieski and Hammatt 2001

In 2000, CSH performed archaeological monitoring for Victoria Ward Ltd. at the site of the Ward Village Phase II (Ward Theaters) construction project in Kaka‘ako (Winieski and Hammatt 2001). No pre-Contact materials, historic cultural materials, or human burials were encountered. Stratigraphic profiles within the project area revealed that fill materials were placed over a pre-existing marsh surface. In the northwest corner of the project area, an old A horizon, naturally deposited pond sediments, and calcareous sand were observed. In the southwest corner of the project area, an old A horizon and naturally deposited calcareous sand were observed.

4.1.1 Souza et al. 2002

In 2000, construction monitoring associated with the Kaka‘ako ID 7 construction project was undertaken by CSH (Souza et al. 2002). Three human burials were encountered, which were severely disturbed by excavation activities. The burials’ age and ethnicity are unknown, though the lack of grave goods may indicate that they are pre-Contact or early post-Contact. Burial 1

Table 1. Previous Archaeological Studies in the Vicinity of the Project Area

Author	Type of Study	General Location	Results (SIHP #s 50-80-14-)
Winieski and Hammatt 2000	Archaeological monitoring	Kaka‘ako Improvement District 4, Kamake‘e St	Two isolated historic coffin burials documented on Kamake‘e St (SIHP # -5598), between the intersections of Kawaiaha‘o and Waimanu streets
Borthwick and Hammatt 2001	Archaeological monitoring	Kaka‘ako Improvement District 6, TMKs: [1] 2-1-058, 2-3, 2-3-001–005)	No cultural materials found during monitoring; fill material found over old tidal flats
Winieski and Hammatt 2001	Archaeological monitoring	Nimitz Hwy Reconstructed Sewer, TMKs: 1-7-002, 003 and 2-1-002, 013–016, 025, 027, 029–032	Monitoring for Nimitz Hwy Reconstructed Sewer project; historic artifacts and features (including SIHP #-5942) observed
Souza et al. 2002	Archaeological monitoring	Kaka‘ako Improvement District 7, Kamake‘e St	SIHP #s -6376, -6377, and -6378, three disturbed, likely pre-Contact burials; old A horizon noted
Tulchin and Hammatt 2004	Literature review and field check	Kapi‘olani area, TMKs: [1] 2-3-004, 005, 007, 009, 010, 013, 013, 017, 018, 022, 035, 036, 038	No surface archaeological or historical features observed
Tulchin and Hammatt 2005	Addendum to archaeological inventory survey	Ko‘olani Condominium	SIHP # -6636, original wetland surface of Kewalo area; SIHP # -6641, historic trash layer (outside Figure 30 area)
Bell et al. 2006	Archaeological inventory survey	Victoria Ward Village Shops	SIHP # -6854, five burials, cultural layer/activity area, and historic privy; SIHP # -6855, six burials and remnant activity area; SIHP # -6856, fishpond sediments from Kolowalu Pond
Bush and Hammatt 2006	Archaeological monitoring	Hokua Tower, Ala Moana Blvd	Old A horizon found at eastern end of Auahi St

Author	Type of Study	General Location	Results (SIHP #s 50-80-14-)
O’Hare et al. 2006	Archaeological monitoring	Queen St from Kamake‘e St to Pi‘ikoi St	SIHP # -6658, cluster of 28 historic burials relating to a cemetary; SIHP # -6659, two isolated disturbed burials; and SIHP # -6660, a historic trash layer, weak A horizon; fishpond sediments
Carney and Hammatt 2008	Archaeological monitoring	Hokua Tower, Ala Moana Blvd	Isolated human mandible fragment and SIHP # -6765, a historic trash layer
Fong et al. 2009	Archaeological monitoring	Kapi‘olani Blvd from Kalākaua to Ward Aves, Kamake‘e St from Kapi‘olani Blvd to Auahi St, and Atkinson Dr from Kapi‘olani to Ala Moana Blvds, TMKs: [1] 2-1-044, 049, 2-3-001–005, 007, 008, 010, 015, 016, 021, 022, 032, 034–036, 038–041	No cultural material observed
Petry et al. 2009	Archaeological monitoring	Nimitz Hwy/Ala Moana Blvd, TMKs: [1] 2-1-014 and 027	No historic properties or burials encountered; project excavations generally to depths of 0.6 m or less below existing surface
Thurman et al. 2009	Archaeological inventory survey	Queen Street Parks	Historic trash layer (likely correlated to previously documented SIHP # -6641) and SIHP # -6856, previously documented historic fishpond remnant Kolowalu Pond
Tulchin et al. 2009	Archaeological monitoring	Ala Wai Watermark, TMKs: [1] 2-6-011:001, 037	Subsurface inventory of Halekauwila Place; 18 test trenches excavated; no pre-Contact material recorded; numerous historic artifacts (bottles and ceramics) found, dating to late nineteenth to early twentieth century

Author	Type of Study	General Location	Results (SIHP #s 50-80-14-)
Hammatt and Shideler 2010a	Archaeological literature review and field inspection	Kewalo Basin, TMK: [1] 2-1-058	At least 95% of study area is twentieth century fill; some question remains whether there may be potential cultural deposit bearing soils within 10 m seaward of seaward curb of Ala Moana Blvd
Hammatt and Shideler 2010b	Summary report on cultural anthropology and archaeology	Kaka‘ako Makai, TMKs: [1] 2-1-015, 058, 059 and 060	By the 1960s much of study area was under water suggesting no pre-twentieth century in situ deposits would be expected in 95%+ of project area
Altizer et al. 2011	Archaeological monitoring	Kapi‘olani area	Encountered previously documented SIHP # -6636, original wetland surface of Kewalo area
Sroat and McDermott 2012	Supplemental archaeological inventory survey	Victoria Ward Village Shops Phase II	Five test units within or adjacent to SIHP # -6855 substantiated extrapolated boundaries of cultural layer; no additional finds identified
Hammatt 2013	Archaeological inventory survey	Honolulu City Center, TMKs: [1] 1-2, 1-5, 1-7, 2-1, 2-3	Section 4 of the HHCTCP project; total of 78 historic artifact fragments collected, consisting of one ceramic vessel fragment, 11 glass bottle/bottle fragments, and 66 miscellaneous items
Medina et al. 2013	Archaeological monitoring	Queen and Kamake‘e traffic signal	Stratigraphy consisted of various fill layers, beach (Jaucas) sand, and coral shelf; no historic properties encountered
Yucha et al. 2014	Archaeological inventory survey	Ward Neighborhood Block C	Burned trash layer SIHP # -7422; majority of project area contained sand or peat A horizon and Jaucas sand beneath reclamation fill layers; no cultural material or features observed

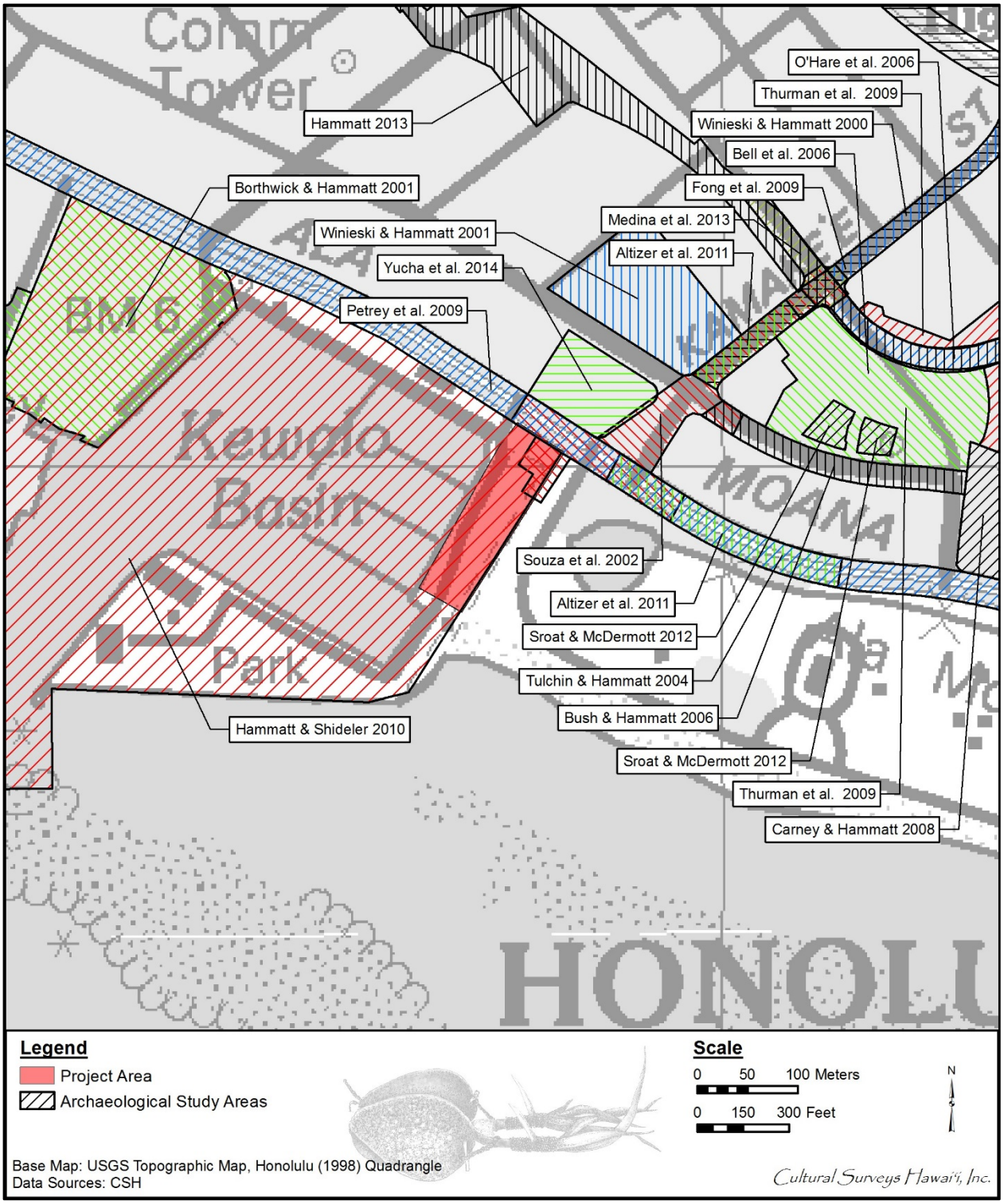

Figure 30. A portion of the 1998 USGS Topographic Map, Honolulu Quadrangle showing the location of the project area with previous archaeological studies conducted in the vicinity

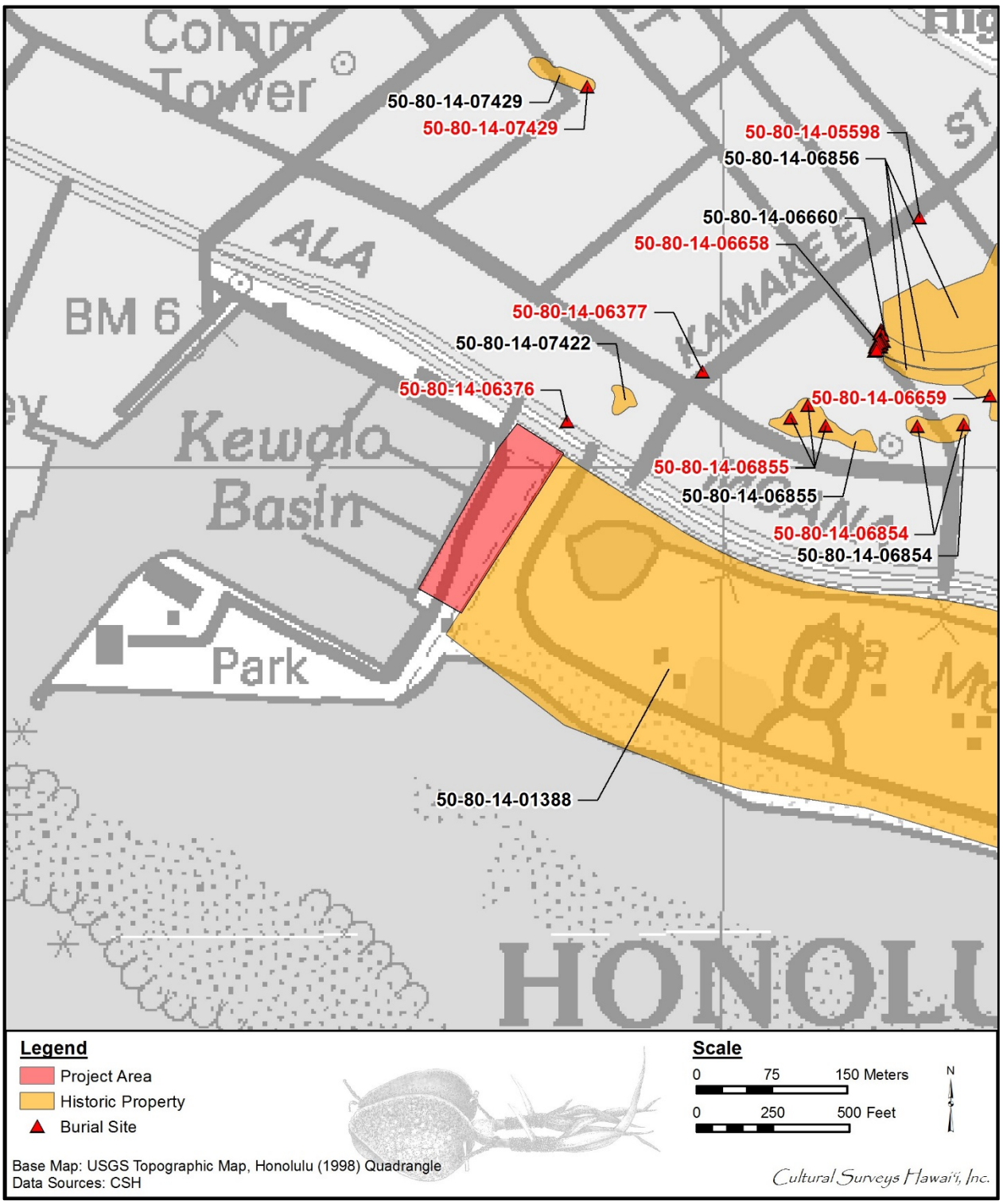

Figure 31. USGS Topographic Map, Honolulu (1998) showing the location of the project area with Historical Properties in the vicinity

(SIHP # -6376), a single cranium, was inadvertently discovered by construction personnel in the base yard back dirt pile. Burial 2 (SIHP # -6377), an adult individual, was encountered by a CSH archaeologist during backhoe excavations for a box drain. The burial was within an undisturbed beach sand deposit. Burial 3 (SIHP # -6378), a femur and several rib fragments, again was recovered in the base yard.

4.1.2 Tulchin and Hammatt 2005

In 2005, CSH conducted Phase II of the archaeological inventory survey for the Ko‘olani Condominium project (Tulchin and Hammatt 2005). Two previously recorded (by O’Hare et al. 2004) historic properties were identified: an original wetland surface of the Kewalo area (SIHP # -6636) and an historic garbage layer (SIHP # -6641).

4.1.3 Bell et al. 2006

In 2006, CSH completed an archaeological inventory survey for the Victoria Ward Village Shops project (Bell et al. 2006). A total of 86 trenches were excavated in the project area. Three historic properties were identified: a subsurface cultural layer/activity area remnant, which contains an immature pig skeleton, remnants of a historic privy, remnants of a culturally enriched A horizon containing both historic and prehistoric cultural material, and five previously identified human burials (SIHP # -6854); an activity area remnant comprised of a pronounced subsurface traditional Hawaiian cultural layer that includes numerous pit features and six previously identified human burials (SIHP # -6855); and an historic fishpond remnant, part of Land Commission Grant 3194, “Kolowalu,” awarded to Kalae and Kaaua (SIHP # -6856).

4.1.4 Bush and Hammatt 2006

Between 2003 and 2005, CSH conducted archaeological monitoring along Auahi Street for the Hokua Tower project (Bush and Hammatt 2006). No cultural materials were observed.

4.1.5 O’Hare et al. 2006

In 2006, CSH completed archaeological monitoring for the Queen Street Extension project (O’Hare et al. 2006). During monitoring of the construction, 30 human burials were found and disinterred. Analysis of the distribution of the burials and the associated grave goods indicates 28 of the burials (SIHP # -6658) constitute a cemetery, possibly used between the 1840s and the 1880s, located on the lip of Kolowalu Pond. Two burials (SIHP # -6659) were isolated finds not related to the main cemetery cluster. Historic trash pits (SIHP # -6660) were also discovered during monitoring intruding into the eastern edge of the cemetery. The human remains and associated grave goods were reburied on site in a specially constructed vault complex.

4.1.6 Carney and Hammatt 2008

In 2008, CSH performed archaeological monitoring for the Hokua Tower project on Ala Moana Boulevard (Carney and Hammatt 2008). An isolated human mandible fragment and an historic trash pit (SIHP # -6765) were observed.

4.1.7 Fong et al. 2009

In 2009, CSH completed archaeological monitoring of construction associated with the upgrading of existing drainage, water, and sewer systems within Kapi‘olani Boulevard from Kalākaua Avenue to Ward Avenue, within Kamake‘e Street from Kapi‘olani Boulevard to Auahi

Street and within Atkinson Drive from Kapi‘olani Boulevard to Ala Moana Boulevard (Fong et al. 2009). No historic properties were observed. Observed stratigraphy consisted primarily of imported fill material associated utility and road construction. In some instances pockets of naturally deposited sediment (Jaucas sand and wetland clays) were observed beneath fill deposits.

4.1.8 Petrey et al. 2009

In 2007, CSH (Petrey et al. 2009) completed archaeological monitoring for the resurfacing of portions of Nimitz Highway and Ala Moana Boulevard along with the installation of streetlights, replacement of concrete bus pads, and limited drainage installation. The majority of ground disturbance consisted of very shallow excavations with the exception of traffic signal installations. In the area of Fort Street and Nimitz Highway fill deposits containing historic and modern building debris were documented. In the area of Bishop Street and Nimitz Highway fill deposits containing building rubble were observed. In the area along Ala Moana Boulevard between Channel and Pi‘ikoi Streets natural coralline sand was documented beneath fill material. No archaeological cultural resources were documented.

4.1.9 Thurman et al. 2009

In 2009, CSH completed an archaeological inventory survey for the Queen Street Parks project. Fieldwork involved the excavation of 29 backhoe trenches. One previously identified historic property was recorded, SIHP # -6856, a historic fishpond remnant, originally identified by Bell et al. (2006).

Documented stratigraphy consisted of varying layers of fill overlying various naturally deposited sediments atop the coral shelf. The fill consisted of imported terrigenous sediment, incinerator material containing burnt and unburnt historic refuse, crushed coral, and hydraulic pump dredge. The historic trash layer has not been assigned its own SIHP number; however, this layer appears to correlate to SIHP # -6641. Natural sediments consisted primarily of backshore marsh or pond sediments associated with SIHP # -6856 (Kolowalu fish pond). Naturally deposited Jaucas sand deposits were also observed.

4.1.10 Tulchin and Hammatt 2009

In 2009, CSH conducted archaeological monitoring for the Ala Wai Watermark (Gateway) project (Tulchin and Hammatt 2009). The four previously documented historic properties from the 2005 AIS were observed again. No new cultural properties were documented.

4.1.11 Hammatt and Shideler 2010

In May 2010, CSH conducted an archaeological literature review and field inspection of the Kewalo basin repairs project (Hammatt and Shideler 2010). No historic properties were identified within the project area or are believed to be present.

4.1.12 Altizer et al. 2011

From 2008 to 2009, CSH conducted archaeological monitoring of the Kapi‘olani Area Revised Sewer System project (Altizer et al. 2011). The project comprised multiple sewer line segments located throughout Kaka‘ako, Kewalo, and Kālia. The study documented two layers of former wetland sediments, identified as SIHP # -6636 within one sewer line segment, Sewer Line G.

Sewer Line G was located in the easement between Pensacola and Pi‘ikoi streets, near Kamaile Street.

4.1.13 Sroat and McDermott 2012

In 2012 a supplemental archaeological inventory survey report for the Ward Village Shops Phase 2 project (Sroat and McDermott 2012) identified no new historic properties, however further documentation of SIHP # -6855 (an activity area remnant comprised of a pronounced subsurface traditional Hawaiian cultural layer that includes numerous pit features and six previously identified human burials) was conducted.

4.1.14 Hammatt 2013

In 2013, CSH performed archaeological inventory survey testing within numerous locations between Middle Street and Ala Moana Center (Hammatt 2013). Testing revealed multiple sites, two of which were identified near the Medina et al. 2013 project area. These are SIHP # -6636 (former wetland land surface) and SIHP # -6856 (Kolowalu fishpond). These wetland sediments represent the natural wetland surface of the Kewalo area and were identified within 25 archaeological inventory survey test excavations within the East Kaka‘ako and Kālia Geographic Zones for the Honolulu High Capacity Transit Corridor Project (T-186 through T-193, T-195, T-196, T-198 through T-200, T-202, T-202A, T-203, T-205, T-207, T-208, T-210 through T-212, T-214, T-219, and T-220). In general, the wetland sediments were documented as variations of brown and gray silty clays, sandy clays, clay loams, and black silt loam peat layers.

4.1.15 Medina et al. 2013

In 2013, CSH conducted archaeological monitoring for the Queen and Kamake‘e traffic signal project in Kaka‘ako (Medina et al. 2013). No historic properties were encountered during archaeological monitoring within the project area. In general, observed stratigraphy consisted of various fill layers overlying remnant or truncated portions of a buried sand A horizon, Jaucas sand, and the coral shelf.

4.1.16 Yucha et al. 2014

Between December 2012 and January 2013, CSH conducted an archaeological inventory survey of the Ward Neighborhood Block C project, a component of the Ward Neighborhood Master Plan area, located immediately adjacent to (southeast of) the current project area at the intersection of Ala Moana Boulevard and Kamake‘e Street (Yucha et al. 2014). Forty-one test excavations were distributed across the project area. Only one historic property was identified, a burned trash layer (SIHP # -7422) located near the corner of Kamake‘e and Auahi streets. Stratigraphy within the project area was largely consistent. A deposit of hydraulic fill associated with the reclamation infilling of Kaka‘ako during the 1913–1930 period was found within the north, west, and south portions of the project area. Beneath the fill layers, a coarse sand A horizon was documented within 25 test excavations throughout the project area, while a peat A horizon was found within three excavations within the northern portion of the project area. A majority of the project area (35 test excavations) contained Jaucas sand. No cultural material or features were observed within the test excavations or within screened and bulk sediment samples.

Section 5 Results of Field Inspection

The fieldwork component of the archaeological literature review and field inspection was carried out under archaeological permit number 14-04, issued by the SHPD, per HAR §13-282. A brief field inspection (approximately one hour) was carried out by William Folk, B.A. on 29 August 2014 under the overall supervision of Hallett H. Hammatt Ph.D., principal investigator.

The project area was accessed from Ala Moana Boulevard. At present, virtually the entire area is an asphalt parking lot with scattered utility poles and a central parking lot median that is minimally landscaped. Approximately 30% of the project area is in current use as temporary park space. The landscaping consists of pink shower trees (*Cassia nealiae*), monkey pod trees (*Samanea saman*), hibiscus (*Hibiscus* sp.), and palm trees (*Cocos nucifera*). There appear to be only a few exotic weedy species present (such as finger grass *Chloris virgata*, etc.). The vast majority of the parcel is presently visitor and permit parking for the Kewalo Basin boat harbor.

Section 6 Summary and Recommendations

Background research conducted indicates a limited potential for historically significant findings. The project area is comprised nearly exclusively of reclaimed fill land. In the historical record the area goes almost unmentioned by pre-Contact and early post-Contact Hawaiians aside from the casual gathering of a few natural coastal resources, harvesting salt and gathering *pili* grass.

The historical accounts describe the area as a mostly vacant location, generally mentioned as a place connecting two largely populated areas, Honolulu and Waikīkī. Some of the first records by Hawaiians are during the Māhele of 1848, when the entire *‘ili* of Kukuluāe‘o was awarded to the American Board of Commissioners for Foreign Missions (ABCFM). Initially this land was associated with Punahou School in Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiaha‘o Church in 1829 (DeLeon 1978:3). The area later developed into an industrial district for things like the Honolulu Iron Works and a Transit of Venus station, thanks to its close proximity to the Honolulu boat harbor, Honolulu downtown, and Waikīkī.

The urban development of the downtown waterfront and surrounding areas in the nineteenth and twentieth centuries involved extensive filling associated with the development of harbor infrastructure, industrial subdivisions, and commercial districts. These land reclamations and subsequent urban development would have destroyed and/or buried any surface archaeological historic properties that may have been present within this area. However it is unlikely that archaeological resources in the form of subsurface cultural deposits are present beneath historic and modern fill layers within the project area.

There is no evidence historically or archaeologically that meets Hawai‘i State historical significance criteria (in accordance with HAR §13-13-275-6 **–or–** §13-13-284-6) qualified by at least one of the following:

a. Be associated with events that have made an important contribution to the broad patterns of our history;

b. Be associated with the lives of persons important in our past;

c. Embody the distinctive characteristics of a type, period, or method of construction, represent the work of a master, or possess high artistic value;

d. Have yielded, or is likely to yield, information important for research on prehistory or history; or

e. Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity.

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APPENDIX B

CULTURAL IMPACT ASSESSMENT

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Draft

Cultural Impact Assessment for the Kewalo Basin Retail, Honolulu Ahupuaʻa, Honolulu (Kona) District, Oʻahu TMK: [1] 2-1-058:128 por.

Prepared for
Good Luck Corporation

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Prefatory Remarks on Language and Style

A Note about Hawaiian and Other Non-English Words:

Cultural Surveys Hawai‘i (CSH) recognizes that the Hawaiian language is an official language of the State of Hawai‘i, it is important to daily life, and using it is essential to conveying a sense of place and identity. In consideration of a broad range of readers, CSH follows the conventional use of italics to identify and highlight all non-English (i.e., Hawaiian and foreign language) words in this report unless citing from a previous document that does not italicize them. CSH parenthetically translates or defines in the text the non-English words at first mention. A glossary of Hawaiian words can also be found in Appendix A

Management Summary

Reference	Cultural Impact Assessment (CIA) for the Kewalo Basin Retail Project, Honolulu Ahupua‘a, Honolulu (Kona) District, O‘ahu TMK: [1] 2-1-058:128 por. (Ishihara, Liborio, Magat, and Hammatt 2014)
Date	October 2014
Project Number (s)	Cultural Surveys Hawai‘i (CSH) Job Code: KAKAAKO 139
Agencies	State of Hawai‘i Department of Health/Office of Environmental Quality Control (DOH/OEQC)
Land Jurisdiction	State of Hawai‘i–Kaka‘ako Community Development District
Agencies	State of Hawai‘i Department of Land and Natural Resources/State Historic Preservation Division (SHPD); State Office of Environmental Quality Control (OEQC)
Project Description	The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The facility consists of four two-level buildings with the majority of the second level equipped with an open deck and viewing spaces. Combined, the four buildings include almost 50,000 sq ft of waterfront retail stores; small restaurants, cafes and bars; commercial office space; a live entertainment venue; and a large observation deck and signature multipurpose venue on the second floor. Additionally, the proposed project includes a 250-stall, multi-level parking structure.
Project Acreage	Approximately 2.1 acres
Area of Potential Effect (APE) and Survey Acreage	For the purposes of this CIA, the APE is defined as the approximately 2.1-acre area outlined in Figure 1. While this investigation focuses on the project APE, the study area included the entire *ahupua‘a* (land division usually extending from the uplands to the sea) of Kaka‘ako.
Document Purpose	This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts to cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance criterion “e,” pursuant to Hawai‘i Administrative Rules (HAR) §13-275-6 and §13-284-6. Significance

	criterion “e” refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.
Consultation Effort	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the permanent project footprint and the vicinity. The organizations consulted included the State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs (OHA), the O‘ahu Island Burial Council (OIBC), Hui Mālama I Nā Kūpuna ‘O Hawai‘i Nei, the Honolulu Hawaiian Civic Club, Friends of Kewalos, and community members of Kaka‘ako.
Results of Background Research	Background research for this project yielded the following results: 1. Kaka‘ako is located between two of the most intensely populated and cultivated areas in southeastern O‘ahu during the pre-Contact period: Waikīkī and Honolulu (also known as Kou). Hawaiians utilized the marshes and wetlands for salt making and farming of fishponds along with some limited wetland agriculture. 2. The Kaka‘ako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation. 3. Land Commission and other historic-era documents identify the Kewalo area between Cooke and Sheridan streets *mauka* (toward the mountain) of Queen Street and the coastal sections of Ka‘ākaukukui, Kukuluāe‘o, and Kālia. According to Pukui et al. (1974:109), members of the *kauwā* (members of a pariah caste intended for sacrifice) were drowned in the Kewalo area. At one time, the Kewalo area also had a sandy beach where various sports including surfing were held (Kekahuna 1958). 4. Pu‘ukea Heiau was located in the *‘ili* (land section) of Kukuluāe‘o according to Kamakau (1991a:24). Pu‘ukea means “white hill” and is also the name of a smaller land division within Kukuluāe‘o ‘Ili that is mentioned in at least two Land Commission Awards (LCA): 1502 (not awarded) and 1504. LCA 1504 is located near the junction of Halekauwila and Cooke streets. There is a possibility that the *heiau* (pre-Christian place

	of worship) platform or the area that it was built on was one of the few elevated locations in the flat, low-lying swamp that surrounded it. 5. A trail traversed the Kaka‘ako area, ultimately connecting Waikīkī to Honolulu. ‘Ī‘ī (1959:89) described the middle trail (close to the current alignment of Queen Street) extending from Kālia to Kukuluāe‘o as passing “along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha. On the upper side of the trail was the place of Kinau, the father of Kekauonohi.” 6. The project area—the Kewalo Basin Harbor—was formerly shallow reef that enclosed a deep section of water. The harbor was dredged and filled in the mid-1880s. No LCAs were awarded for the project area. There is no documented evidence that any *iwi kūpuna* (ancestral remains) were found within the project area. However, human remains were discovered near the coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002). 7. A majority of the land in Kewalo and Kukuluāe‘o was used to produce salt. Hawaiians used *pa‘akai* (salt) to flavor food, to preserve fish, to use for ceremonial purposes, and for medicinal purposes. 8. Hansen’s disease was first reported in 1840 and definitively identified in 1853. In 1865, a hospital in Kalihi was set up to examine suspected lepers. If the disease was confirmed, patients were exiled to Kalaupapa on Moloka‘i. In 1881, a receiving station was built in Kaka‘ako for Hansen’s Disease patients, in a block now bound by Ala Moana, Auahi, Coral, and Keawe streets, under the direction of Saint Marianne Cope (Griffin et al. 1987:55). 9. During an 1853 smallpox epidemic, patients were isolated at a temporary quarantine camp in Kaka‘ako (Thrum 1897:98). Victims of the disease were buried at Honuakaha Cemetery, near the junction of Quinn Lane and South streets (Griffin et al. 1987:13). 10. Kaka‘ako was also the location for a battery with three cannons used to salute visiting naval vessels. The small battery, Fort Armstrong, was set up on the Ka‘ākaukukui Reef as a station for the storage for underwater mines. 11. In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo for the aim of a harbor extension that was to serve fishing fleets and to relieve Honolulu Harbor. The harbor was adjacent to several lumber yards, and

	was initially made to provide docking for lumber schooners. When the wharf was completed in 1926, the lumber business faded and the harbor was used mainly by commercial fishermen. Dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate. In 1941, the basin was dredged and expanded to its current 55 acres. In 1955, dredged material was placed along the *makai* (towards the ocean) side to form an 8-acre land section. 12. Japanese fishing vessels called *sampans* entered Hawaiian waters at the turn of the twentieth century. With continuing labor migration, Japanese fishing vessels and their sailors found employment with the offshore fishing industry, unloading large catches of *ahi* and *aku*. World War II severely impacted the *sampan* fishing industry by limiting hours in certain areas. The government confiscated the *sampan* fleet in fear that Japanese boat owners were using the vessels for spying or sabotage.
Results of Community Consultation	A total of 30 people were contacted for the purposes of this CIA; three people responded and two people were interviewed for more in-depth contributions. Interview summaries are pending. This community consultation currently indicates the following: 1. Ms. Kiersten Faulkner of Historic Hawai‘i Foundation stated Ala Moana Beach Park is designated as a historic property on the National Register of Historic Places (State Inventory of Historic Properties [SIHP] # 50-80-14-1388). She noted that commercial development along the park boundaries “has the potential to impact its historic integrity.” 2. Ms. Faulkner also identified the surf break known as Kewalos, which is accessed south of the project area. Surfing is not only a recreational activity, but also a traditional cultural practice dating to pre-Contact times within the Hawaiian Islands. 3. State of Hawai‘i recognized lineal descendant Paulette Ka‘anohi Kaleikini clarified that Kaka‘ako is not an *ahupua‘a* (land division extending from the mountains to the sea) but an *‘ili* (land section). She stated the project area is in the *ahupua‘a* of Honolulu, which was once known as Kou. Kou was named after a chief of the Kakuhihewa line. 4. Ms. Kaleikini shared that during the pre-Contact period, the Kewalo Basin reef area had once been a site for canoe landings. An *ali‘i* (chief) compound was *mauka* of the Kewalo area and “this was the closest landing area for their canoes.” 5. The reef was destroyed and later dredged for docking purposes. Although the 2.1-acre proposed project area is on reef and Ms. Kaleikini is not aware of any spoken or written historical references of cultural sites on the reef; the ocean itself was of

	cultural significance. Food was provided from the reef and ocean. 6. Ms. Kaleikini recalled that as a child she saw families and school groups congregate near the project area. Families could often be seen fishing in the vicinity of the project area in the past as well as today. 7. Honolulu Ahupua‘a was an epicenter of Hawaiian habitation in the pre-Contact period. In situ flexed burials *mauka* of Ala Moana Boulevard provide evidence that this area was heavily populated. Ms. Kaleikini added that Native Hawaiians buried the dead close to the ocean in sand. Ms. Kaleikini questioned the possibility that the project area contains pockets of sand. 8. Kewalo was also an area where the *kauwā* were drowned by holding their heads under water. Ms. Kaleikini posed the question, “Where did their bodies drift?” If bodies of the *kauwā* did not drift out to sea, she suggested they could possibly be tucked under the reef.
Community Recommendations	Based on information gathered from the community consultation, participants voiced the following concerns: 1. Kiersten Faulkner of Historic Hawai‘i Foundation stated the Ala Moana Beach Park is designated as a historic property (SIHP # 50-80-14-1388). She raised concerns about historic integrity and suggested that design and construction of the project area “should emphasize computability with the historic setting and views” and referenced the Secretary of the Interior’s *Standards for the Rehabilitation of Historic Properties* to provide a framework and guidelines for new construction within a historic district. 2. The Historic Hawai‘i Foundation recommended evaluatation of the surf break, Kewalos, as a Traditional Cultural Property (TCP), which may be eligible for the Hawai‘i Register of Historic Places. Contributing features could be accessed via land and sea, which should be integrated into development plans. 3. Ms. Kaleikini recommended consultation with State of Hawai‘i recognized descendants after the CIA is completed and prior to an archaeological inventory survey plan being developed.
Impacts & Recommendations	The following recommendations are based on a synthesis of all the information gathered during preparation of this CIA. Faithful attention to these recommendations and efforts to develop appropriate measures to address these concerns will help mitigate the adverse impacts of the proposed action on Hawaiian cultural beliefs, practices and resources by the project.

	1. Although the project area is primarily comprised of Fill land, there is a possibility *iwi kūpuna*, ancestral bones, may be present within the project area and that land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. In addition, a community participant indicated the presence of burials just *mauka* of the proposed project area. 2. Personnel involved in the construction activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials or other cultural finds be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies be notified pursuant to applicable law. 3. Project proponents should consult with State of Hawai‘i recognized lineal and cultural descendants to develop reinterment and cultural preservation plans in the event that any human remains, cultural sites, or artifacts are uncovered during construction or long-term maintenance for the project. 4. Project proponents should consult with the State Historic Preservation Division and refer to the Secretary of the Interior’s *Standards for the Rehabilitation of Historic Properties* in regards to possibly affecting the historic integrity and setting of neighboring historic properties such as Ala Moana Beach Park (SIHP # 50-80-14-1388). 5. Project proponents should consider an evaluation of the surf break known as Kewalos as a Traditional Cultural Property, which may be eligible for the Hawai‘i Register of Historic Places, as suggested by a community participant. In addition to the many surf break Kewalos, the surrounding area is rich in pre-Contact and historic events.

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Section 1 Introduction

1.1 Project Background

At the request of Good Luck Corp., Inc., Cultural Surveys Hawai‘i, Inc. (CSH) conducted this cultural impact assessment (CIA) for the Kewalo Basin Retail, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu TMK: [1] 2-1-058:128 por. (Figure 1 through Figure 3).

The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The facility consists of four, two-level buildings with the majority of the second level equipped with an open deck and viewing spaces. Combined, the four buildings include almost 50,000 sq ft of waterfront retail stores, small restaurants, cafes and bars, commercial office space, a live entertainment venue, and a large observation deck and signature multipurpose venue on the second floor. Additionally, the proposed project includes a 250-stall, multi-level parking structure.

1.2 Document Purpose

This CIA was prepared to comply with the State of Hawai‘i’s environmental review process under Hawai‘i Revised Statutes (HRS) §343, which requires consideration of the proposed project’s potential effect on cultural beliefs, practices, and resources. Through document research and cultural consultation efforts, this report provides information compiled to date pertinent to the assessment of the proposed project’s potential impacts on cultural beliefs, practices, and resources (pursuant to the Office of Environmental Quality Control’s *Guidelines for Assessing Cultural Impacts*) which may include Traditional Cultural Properties (TCPs). These TCPs may be significant historic properties under State of Hawai‘i significance criterion “e,” pursuant to Hawai‘i Administrative rules (HAR) §13-275-6 and §13-284-6. Significance criterion “e” refers to historic properties that “have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity” (HAR §13-275-6 and §13-284-6). The document will likely also support the project’s historic preservation review under HRS §6E and HAR §13-275 and §13-284. The document is intended to support the project’s environmental review and may also serve to support the project’s historic preservation review under HRS §6E-8 and HAR §13-284.

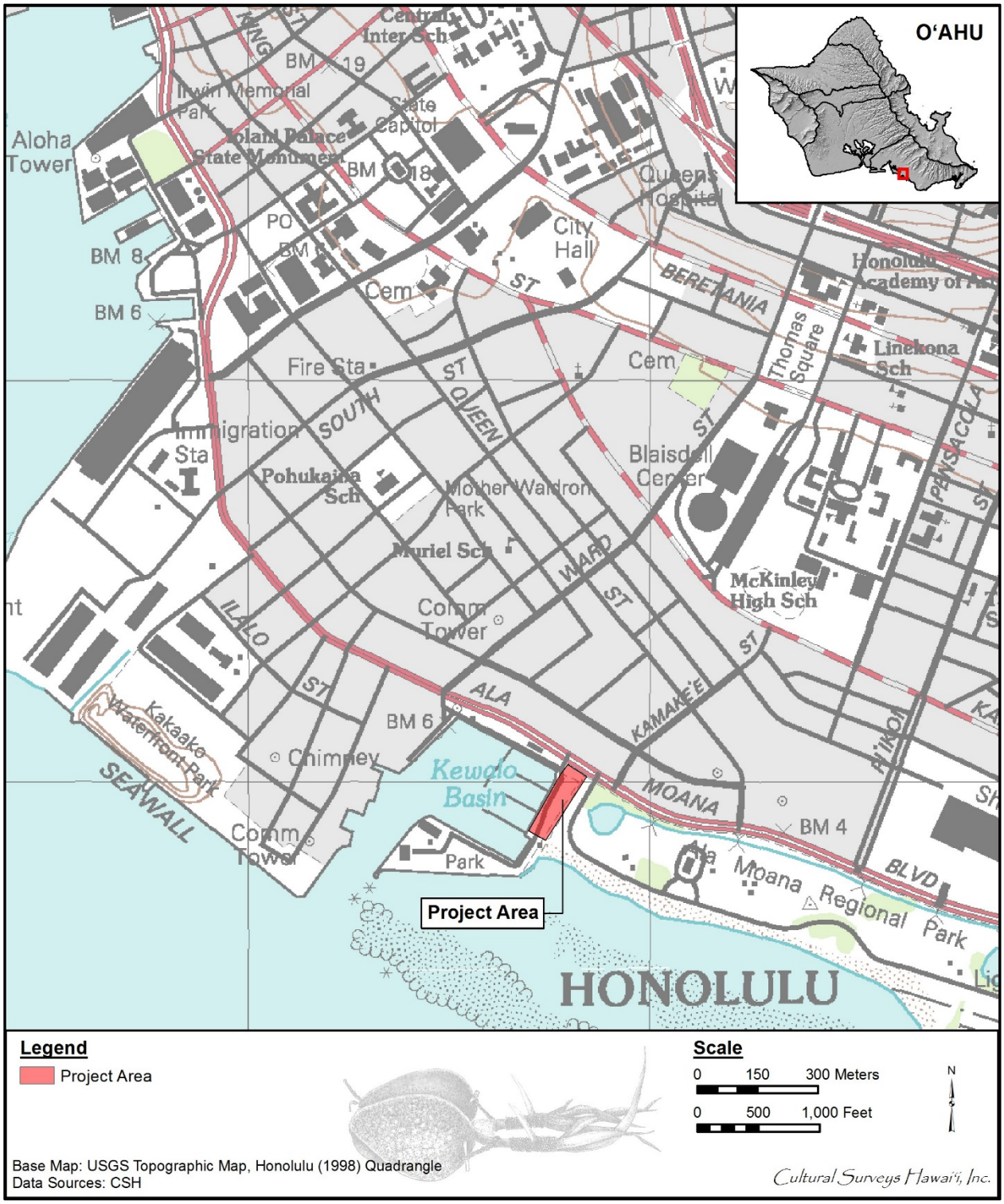

Figure 1. Portion of the 1998 Honolulu USGS 7.5-Minute Series Topographic Quadrangle showing location of the project area

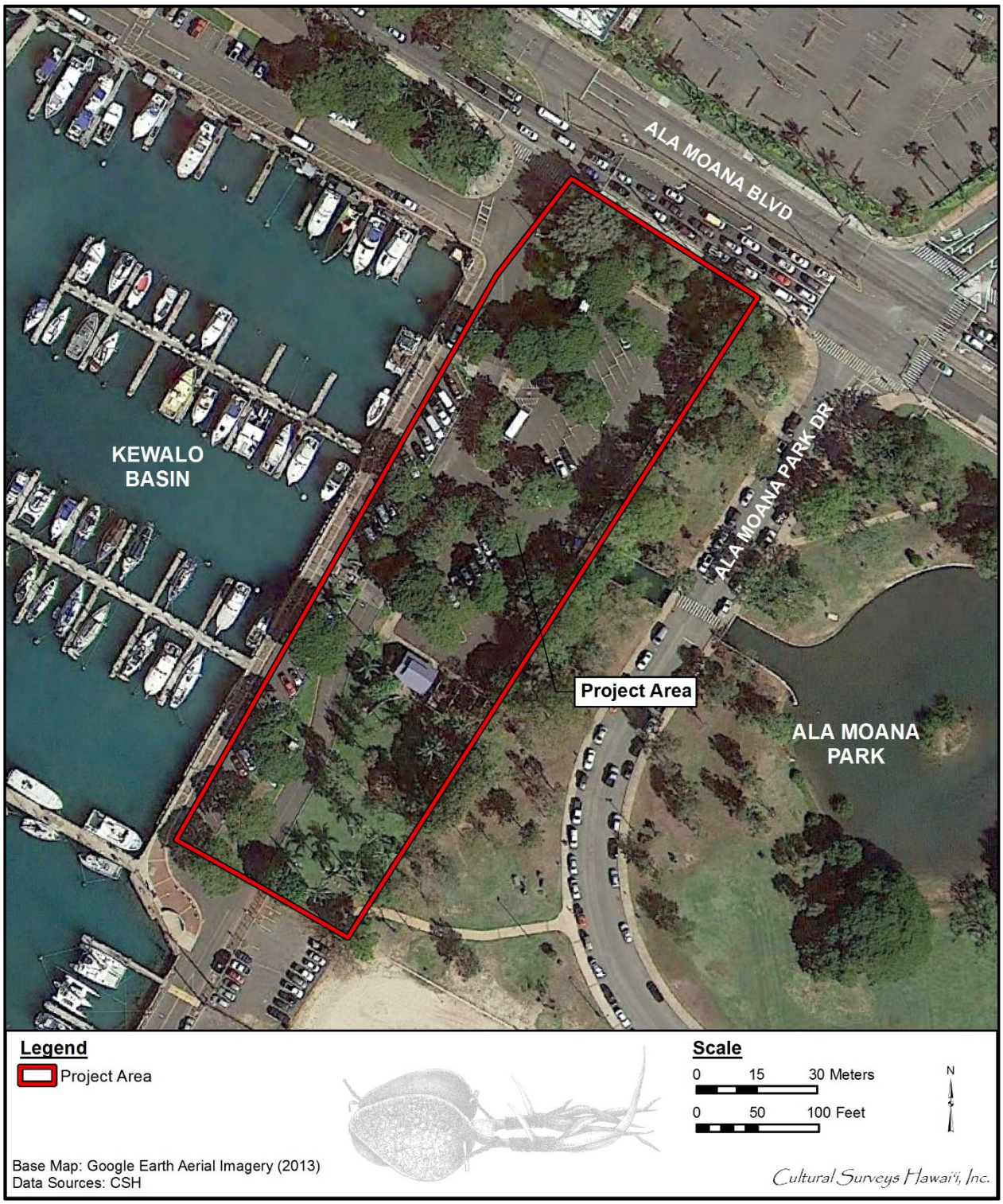

Figure 2. Aerial photograph showing the project area (Google Earth 2013)

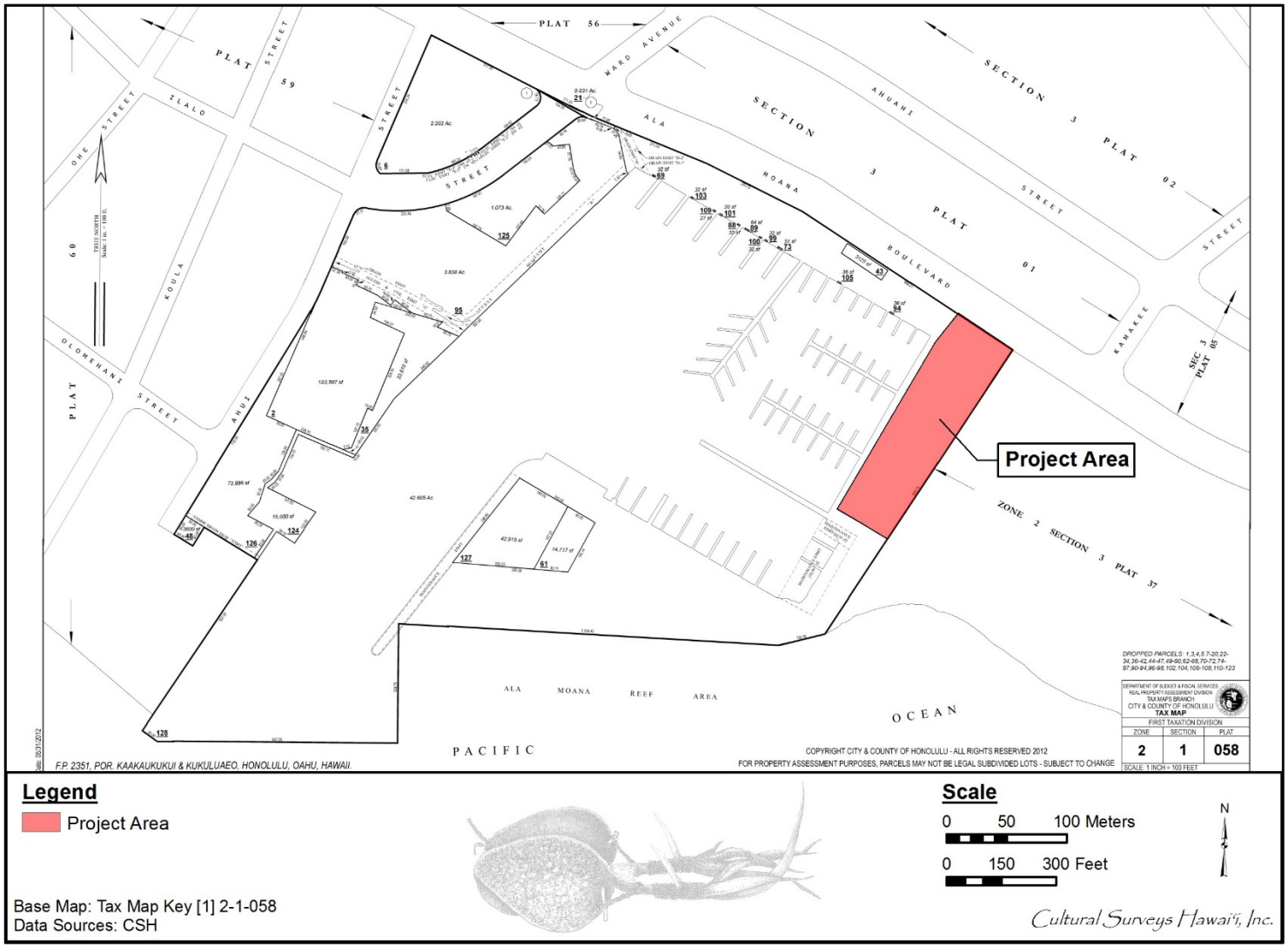

Figure 3. Tax Map Key (TMK) [1] 2-1-058 showing project area (Hawai‘i TMK Service 2012)

1.3 Scope of Work

The scope of work for this CIA includes the following:

1. Examination of cultural and historical resources including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel
3. Consultation and interviews with knowledgeable parties regarding cultural and natural resources and practices at or near the parcel; present and past uses of the parcel; and/or other practices, uses, or traditions associated with the parcel and environs
4. Preparation of a report that summarizes the results of these research activities and provides recommendations based on findings

1.4 Environmental Setting

1.4.1 Natural Environment

The Kaka‘ako project area is within a physiographic region of O‘ahu called the Honolulu Plain, an area generally less than 4.5 m, or 15 ft, above mean annual sea level (Davis 1989:5). The Honolulu Plain is stratified with late Pleistocene coral reef substrate overlain with calcareous marine beach sand or terrigenous sediments (i.e., formed from erosion of rocks on land), and stream-fed alluvial deposits (i.e., material deposited by running water) (Armstrong 1983:36). A high stand of the sea for the Hawaiian Islands, approximately 1.5 to 2.0 m above present sea level, has been well documented between 4,500 and 2,000 years ago (Stearns 1978:50).

The deposition of marine sediments during this elevated sea level greatly affected the Honolulu coastline. The subsequent drop in sea level to its present level, ca. 2,000 years ago, created a slightly erosional regime that may have removed sediments deposited during the preceding period of deposition (Dye and Athens 2000:19). However, the net gain in sediments would have been substantial. Nakamura (1979:65), citing a Hawaiian Territory Sanitary Commission Report, estimated that about one-third of the Honolulu Plain was a wetland in 1911. Pre-Contact Hawaiians used the lagoon/estuary environment of the Honolulu Plain to construct fishponds. Fishpond walls served as sediment anchors for the accumulation of detrital reef sediments. They also likely affected long shore sedimentary transport, resulting in new littoral deposition and erosion patterns. Fishponds, which the Hawaiians no longer actively maintained or utilized in the post-Contact period, became locations for the deposition of fill. These reclaimed areas provided valuable new land near the heart of growing urban Honolulu. The current project area previously consisted of reef with a naturally deep outlet from fresh water run off. Cultural activities such as fishing, diving, and *limu* gathering occurred here.

The entire project area is located on Fill Land, Mixed (FL) as indicated in the soil maps (Figure 4). Beaches (BS) and Water (W) are outside the project area but nearby. Fill Land consists of areas

filled in with materials from dredging, excavation from upland, garbage, and bagasse and slurry from sugar mills (Foote et al. 1972:31). Fill land, mixed, occurs in areas adjacent to the ocean. This particular land type is used for urban development including airports, housing areas, and industrial facilities.

1.4.2 Built Environment

The project area is located within central Honolulu. The project area previously consisted of reef until it was dredged and filled in the mid-1880s (see Section 4.9 for an expanded version). The project area went through a series of different uses including the location for a battery and cannons (see Section 4.5); a dock for lumber yards; and for commercial fishing (see Section 4.6). The project area currently consists of a parking lot, a comfort station, and a grassy area. Foliage within the project area consists of false *kamani* trees (*Calophyllum inophyllum*), coconut trees, octopus trees, and other flora. The project area is bound by Ala Moana Boulevard to the north and Ala Moana Park Drive to the east. To the west of the project area is Kewalo Basin. Southwest of the project area is Kewalo Basin Park and the ocean.

Figure 4. 2013 Google Earth aerial with project area and soils overlay (Foote et al. 1972)

Section 2 Methods

2.1 Archival Research

Historical documents, maps, and existing archaeological information pertaining to Kaka‘ako Ahupua‘a were researched at the CSH library and other archives including the University of Hawai‘i at Mānoa’s Hamilton Library, the State Historic Preservation Division (SHPD) library, the Hawai‘i State Archives, the State Land Survey Division, and the Bishop Museum Archives. Previous archaeological reports for the area were reviewed, as were historic maps and photographs and primary and secondary historical sources. Information on Land Commission Awards (LCAs) was accessed through Waihona ‘Aina Corporation’s Māhele database (Waihona ‘Aina 2000), the Office of Hawaiian Affairs (OHA) Papakilo database (Office of Hawaiian Affairs 2011), as well as a selection of CSH library references.

For cultural studies, research for the Traditional Background section centered on Hawaiian activities including religious and ceremonial knowledge and practices; traditional subsistence land use and settlement patterns; gathering practices and agricultural pursuits; as well as Hawaiian place names and *mo‘olelo* (stories), *mele* (songs), *oli* (chants), *‘ōlelo no‘eau* (proverbs), and more. For the Historic Background section, research focused on land transformation, development, and population changes beginning in the early post-Western Contact era to the present day (see Scope of Work above).

2.2 Community Consultation

2.2.1 Sampling and Recruitment

A combination of qualitative methods including purposive, snowball, and expert (or judgment) sampling, were used to identify and invite potential participants to the study. These methods are used for intensive case studies such as CIAs to recruit people who are hard to identify, or are members of elite groups (Bernard 2006:190). Our purpose is not to establish a representative or random sample. It is to

> identify specific groups of people who either possess characteristics or live in circumstances relevant to the social phenomenon being studied . . . This approach to sampling allows the researcher deliberately to include a wide range of types of informants and also to select key informants with access to important sources of knowledge. [Mays and Pope 1995:110]

We began with purposive sampling informed by referrals from known specialists and relevant agencies. For example, we contacted via letter the SHPD, OHA, O‘ahu Island Burial Councils (OIBC), and community and cultural organizations in Kaka‘ako Ahupua‘a for their brief response and review of the project and to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the permanent project footprint and vicinity, cultural and lineal descendants, and other appropriate community representatives and members (see Section 6 Community Consultation, Table 2). Based on their in-depth knowledge and experiences, these key respondents then referred CSH to additional potential participants who were added to the pool of invited participants. This is snowball sampling, a chain referral method that entails

asking a few key individuals (including agency and organization representatives) to provide their comments and referrals to other locally recognized experts or stakeholders who may be likely candidates for the study (Bernard 2006:192).

CSH also employs expert or judgment sampling which involves assembling a group of people with recognized experience and expertise in a specific area (Bernard 2006:189–191). CSH maintains a database that draws on over two decades of established relationships with community consultants, cultural practitioners and specialists, community representatives, and cultural and lineal descendants. The names of new potential contacts were also provided by colleagues at CSH and from the researchers' familiarity with people who live in or around the study area. Researchers often attend public forums (e.g., Neighborhood Board, Burial Council, and Civic Club meetings) in (or near) the study area to recruit participants. Please see Table 2 for a complete list of individuals and organizations contacted for this CIA and Interviews in Section 7 for a detailed account.

CSH focuses on obtaining in-depth information with a high level of validity from a targeted group of relevant stakeholders and local experts. Our qualitative methods do not aim to survey an entire population or subgroup. A depth of understanding about complex issues cannot be gained through comprehensive surveying. Our qualitative methodologies do not include quantitative (statistical) analyses, yet they are recognized as rigorous and thorough. Bernard (2006:25) describes the qualitative methods as "a kind of measurement, an integral part of the complex whole that comprises scientific research." Depending on the size and complexity of the project, CSH reports include in-depth contributions from about one-third of all participating respondents. Typically this means three to 12 interviews.

2.2.2 Informed Consent Protocol

An informed consent process was conducted as follows: 1) before beginning the interview the CSH researcher explained to the participant how the consent process works, the project purpose, the intent of the study and how his/her information will be used; 2) the researcher gave him/her a copy of the Authorization and Release Form to read and sign (Appendix B); 3) if the person agreed to participate by way of signing the consent form or providing oral consent, the researcher started the interview; 4) the interviewee received a copy of the Authorization and Release Form for his/her records, while the original was stored at CSH; 5) after the interview was summarized at CSH (and possibly transcribed in full), the study participant was afforded an opportunity to review the interview notes (or transcription) and summary and to make any corrections, deletions or additions to the substance of their testimony/oral history interview; this was accomplished either via phone, post or email or through a follow-up visit with the participant; 6) the participant received the final approved interview and any photographs taken for the study for their records. If the participant was interested in receiving a copy of the full transcript of the interview (if there is one; not all interviews are audio-recorded and transcribed), a copy was provided. Participants were also given information on how to view the report on the OEQC website and offered a hard copy of the report once the report becomes a public document.

2.2.3 Interview Techniques

To assist in discussion of natural and cultural resources and cultural practices specific to the study area, CSH initiated semi-structured interviews (as described by Bernard 2006) asking

questions from the following broad categories: cultivation, gathering practices and *mauka* (towards the mountain) and *makai* (towards the ocean) resources, burials, trails, historic properties, and *wahi pana* (storied place). The interview protocol is tailored to the specific natural and cultural features of the landscape in the study area identified through archival research and community consultation. For example, for this study, cultivation and gathering practices were emphasized over other categories less salient to project participants. These interviews and oral histories supplement and provide depth to consultations from government agencies and community organizations that may provide brief responses, reviews and/or referrals gathered via phone, email, and occasionally face-to-face commentary.

2.2.4 In-depth Interviews and Oral Histories

Interviews are conducted with individuals or in focus groups comprised of *kūpuna* (elder) and *kama‘āina* (Native-born) who have a similar experience or background (e.g., the members of an area club, elders, fishermen, hula dancers). Interviews are conducted initially at a place of the study participant’s choosing (usually at the participant’s home or at a public meeting place) and/or—whenever feasible—during site visits to the proposed project. Generally, CSH’s preference is to interview a participant individually or in small groups (two–four); occasionally participants are interviewed in focus groups (six–eight). Following the consent protocol outlined above, interviews may be recorded on tape and in handwritten notes, and the participant photographed. The interview typically lasts one to four hours, and records the who, what, when and where of the interview. In addition to questions outlined above, the interviewee is asked to provide biographical information (e.g., connection to the study area, genealogy, professional and volunteer affiliations).

2.3 Compensation and Contributions to Community

Many individuals and communities have generously worked with CSH over the years to identify and document the rich natural and cultural resources of these islands for cultural impact, ethno-historical and, more recently, Traditional Cultural Properties (TCP) studies. CSH makes every effort to provide some form of compensation to individuals and communities who contribute to cultural studies. This is done in a variety of ways. Individual interview participants are compensated for their time in the form of a small honorarium and/or other *makana* (gift); community organization representatives (who may not be allowed to receive a gift) are asked if they would like a donation to a Hawaiian charter school or nonprofit of their choice to be made anonymously or in the name of the individual or organization participating in the study; contributors are provided their transcripts, interview summaries, photographs and—when possible—a copy of the CIA report; CSH is working to identify a public repository for all cultural studies that will allow easy access to current and past reports; CSH staff do volunteer work for community initiatives that serve to preserve and protect historic and cultural resources. Generally our goal is to provide educational opportunities to students through internships, share our knowledge of historic preservation and cultural resources and the State and Federal laws that guide the historic preservation process, and through involvement in an ongoing working group of public and private stakeholders collaborating to improve and strengthen the §343 environmental review process.

Section 3 Traditional Background

The Kaka‘ako area remained outside the two most intensely populated and cultivated areas of southeastern O‘ahu—Waikīkī and Honolulu (or Kou)—during pre-Contact times, yet Hawaiians used the marshes and wetlands for salt making and farming of fishponds along with some limited wetland agriculture. The Kaka‘ako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation. Much of the cultural and natural deposits and land forms of the area (lowland marshes, sand deposits, coral reef flats, and fishponds) have survived below this fill, and numerous pre-Contact and post-Contact burials have been documented, largely the result of post-Contact epidemics. However, the history of land use in the project area is very recent in time. The area was once primarily shallow coral reefs under water at high tide. The coastline along the Kaka‘ako region was expanded in the early twentieth century as a result of dredging and reclamation of marsh lands. The project area—the Kewalo Basin Harbor—was part of the Kukuluāe‘o coastline with marshes, salt pans, and fishponds in the late 1880s. In successive waves of development, the coastline was extended *makai* to the current Ala Moana Boulevard by 1914, the Kewalo Channel was dredged in 1924 and expanded in 1941, and the dredged material was used to create a revetment—now the Kewalo Basin Park—in 1955 (Kewalo Basin Harbor 2009). For clarity, the cultural properties once located within Kaka‘ako, including *wahi pana*, *heiau* (pre-Christian place of worship), *loko i‘a* (fishpond), *ala hele* (path, road) and *‘ili* (land division), appear in bold in the text of Section 3.1.

3.1 Wahi Pana

A Hawaiian *wahi pana* is an integral part of Hawaiian culture. “In Hawaiian culture, if a particular spot is given a name, it is because an event occurred there which has meaning for the people of that time” (McGuire 2000:17). Hawaiian place names convey a wide variety of information about the relationships among people, landscapes, and other natural and cultural resources. Place names may also express cultural, historical and/or spiritual values and concepts important to Hawaiian world views. It is common for places and landscape features to have multiple names, some of which may only be known to certain *‘ohana* (families) or even certain individuals within *‘ohana*, and many have also been lost, forgotten or kept secret through time. Place names may also convey *kaona* (hidden meanings) and *huna* (secret) information that may even have political or subversive undertones. Before the introduction of writing to the Islands, when cultural information was exclusively preserved and perpetuated orally, Hawaiians gave names to literally everything in their environment, including individual garden plots and *‘auwai* (ditch, canal), house sites, intangible phenomena such as meteorological and atmospheric effects, *pōhaku* (rocks), *pūnāwai* (freshwater springs), and many others.

In this way, the *wahi pana* of Kaka‘ako, and the specific project area tangibly link the *kama‘āina* of Kaka‘ako to their past. All *wahi pana* meanings are cited from Pukui et al. (1974) unless otherwise noted.

3.1.1 Place Name of Kaka‘ako

Pukui et al. (1974) do not give a meaning for the place name Kaka‘ako, but Pukui and Elbert (1986:110) translate the word *kākā ‘āko* as “dull, slow,” and Thrum (1922:639) translated the word

as “prepare the thatching,” as *kākā* means “to chop, beat, or thresh” and *ako* means “thatch.” If Thrum’s translation is correct, it could be related to the fact that salt marshes, such as areas like Kaka‘ako, were excellent places to gather tall *pili* (*Heteropogon contortus*; a type of grass), which the Hawaiians traditionally used to thatch their houses.

Ka‘ākaukukui, a filled in reef, means “the right (or north) light,” and it may refer to a maritime navigation landmark. According to Kekahuna (1958:4), Ka‘ākaukukui was “a beautiful sand beach and reef that formerly extended a quarter mile along Ala Moana Park to Kewalo Basin. Various translations of Ka‘ākaukukui include “radiating place for lamp” (Thrum 1922:635) and “to the right of the lighthouse” (Gessler 1937:187). This would have been an accurate description of the area at that time as Ka‘ākaukukui was east, or “to the right” of the Honolulu Lighthouse in the harbor. This is probably a historic, not an ancient, interpretation as the Honolulu Lighthouse was not built until 1869 (Dean 1991:7). Ka‘ākaukukui was a *lele* (a detached part or lot of land belonging to one *‘ili* and located in another) with one parcel on the coast and two other, non-contiguous parcels inland. Ka‘ākaukukui was adjacent on the *mauka* side to several other small *‘ili* and *lele* lands, including portions of Pu‘unui (big hill) and Pualoalo (*Hibiscus kokio*; Thrum 1922:667).

Kukuluāe‘o, which translates literally as the “Hawaiian stilt (bird),” means “to walk on stilts.” This area on the upland side of Ka‘ākaukukui (Kekahuna 1958:4) formerly fronted Kewalo Basin and was an ideal environment for the Hawaiian stilt with its marshes, salt pans, and small fishponds (Griffin et al. 1987:36).

Kolowalu was a small land section between Kukuluāe‘o and Kewalo that encompassed a large fishpond. Pukui et al. (1974:116-117) do not give a meaning for Kolowalu Pond, but they interpret the name of Kolowalu, a ridge in Mānoa, as “eight creeping.” As Kolowalu Kai was probably associated with Mānoa, it is possible that “eight creeping” is also the correct interpretation for the pond name. Thrum (1922:652) interpreted *kolowalu* as “a beneficent law of Kualii.” The *kolowalu* law was initiated by the Hawaiian chief Kūali‘i, who ruled O‘ahu from about 1720 to 1740 (Cordy 2002:19). This law protected the rights of commoners and provided food to the hungry (Fornander 1917:4 (2):432).

Kewalo literally means “the calling (as an echo).” Land Commission and other historic-era documents identify it as the area between Cooke and Sheridan streets *mauka* of Queen Street and the coastal sections of Ka‘ākaukukui, Kukuluāe‘o, and Kālia. According to Pukui et al. (1974:109), *kauwā*, or members of a pariah caste, intended for sacrifice were drowned there. At one time, there was a sand beach at Kewalo, where various sports, such as surfing were held (Kekahuna 1958). The *‘ōlelo no‘eau*, “*Ka wai huahua‘i o Kewalo*,” translated as “The bubbling water of Kewalo” (Pukui 1983:178), suggests Kewalo once contained a freshwater spring. A *mo‘olelo* of Kawaiaha‘o (see Section 3.3.2) also mentions two springs in Kewalo— Kawaiaha‘o (The Waters of Ha‘o) and Kewalo Spring (Pukui 1988:87-89).

Kō‘ula (red sugar cane) is the area around Thomas Square and the *mauka* portion of the Ward Estate, suggesting Kawailumalumai Pond may have been east of the Ward Estate. It may be part of the pond complex awarded to Koalele (LCA 3169), to the southeast of the Ward/Booth Estate (LCA 274).

3.2 ‘Ōlelo No‘eau

Hawaiian sayings collected, translated, and annotated by Mary Kawena Pukui in the definitive *Ōlelo No‘eau: Hawaiian Proverbs and Poetical Sayings* offer a unique opportunity to relish the wisdom, poetic beauty, and earthy humor of the Hawaiian language. They reveal deeper layers of meaning, sharing an understanding not only of Hawai‘i and its people but of all humanity. These sayings are considered to be the highest form of cultural expression in old Hawai‘i and they bring one closer to the everyday thoughts and lives of the Hawaiians who created them (Pukui 1983:vii).

The following poetic saying pertains to the place of study:

1652

> Ka wai huahua’i o Kewalo.
> *The bubbling water of Kewalo.*
> Kewalo once had a large spring where
> many went for cool, refreshing water. [Pukui 1983:178]

3.3 *Mo‘olelo*

3.3.1 Kū‘ula

Kaka‘ako is mentioned in Thrum’s version of the legend of Kū‘ula, the god presiding over the fish, and his son ‘Ai‘ai. ‘Ai‘ai was the first to teach Hawaiians how to make various fishing lines and nets, the first to set up a *ko‘a kū‘ula*, a rock shrine on which the fishermen placed their first catch as an offering to Kū‘ula, and the first to set up *ko‘a i‘a*, fishing stations where certain fish were known to gather. Leaving his birthplace in Maui, ‘Ai‘ai traveled around the islands, establishing *ko‘a kū‘ula* and *ko‘a ia*. On O‘ahu, he landed first at Makapu‘u in Ko‘olaupoko, and then traveled clockwise around the island:

> Aiai came to Kalia [Waikīkī] and so on to Kakaako. Here he was befriended by a man named Apua, with whom he remained several days, observing and listening to the murmurs of the chief named Kou. This chief was a skillful haiku [bonito] fisherman, his grounds being outside of Mamala until you came to Moanalua. There was none so skilled as he, and generous withal, giving akus to the people throughout the district. [Thrum 1998:242]

3.3.2 Kawaiaha‘o

Two springs in Kewalo are mentioned in the *mo‘olelo* of the *Waters of Ha‘o*, which describes two children of the chief Ha‘o who ran away from their cruel stepmother. They stayed a time with the caretakers of Kewalo Spring, which may have been located close to the trail that connected Waikīkī and Honolulu. The children then left when they heard that the chiefess had sent men to look for them. The two children followed the moonlit trail across the plain toward Kou (Honolulu), but finally collapsed from weariness and thirst. In a dream, the boy’s mother told him to pull up a plant close to his feet. When he did, he found a spring under the plant, which was called the Water of Ha‘o, or Kawaiaha‘o. This spring is located at the western end of the trail, near Kawaiaha‘o Church in Kaka‘ako (Pukui 1988:87-89).

3.3.3 Kānāwai Kaihehe‘e

Kewalo once had a famous fishpond used to drown the *kauwā* and *kapu* (taboo) breakers as the first step in a sacrificial ritual known as Kānāwai Kaihehe‘e (Kamakau 1991:6) or Ke-kai-he‘ehe‘e, which translates as “sea sliding along,” suggesting the victims were slid under the sea (Westervelt 1963:16). Kewalo is described as follows:

> A fishpond and surrounding land on the plains below King Street, and beyond Koula. It contains a spring rather famous in the times previous to the conversion to Christianity, as the place where victims designed for the Heiau of Kanelaau on Punchbowl slopes, was first drowned. The priest holding the victim’s head under water would say to her or him on any signs of struggling, ‘Moe malie i ke kai o ko haku.’ ‘Lie still in the waters of your superiors.’ From this it was called Kawailumalumai, ‘drowning waters.’ [Sterling and Summers 1978:292]

3.3.4 Kukaeunahiokapueo

In one legend, Kewalo is a marsh near the beach, where tall *pili* grass grew. A man named Kapo‘i went to this area to get thatching for his house. While there, he found seven eggs of a *pueo* (Hawaiian short-eared owl) and took them home to cook for his supper. An owl perched on the fence surrounding his house and cried out “O Kapoi, give me my eggs!” After several such pleas, Kapo‘i eventually returned the eggs. In return, the owl became his *‘aumakua* (deified ancestor) and instructed him to build a *heiau* named Mānoa. Kapo‘i built the *heiau*, placed some bananas on the altar as a sacrifice, and set the *kapu* days for its dedication. The king of O‘ahu, Kākuhihewa, who was building his own *heiau*, had made a law that if any man among his people erected a *heiau* and set the *kapu* before him, that man should die. Kapo‘i was seized and taken to the *heiau* of Kūpalaha at Waikīkī. Kapo‘i’s *‘aumakua* asked for aid from the king of the owls at Pu‘u Pueo in Mānoa, who gathered all of the owls of the islands. They flew to Kūpalaha and battled the king’s men, who finally surrendered: “The owls scratched at the eyes and noses of the men and befouled them with excrement” (Kamakau 1991:23). From this time, Hawaiians considered the owl a powerful *akua* (god, divine). Because of this battle, the Hawaiians name the area Kukaeunahiokapueo, which means, “the confused noise of owls rising in masses” (Westervelt 1963:135-137; Thrum 1998:200-202).

3.3.5 Huanuikalala‘ila‘i

Kewalo was the birthplace of Huanuikalala‘ila‘i, a chief famous for his love of cultivation at Kewalo and his care for the people (Kamakau 1991:24). An *oli* recounted by Kamakau (1991) captures the significance of Kewalo:

‘O Hua-a-Kamapau ke ‘li‘i	Hua-a-Kamapau the chief
O Honolulu o Waikīkī	O Honolulu, of Waikīkī
I hanau no la i kahua la i Kewalo,	Was born at Kewalo,
‘O Kālia la kahua	Kālia was the place [the site]
O Makiki la ke ēwe,	At Makiki the placenta,
I Kānelā‘au i Kahehuna ke piko,	At Kānelā‘au at Kahehuna the navel cord,
I Kalo i Pauoa ka ‘a‘a;	At Kalo at Pauoa the caul;
I uka i Kaho‘iwai i	Upland at Kaho‘iwai, at

Kanaloaho‘okau . . .	Kanaloaho‘okau . . .

[Kamakau 1991:24]

Kamakau (1991) recorded a traditional *wānana* (prophecy) that mentions the chief Huanuikalala‘ila‘i of Pu‘ukea Heiau:

[Ka makaua ua kahi o ‘Ewa]	[The increasing ‘first rain’ of ‘Ewa]
Ua puni ka i‘a o Mokumoa,	Overcomes the fish of Mokumoa,
Ua kau i‘a ka nene;	Washes up fish to the nene plants;
Ua ha‘a kalo ha‘a nu;	Lays low the taro as it patters down;
Ha‘a ka i‘a o Kewalo,	Lays low the fish of Kewalo,
Ha‘a na ‘ualu o Pahua,	Lays low the sweet potatoes of Pahua,
Ha‘a ka mahiki i Pu‘ukea,	Lays low the mahiki grass at Pu‘ukea,
Ha‘a ka unuunu i Pele‘ula,	Lays low the growing things at Pele‘ula
Ha‘a Makaaho i ke ala.	Lays low Makaaho [Makāho] in its path
E Kū e, ma ke kaha ka ua, e Kū,	O Kū, the rain goes along the edge [of the island], O Kū
[I ‘ai na ka i‘a o Maunalua] . . .	[‘Eating’ the fish of Maunalua] . . .

[Kamakau 1991:24-25]

The chant mentions the *mahiki* grass (seashore rush grass; *Sprorbolus virginicus*) of Pu‘ukea, a tufted rush found near the seashore. The term *mahiki* connotes several historical and contemporary meanings. With serious family discord, a *kupuna* (grandparent, ancestor) can contine with lines of inquiry of *ho‘oponopono* (family conference in which relationships are set right) to “peel off” layers of deeper feelings (Pukui et al. 1972:228). In a deeper Hawaiian past, skilled *kāhuna* (priests) formely exorcised malicious spirits from the afflicted in an exorcist ritual with the aid of *mahiki* (Pukui and Elbert 1986:219). The use of this grass in a ritual may explain its association with a ceremonial *heiau*, or it may simply be that the Kukuluāe‘o coast was a good habitat and thus a favored place for healers to collect this type of grass.

3.3.6 Ka‘ākaukukui

Ka‘ākaukukui is briefly mentioned in the legend of Hi‘iaka, beloved sister of the Hawaiian volcano goddess, Pele. Hi‘iaka and her companions had been traveling around O‘ahu on the land trails, but decided to travel from Pu‘uloa (Pearl Harbor) to Waikīkī by canoe. At Pu‘uloa, Hi‘iaka met a party who were planning to travel to the house of the chiefess Pele‘ula in Waikīkī. Hi‘iaka recited a chant, telling the people that although they were going by land and she was going by sea they would meet again in Kou. One portion of the chant mentions the place Ka‘ākaukukui, with reference to a pool, possibly a reference to the salt ponds of the area:

A pehea lā au, e Honoka‘upu, ku‘u aloha	And what of me, O Honoka‘upu, my love
I ka welelau nalu kai o Uhi, o ‘Ōa	Upon the crest of the surf at Uhi and ‘Ōa
‘O nā makai ke ao (pō) o poina	Eyes in the living realm (night) of oblivion
Ma hea lā wau, e ke aloha lā	Where am I, O my love
‘O Kou ka papa	Kou is the coral flat

‘O Ka‘ākaukukui ka loko	Ka‘ākaukukui is the pool
‘O ka ‘alamihi a‘e nō	Some ‘alamihi indeed
‘O ka lā a pō iho	Wait all day until night
Hui aku i Kou nā maka.	Friends shall meet in Kou.

[Ho‘oulumāhiehie 2006a:297; Ho‘oulumāhiehie 2006b:277]

The exact meaning of the word *‘alamihi* within this chant is unknown. *‘Alamihi* is the name of a Native Hawaiian small black crab, a scavenger often associated in Hawaiian sayings with corpse-eating (Pukui and Elbert 1986:18). *Alamihi* can also mean “path [of] regret” (Pukui et al. 1974:9).

3.4 Heiau

The chief Huanuikalala‘ila‘i governed Pu‘ukea Heiau in the land section of Kukuluāe‘o, according to Kamakau (1991:24). Pu‘ukea literally means “white hill” and is also the name of a small land division within the *‘ili* of Kukuluāe‘o that is mentioned in at least two Land Commission cases, LCA 1502 (not awarded) and LCA 1504. LCA 1504 is located near the junction of Halekauwila and Cooke streets. It is common for a *heiau* to have the same name as the *‘ili* in which it is located, so it is possible Pu‘ukea Heiau was also near the junction of Halekauwila and Cooke streets. The majority of the house sites in the mid-nineteenth century in Kukuluāe‘o were located near Halekauwila and Queen streets, *mauka* of the low-lying coastal swamplands on higher, dry ground. It is possible the *heiau* platform or the area that it was built on was one of the few elevated locations in the flat, low-lying swamp that surrounded it, and thus gained the name *pu‘u kea*, or “white hill.”

3.5 Ala Hele

John Papa ‘Ī‘ī (1959) mentions some relevant place names while discussing early nineteenth-century trails in the Honolulu/Waikīkī area (Figure 5). The fact that a trail traversed this region characterized by ponds, marshlands, and *lo‘i* (irrigated terrace) suggests the trail, especially as it neared the coastline at Kālia, must have run on a sand berm raised above surrounding wetlands and coral flats. ‘Ī‘ī describes the middle trail (probably close to the current alignment of Queen Street) from Waikīkī to Honolulu:

> The trail from Kalia led to Kukuluaeo, then along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha. On the upper side of the trail was the place of Kinau, the father of Kekauonohi. [‘Ī‘ī 1959:89]

The grave site referred to is the Honuakaha Cemetery at the *makai* corner of Halekauwila and South streets, *makai* of Kawaiaha‘o Church. Honuakaha was a settlement located generally between Punchbowl and South streets, on the *makai* side of Queen Street. ‘Ī‘ī describes the lower, coastal trail from Honolulu towards Waikīkī: “From the makai side of Kaoaopa was a trail to the sea at Kakaako, where stood the homes of the fishermen. Below the trail lived Hewahewa and his fellow kahunas” (‘Ī‘ī 1959:91).

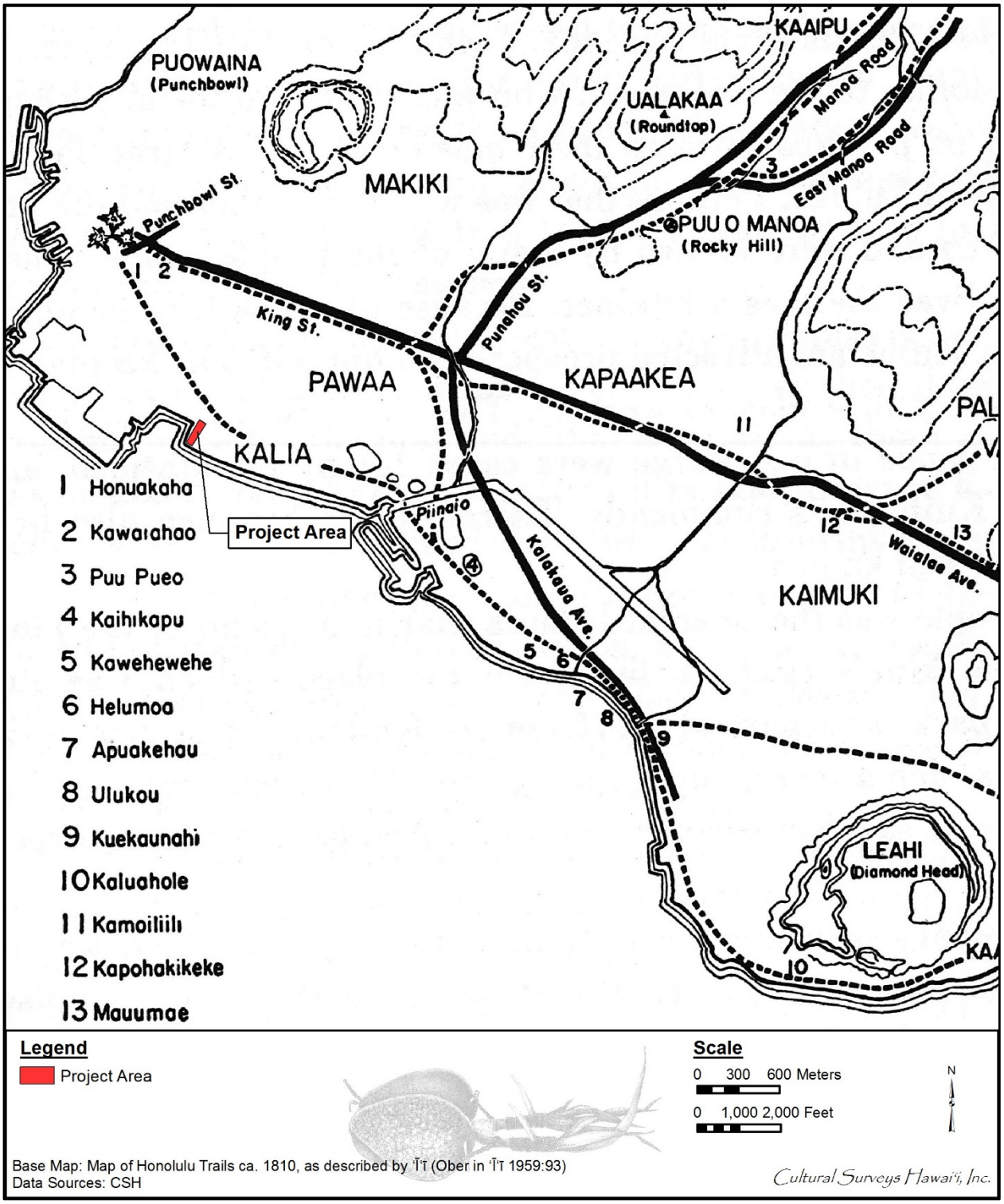

Figure 5. Portion of map of trails (ca. 1810) near the project area (‘Ī‘ī 1959:93)

3.6 Ilina

There is no documented evidence from archaeological surveys, historical records or oral traditions of pre-Contact *ilina* (graves) or *iwi kūpuna* (ancestral remains) within the project area. Indeed, the Kewalo Basin harbor was formerly a shallow reef that enclosed a deep section of water. However, human skeletal remains were discovered near the early coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002).

3.7 Agriculture and Aquaculture

Kaka‘ako (the modern district) is between two traditional centers of population, Kou (Honolulu) and Waikīkī. In Waikīkī, a system of irrigated taro *lo‘i* fed by streams descending from Makiki, Mānoa, and Pālolo valleys blanketed the plain, and networks of fishponds dotted the shoreline. Similarly, Kou—the area of downtown Honolulu surrounding the harbor—possessed shoreward fishponds and irrigated fields watered by perennial streams descending from Nu‘uanu and Pauoa valleys. Reverend Hiram Bingham, arriving in Honolulu-Kou in 1820, described a still predominantly Native Hawaiian environment—still a “village”—on the brink of western-induced transformations:

> We can anchor in the roadstead abreast of Honolulu village, on the south side of the island, about 17 miles from the eastern extremity. . . . Passing through the irregular village of some thousands of inhabitants, whose grass thatched habitations were mostly small and mean, while some were more spacious, we walked about a mile northwardly to the opening of the valley of Pauoa, then turning southeasterly, ascending to the top of Punchbowl Hill, an extinguished crater, whose base bounds the northeast part of the village or town. . . . Below us, on the south and west, spread the plain of Honolulu, having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of kalo in its various stages of growth, with its large green leaves, beautifully embossed on the silvery water, in which it flourishes. [Bingham 1847:92-93]

The Kaka‘ako district would have been in Bingham’s view as he stood atop “Punchbowl Hill” looking toward Waikīkī to the south. It would have comprised part of the area he describes as the “plain of Honolulu” with its “fishponds and salt making pools along the seashore.”

The pre-Contact shaping of Waikīkī, Honolulu, and the Kaka‘ako region is suggested by the 1817 map (Figure 6) by Otto von Kotzebue, commander of the Russian ship *Rurick*, who had visited O‘ahu the previous year. Kotzebue’s map also illustrates that the land between Pūowaina and the shoreline, which included the Kaka‘ako area, formed a “break” between the heavily populated and cultivated centers of Honolulu and Waikīkī. The area is characterized by fishponds (ovals), salt ponds (square clusters), trails connecting Honolulu and Waikīkī, and occasional taro *lo‘i* (rectangles) and habitation sites (trapezoids) along the main trail (later Queen Street). The depicted areas of population and habitation concentration probably reflect distortions caused by the post-Contact shift of Hawaiians to the area around Honolulu harbor—the only sheltered landing on O‘ahu and the center of increasing trade with visiting foreign vessels. This settlement pattern of fish and salt pans near the shore and habitations clustered around the *mauka* boundary of the Kaka‘ako area near Queen and King streets, is even more evident in the 1855 LaPasse map of Honolulu (Figure 7).

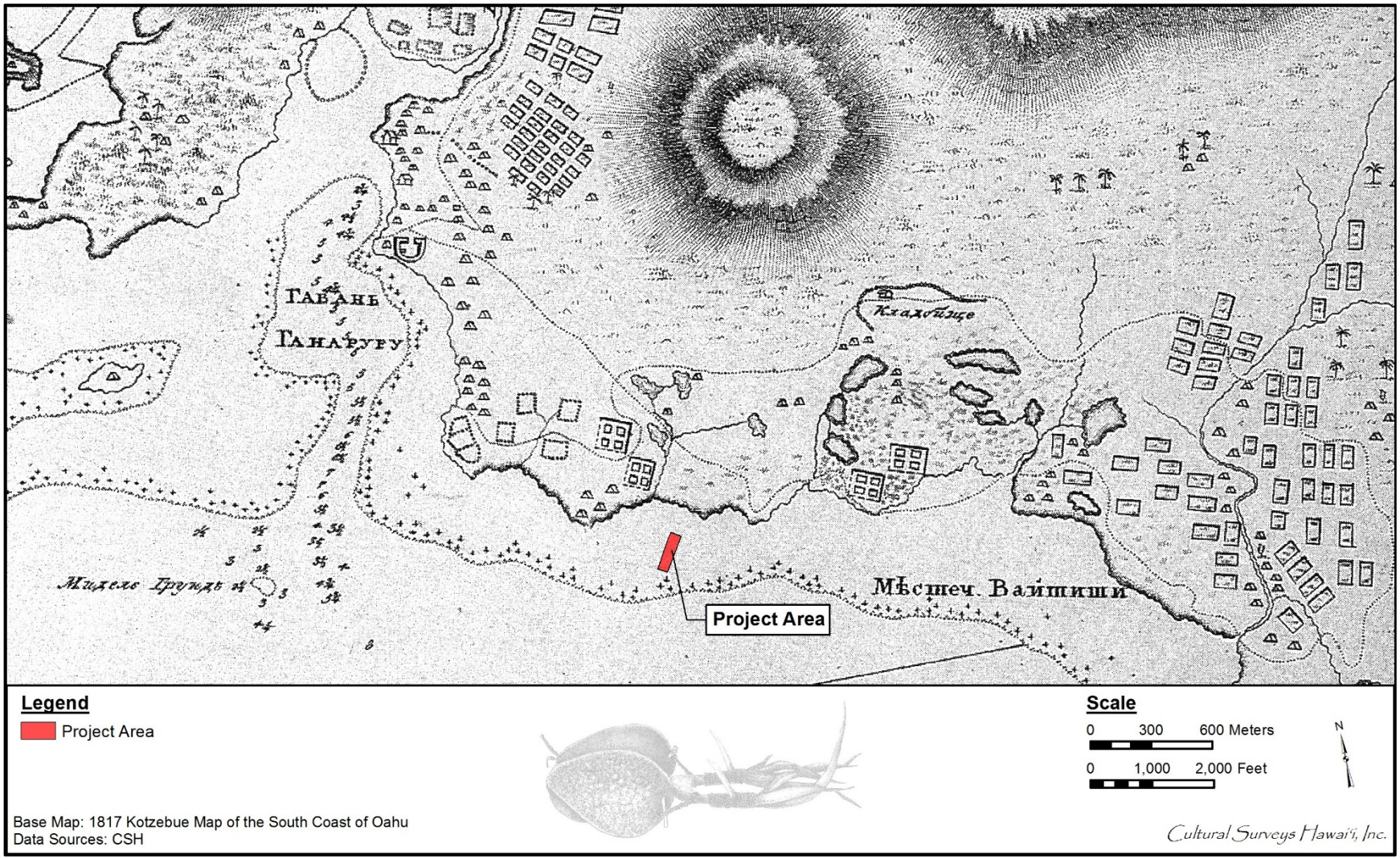

Figure 6. Portion of 1817 map by Otto von Kotzebue, commander of the Russian ship *Rurick*, showing fishponds and salt pans in the Kaka‘ako area (map reprinted in Fitzpatrick 1986:48-49)

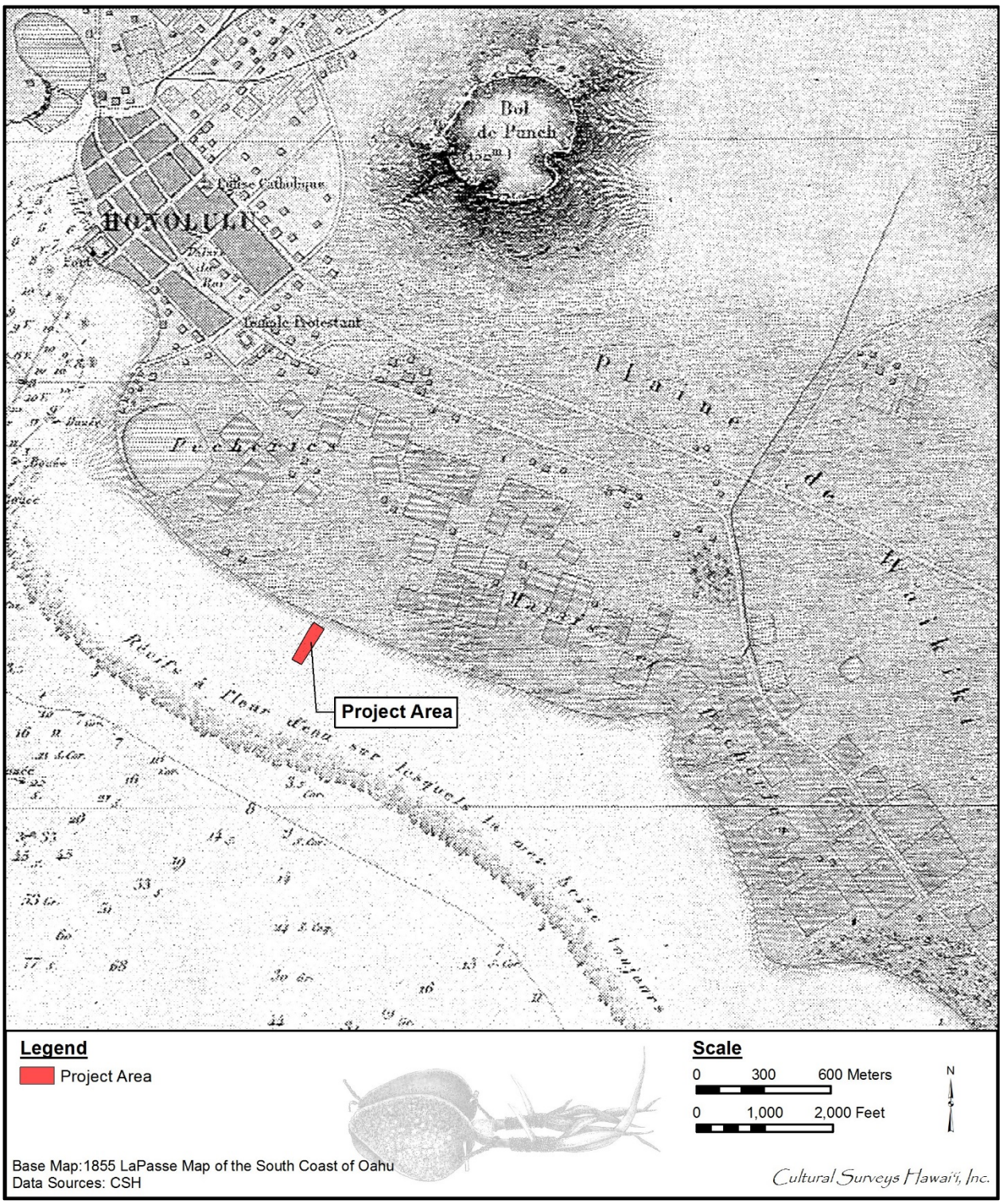

Figure 7. Portion of 1855 map of Honolulu by Lt. Joseph de LaPasse of the French vessel, *L'Eurydice*; project area is southeast of an area labeled "*Pecheries*" ("Fishponds") (map reprinted in Fitzpatrick 1986:82-83)

Section 4 Historical Background

4.1 Overview

The Kaka‘ako area continued to remain outside Waikīkī and Honolulu during the post-Contact era. It served as a place of the dying and the dead, the trash and the wasteland, and the poor and immigrant; however, it also represents the birth of the modern centers of Waikīkī and Honolulu (Griffin et al. 1987:73).

4.2 Mid-1800s and the Māhele

The Organic Acts of 1845 and 1846 initiated the process of the Māhele—the division of Hawaiian lands—that introduced private property into Hawaiian society. In 1848, the Crown and the *ali‘i* (chief) received their land titles. *Kuleana* (Native land rights) awards to commoners for individual parcels within the *ahupua‘a* were subsequently granted in 1850. The crown lands were considered the private lands of the monarch, and many lands were sold or mortgaged during the reigns of Kamehameha III and IV to settle debts to foreigners. To end this practice, the Crown lands were made inalienable in 1865, and their dispensation was regulated by a Board of Commissioners of Crown Lands, which effectively put them under the administrative control of foreign-born residents (Kame‘eleihiwa 1992:310). Before the passage of the Act of January 3, 1865, which made Crown Lands inalienable, Kamehameha III and his successors did as they pleased with the Crown Lands, selling, leasing, and mortgaging them at will (Chinen 1958:27).

In 1850, the Privy Council passed resolutions that affirmed the rights of the commoners or native tenants. To apply for fee-simple title to their lands, native tenants were required to file their claim with the Land Commission within the specified time period of February 1846 to 14 February 1848. The Kuleana Act of 1850 confirmed and protected the rights of native tenants. Under this act, the claimant was required to have two witnesses who could testify they knew the claimant and the boundaries of the land, knew that the claimant had lived on the land for a minimum of two years, and knew that no one had challenged the claim. The land also had to be surveyed.

Not everyone who was eligible to apply for *kuleana* lands did so and, likewise, not all claims were awarded. Some claimants failed to follow through and come before the Land Commission, some did not produce two witnesses, and some did not get their land surveyed. For whatever reason, out of the potential 2,500,000 acres of Crown and Government lands “less than 30,000 acres of land were awarded to the native tenants” (Chinen 1958:31).

Among the first written descriptions of the Kaka‘ako area by Hawaiians are the testimonies recorded during the 1840s and 1850s in documents associated with LCAs and awardees of the Māhele. According to LCA records, traditional Hawaiian usage of the region and its environs may have been confined to salt making and aquaculture, with some wetland agriculture in those areas *mauka* or toward Waikīkī at the very limits of the field system descending from Makiki and Mānoa valleys. The testimonies indicate that Hawaiians lived and worked in the area before the nineteenth century. The LCA records also reveal that midway through the nineteenth century, taro cultivation, traditional salt making, and fishpond farming activities continued within the Kewalo/Kukuluāe‘o area. Due to the urbanization of Honolulu from the end of the nineteenth century, developers

destroyed or buried the land features supporting these activities. The LCA records, historic maps, and archival photographs document more precisely traditional Hawaiian settlement and subsequent historic land usage near the present project area. Because the project area is situated on aritifical land created by Fill, there are no LCAs within the project area. Table 1 is a list of LCA awards in the Kaka‘ako area based partly on the Waihona ‘Aina database (Waihona ‘Aina 2000).

In the western portion of the Kaka‘ako district, the *‘ili* of Ka‘ākaukukui (LCA 7713) was awarded to Victoria Kamāmalu, sister of Kamehameha IV and Kamehameha V. There were no awards to commoners in this *‘ili*, which seems to have consisted entirely of land used for salt making. Early historic maps show no residences in this area until the twentieth century. The largest settlement in the vicinity was the village of Honuakaha, at the corner of Punchbowl and King streets. The government awarded a large number of house lots to commoners in this area; late nineteenth century and early twentieth century maps always show a cluster of houses in this area.

The *‘ili* of Pualoalo**,** or Puaaloalo (10605-A), was awarded to Iona (Jonah) Pi‘ikoi. Pi‘ikoi was an *ali‘i*, a retainer of Kauikeaouli (Kamehameha III), and held several government posts. It consisted of three *lele* lands, two in Nu‘uanu Valley and a small parcel near the Kaka‘ako Salt Works.

The *‘ili* of Pu‘unui, which also had several *lele* lands, included the large rectangular section *mauka* the Kaka‘ako Salt Works. The upper portion was part of LCA 677 awarded to Matio Kekūanao‘a, a high *ali‘i* who was a close friend to Kamehameha II and was married to Kīna‘u, the daughter of Kamehameha I. The lower portion was awarded to Victoria Kamāmalu as part of LCA 7713.

The *‘ili* of Kukuluāe‘o was originally awarded to the king as LCA 387, but he returned it to the government. The *‘ili* was then awarded to the American Board of Commissioners for Foreign Missions (ABCFM). Initially this land was associated with Punahou School in Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiaha‘o Church in 1829 (DeLeon 1978:3). In the Māhele, however, this land became “detached” from the Mānoa award and was instead given to the pastor of the Kawaiaha‘o Church, as noted in a history of the Punahou School (Foster 1991).

Kolowalu, a triangular section of land between Kukuluāe‘o and Kewalo, was awarded to the government during the Māhele. This small land was probably a *lele*. Mānoa has such a division, with an *‘ili* called Kolowalu in the uplands and an *‘ili* called Kolowalu in the taro lands. The Kolowalu fishpond was probably the coastal portion of this *‘ili*. It was not a separate award in the Māhele, but was given in 1878 as a grant (Grant 3294) to Ka‘aua and Kalae, long-time caretakers of the land.

The seventh *‘āpana* (lot) of the *‘ili* of Kewalo (LCA 10605) was awarded to Kamake‘e Pi‘ikoi, wife of Jonah Pi‘ikoi (awardee of Pualoalo ‘Ili). The husband and wife shared the award (Kame‘eleihiwa 1992:269). Kewalo was a large 270.84-acre land section extending from Kawaiaha‘o Church to Sheridan Street. This land section had numerous large fishponds, which were awarded as part of the claim to Pi‘ikoi.The LCA parcels were described as house lots, fishponds, salt ponds or salt lands, *kula* (plain, field) or some combination of the above. The 1884 map also shows the location of buildings; these may not always be houses. The map illustrates that

Table 1. LCAs in the Kaka‘ako District

LCA	Awardee	*‘Ili*	Comments
2	Robert Kilday	Pualoalo	Two fishponds in Kukuluāe‘o
200	Kaina, M.	Kawaiaha‘o; Koula	House lot
272	Joseph Booth	Koula	Royal Patent 306 to Joseph Booth
387	ABCFM	Beretania St, Punahou, Kawaiaha‘o, Kukuluaeo	Salt lands attached to Punahou
569	Puniwai	King St	House lot with salt beds at *makai* end
603	Hoonaulu	Waiahao; King St	House lot
673	Naiwi	Kawaiaha‘o	House lot
677	Kekūanao‘a for Kamāmalu	Honuakaha	Three lots on Queen St, salt pans on *makai* side; Parcel Two included Honuakaha guesthouse and cemetery
1503	Puaa	Kukuluaeo, Kewalo	House lot and four fishponds
1504	Pahika	Kukuluaeo, Kewalo	House lot, fishpond, salt bed
1903	Lolohi	Kukuluaeo	Two salt beds, 15 drains, two *poho kai* (hollows), one salt *kula*
3169	Koalele	Kewalo	*Makai* ponds
7713	V. Kamāmalu,	Honolulu	Retained
9549	Kaholomoku	Kukuluae‘e	Fishpond and four salt pans on east side
10463	Napela	Kukuluae‘e	House site, two ponds, one ditch, salt lands
10605	Pi‘ikoi, Iona	Kawelo, Puaaloalo	Ponds; four structures

people used the coastal strip mainly for salt collection; only a few house lots were nearby on Halekauwila and Queen streets. Fishponds were scattered throughout the area, with some modified into long, narrow ponds probably used to raise fish and ducks. The main habitation areas were adjacent to King Street on the *mauka* border or Kaka‘ako, and in Honuakaha Village at the northwestern border of the Kaka‘ako area.

Large portions of the Kukuluāe‘o and Kewalo sections of the Kaka‘ako district were once part of the Ward Estate. This land was first awarded as LCA 272 to Joseph Booth. Joseph Booth was an early English resident of the Hawaiian Islands who operated a saloon and hotel in Honolulu, known at the time of the Māhele as the Eagle Tavern. He was granted lands in downtown Honolulu, Kewalo Uka (Pacific Heights area), the *‘ili* of Kapuni, and an area with “Three fish ponds, and a part of the plain near the road leading to Waikiki.” Little information on these three fishponds is given in the LCA testimony, but Royal Patent No. 306 for these lands mentions one known as “the large fishpond” or “long fishpond,” which had two huts beside it. The owners later modified this pond into the “lagoon” on the Ward Estate. Figure 8 shows this long T-shaped fishpond and three “old fishponds” that seem to be overgrown with vegetation.

Curtis Perry Ward, a native of Kentucky, came to the Hawaiian Islands in 1853 and soon established a livery and draying business, moving goods from the harbor to Honolulu Town and loading goods at the docks for the whaling and shipping industries. In 1865, he married Victoria Robinson, who was descended from the Hawaiian *ali‘i* and early French and British residents. For his new family, Ward purchased at auction the 12-acre Kewalo estate of Joseph Booth, Royal Patent 306, and additional contiguous lands in the Kō‘ula area in 1870. This constituted the *mauka* portion of the “Old Plantation” from Thomas Square on King Street to the *makai* border at Waimanu Street. A few years later (but before 1875), Ward added to his property with the purchase of 77 acres and 3,000 ft of ocean frontage in the *‘ili* of Kukuluāe‘o, *makai* of Queen Street.

Mr. Ward built a house in the southern style (Figure 9) at the *mauka* end of the estate near King Street, and modified the fishponds into a long “lagoon” (Figure 10). After the death of her husband in 1882, Victoria Ward derived much of her income from “eggs, bananas, firewood, *‘awa* (kava), taro leaf, *makaloa* (a kind of grass), chickens, fish, hay, pigs, salt, white sand, *mānienie* (a kind of grass), hides, butter, squid, and horses” collected from her lands (Hustace 2000:47). Victoria Ward raised her seven daughters on this estate. In 1957, the City and County of Honolulu purchased the *mauka* portion of the estate, razed the old homestead, filled in the ponds and the long lagoon, and constructed the new Blaisdell Civic Center (Hustace 2000:67, 77).

4.3 Kaka‘ako Salt Works and the Salt Pans of Kewalo and Kukuluāe‘o

As noted in the Land Commission documents, much of the land in Kewalo and Kukuluāe‘o was used to produce salt (Figure 11 and Figure 12). The Hawaiians used *pa‘akai* (salt) to flavor food, to preserve fish by salting, for medicines, and for ceremonial purposes. Kamakau (1992:409) reported “The king and Isaac of Pu‘uloa are getting rich by running the salt water into patches and trading salt with other islands.” Thrum describes the how the ancient method of earth saltpans led to the salt works of Kamehameha IV in Kaka‘ako (Thrum 1924:116).

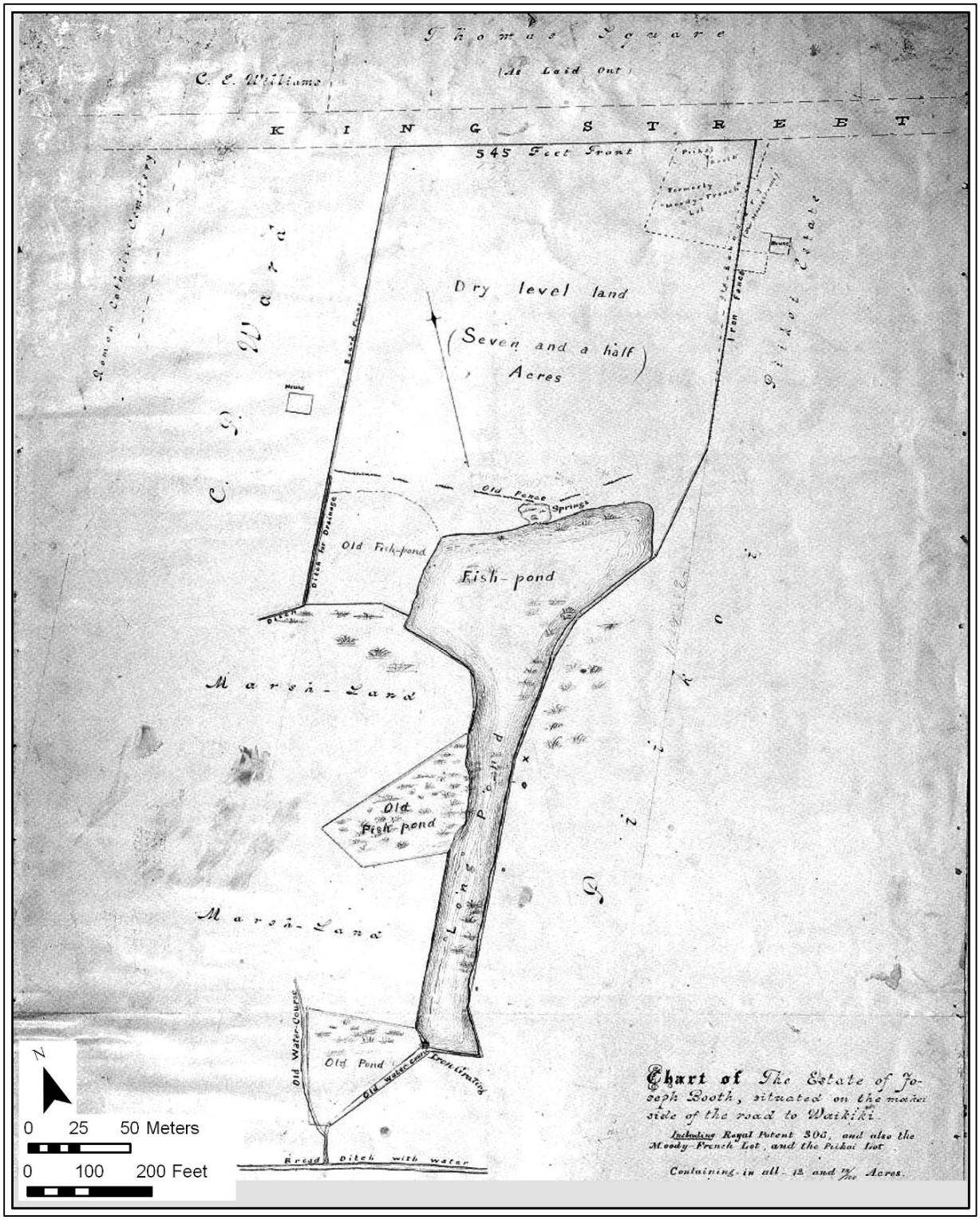

Figure 8. Estate of Joseph Booth, Royal Patent 206, LCA 272; later part of the Ward Estate (map reprinted in Hustace 2000:40)

Figure 9. 1880s photograph of the Old Plantation House, with the Ward family's daughters and friends gathered on the *lanai* (photograph reprinted in Hustace 2000:46)

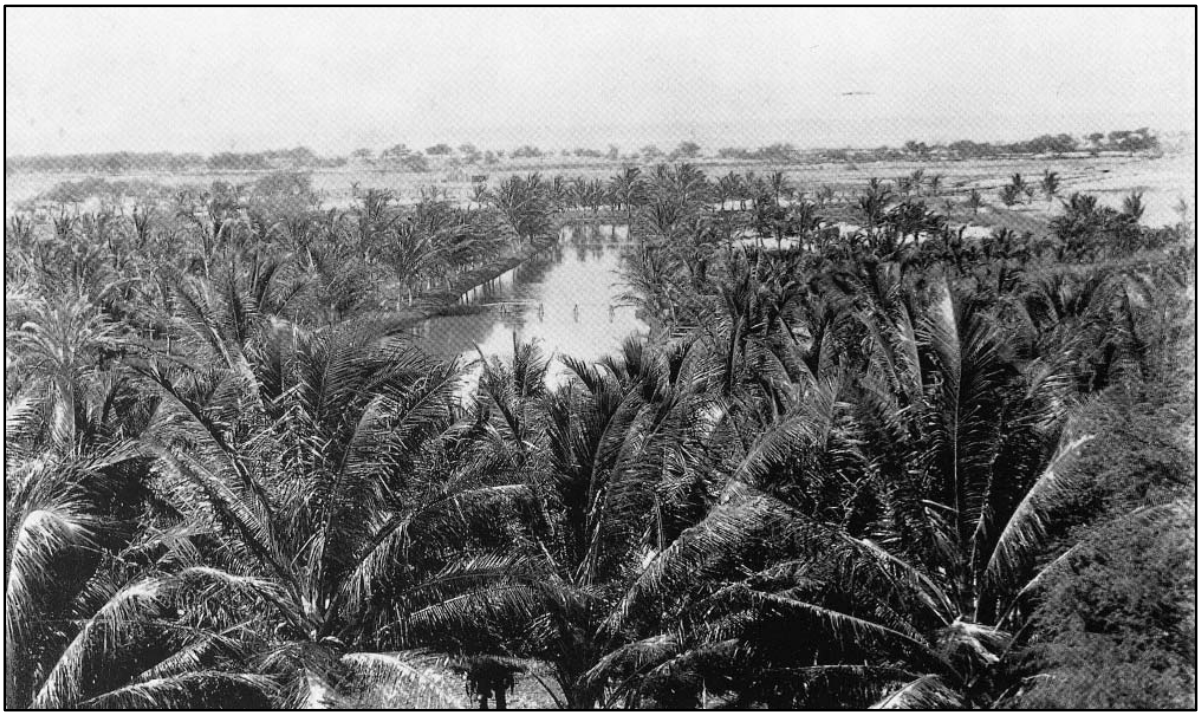

Figure 10. 1888 photograph of the “long lagoon” looking from the cupola of the Ward house towards the Kukuluāe‘o marshlands and the ocean (photograph reprinted in Hustace 2000:2)

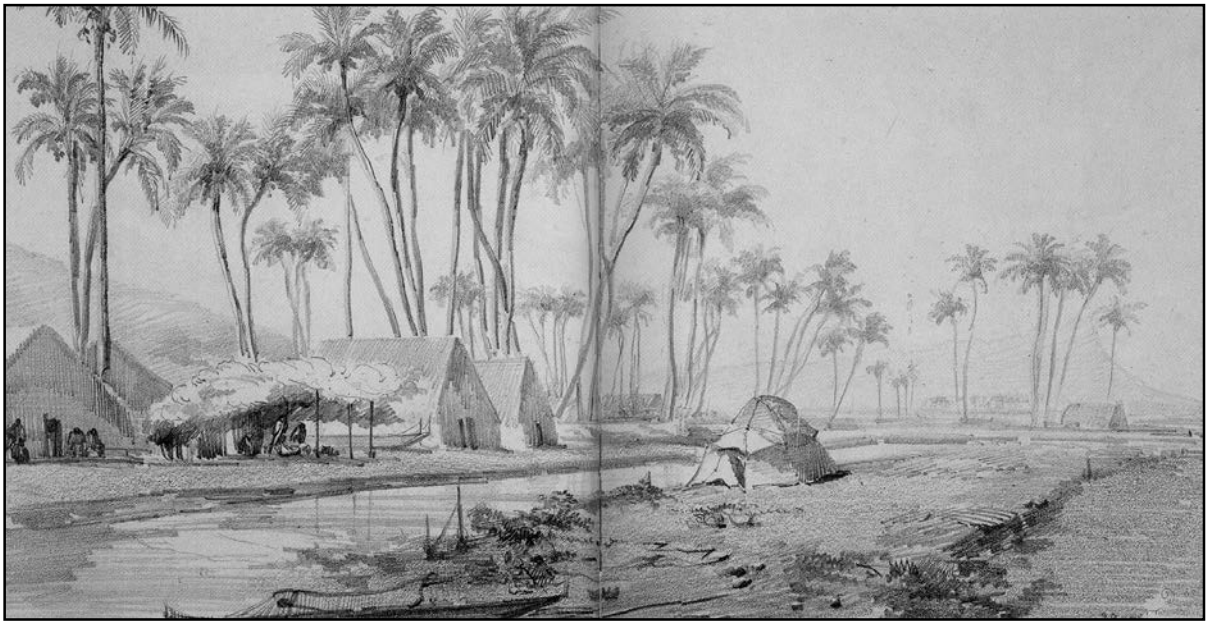

Figure 11. 1838 sketch of “Honolulu Salt Pan, near Kaka‘ako” drawn by a French visitor, Auguste Borget (original sketch at Peabody Essex Museum, Salem, Massachusetts; reproduced in Grant et al. 2000:64-65)

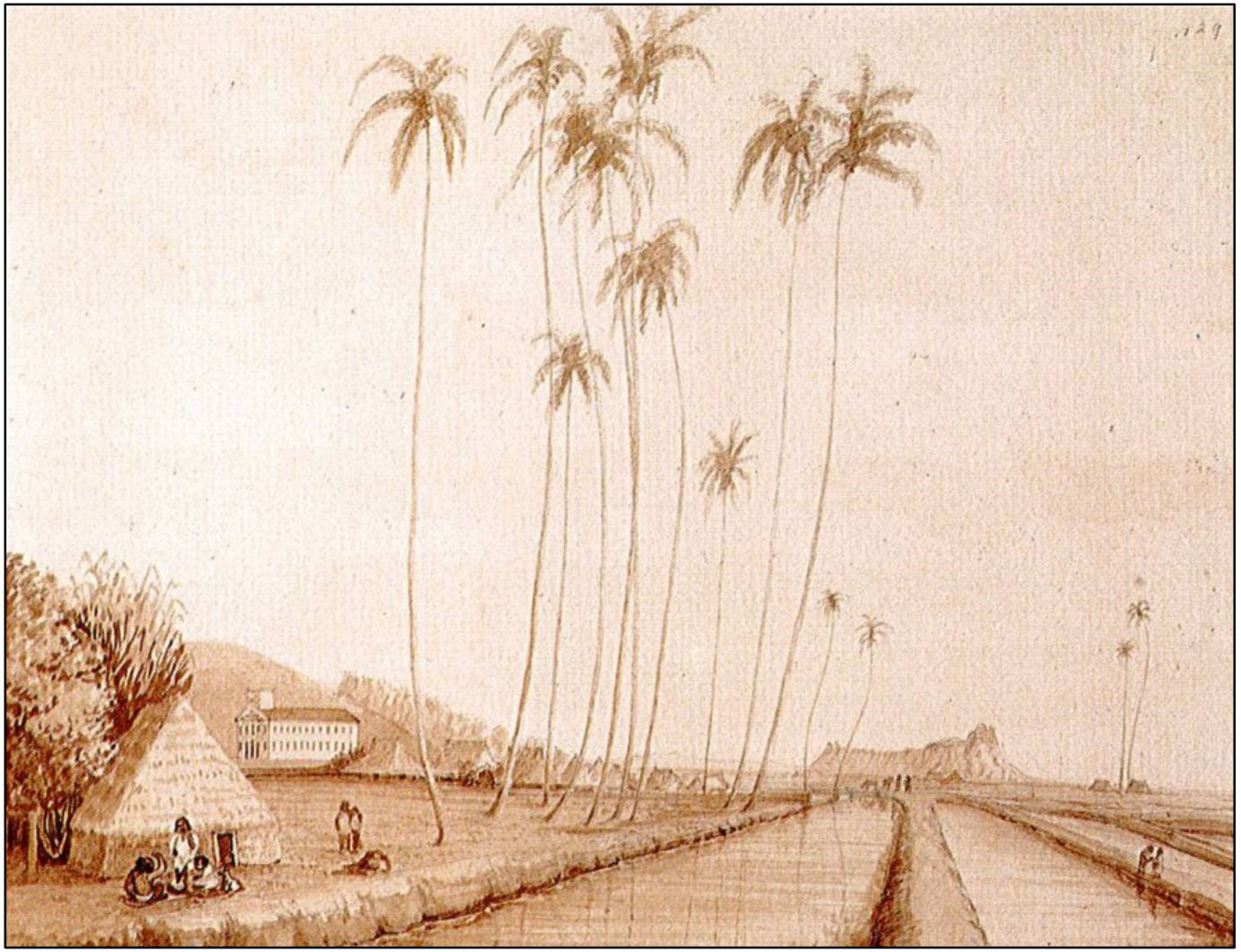

Figure 12. 1845 sketch of “Native Church [Kawaiaha‘o Church], Oahu, from the Old Salt Pans,” drawn by John B. Dale, from the U.S. Exploring Expedition led by Lt. Charles Wilkes (J. Welles Henderson Collection, reproduced in Forbes 1992:126)

In the testimony for LCA 1903, Lolopi claimed four separate types of salt features: the ponds near the shore that fill with salt water at high tide (*ālia*); the drains where the salt water is transferred to smaller clay-lined or leaf-lined channels (*ho‘oliu*); the natural depressions (or modified depressions) in the rocks along the shore where salt formed naturally (*poho kai*); and the land that could probably not be used for agriculture as it was impregnated with salt (*kula*).

The export of salt declined in the late nineteenth century (Thrum 1924:116). By 1916, only one salt works, the Honolulu Salt Company, was still in operation. Salt continued to be manufactured for local use; the Kaka‘ako Salt Works appears on maps as late as 1891 and a page in Victoria Ward’s ledger for 1883 notes a yearly income of $651.50 received from her “Salt Lands” in Kukuluāe‘o (Hustace 2000:50). A 1902 photograph (Figure 13) shows the extensive salt beds of the Kewalo area.

By 1901, government agencies reported that most of the fishponds and salt pans *makai* of the Ward “Old Plantation” area were abandoned. In that year, the Hawai‘i Legislature proposed to build a ditch to drain away the “foul and filthy water that overflows that district at the present time.”

> The district makai of King St. and the Catholic Cemetery, Ewa of Mrs. Ward’s (the Old Plantation), *mauka* of Clayton St., and Waikiki of the land from King St., leading to the Hoomananaauao Church, consists of six large abandoned fish ponds and a large number of smaller ones, all in filthy condition, fed by springs and flowing into Peck’s ditches. Just makai of these ponds, at the end of Clayton street, next to Mr. Ward’s, is Peck’s place. An artesian well flushing the wash houses flows into two foul ditches, thence to the big pond which is Waikiki of what used to be Cyclomere and next to Mrs. Ward’s line [ditch] extending down to Waimanu St. The rear portion of Mrs. Ward’s property down to Waimanu St. used to be fish ponds all connecting to the sea by a ditch which is fed by an artesian well. These ponds, with the exception of three, are abandoned. [Hawai‘i Legislature 1901:185]

4.4 Human and Animal Quarantine

During an 1853 smallpox epidemic, patients were isolated at a temporary quarantine camp in Kaka‘ako (Thrum 1897:98), and victims of the disease were buried at the Honuakaha Cemetery, near the junction of Quinn and South streets (Griffin et al. 1987:13). Hansen’s disease, commonly known as leprosy, was first reported in 1840 and definitively identified in 1853. In 1865, a receiving hospital in Kalihi was set up to examine suspected lepers. If the disease was confirmed, the patients were forcibly exiled to the Kalaupapa colony on Moloka‘i. In 1881, a branch hospital or receiving station for cases of Hansen’s Disease was opened in Kaka‘ako, in a block now bound by Ala Moana, Auahi, Coral, and Keawe streets, under the direction of Saint Marianne Cope (Griffin et al. 1987:55) (Figure 14). In 1888, the Hawai‘i Board of Health decided to close the branch, moving the receiving station to Kalihi, and determined that “The buildings at Kakakao should be entirely removed” (Hanley and Bushnell 1980:275). However, Thrum (1897:101) reports that victims of the cholera epidemic of 1895 were treated at the Kaka‘ako Hospital, so the buildings must have remained or been rebuilt. In 1899, the first case of bubonic plague was identified in Hawai‘i, and spread rapidly through the crowded tenements of Chinatown. The government decided that the best way to eradicate the disease was through “controlled burning”

Figure 13. 1902 photograph of Kewalo Brine Basins; the Kaka‘ako salt works may have extended back to pre-Contact times and are shown here going strong in 1902 (Scott 1968:579)

Figure 14. Statue of St. Marianne Cope at Kewalo Basin Park; St. Marianne was known for her loving care of Hansen’s disease patients (CSH 2010)

of the wooden buildings. Infected patients were moved to a quarantine camp at Kaka‘ako. Before new immigrants could travel to their new homes at the sugar plantations, doctors first examined them for disease. The Immigration Station was established in 1893 on Allen Street near downtown Honolulu, but it was moved to the Kaka‘ako area in 1905. The station was built on mud flats, resting on a pile foundation; it was connected to the shoreline by two bridges (UH 1978:A-11).

Kaka‘ako not only acted as a land set aside for human quarantine, but also for animal quarantine. The first animal quarantine station in the Hawaiian Islands was established in 1905. A veterinarian checked in all imported animals, looking for diseases such as cholera in hogs and tuberculosis in cattle. The workers added kennels to the facility in 1909 for the quarantine of all dogs brought to the Islands. The animal quarantine station was on land wrested from the Ward Estate, in the area between Kamake‘e and Pi‘ikoi streets. The 1913 report has a photograph of the “lethal chamber” where gas was used to euthanize “mangy and homeless” dogs (Hawaii Board of Commissioners for Forestry and Agriculture 1913:214). It is probable the government also buried euthanized dogs at the station. The Ward family also donated some of their land to the society to establish the first animal shelter. This land was at the corner of Pohukaina and Kō‘ula streets; the facility for “all homeless, hungry animals” was completed in 1925. The Humane Society moved to a new and larger facility in Mō‘ili‘ili in 1938 (Hawaiian Humane Society 1997:44, 53). As an area set apart for quarantine, other types of structures not suitable for construction near the center of town were built in Kaka‘ako, such as a pump house, a kerosene storage lot for kerosene used in government buildings, and a garbage incinerator for the daily disposal of the city’s refuse (UH 1978) (Figure 15).

4.5 Military Infrastructure

During the monarchy, the waterfront of Kaka‘ako was the location for a battery with three cannons used to salute visiting naval vessels, which responded with their own cannon salutes (Figure 16). Other saluting batteries were at the top of Punchbowl Crater and at the Honolulu Fort (Dukas 2004:163), and these were used until the overthrow of the monarchy in 1893 (Judd 1975:57).

After the United States’ annexation of the Islands in 1898, the U.S. Congress began to plan for the coastal defenses of their new territory. The major batteries were placed at Pearl Harbor and in Waikīkī, but a small reservation, named Fort Armstrong (Figure 17) was also set up on the Ka‘ākaukukui Reef as a station for the storage of underwater mines. In 1911, the Honolulu Rifle Association, and possibly other groups, used the flat, uninhabited Kaka‘ako lands near the coast as a rifle range. The militia probably chose this area for target practice based on the absence of any habitations in the area (Williford and McGovern 2003:15).

The fort saw some small action during World War I. The military authorities closed Honolulu Harbor between sunset and sunrise in October 1917. The steamer *Claudine,* which was sailing from Maui when the edict went into effect, sailed into Honolulu Harbor unknowingly after twilight. The coast artillery at Fort Armstrong shot a few shells across her bow, and the steamer quickly reversed her engines and went back out to sea until the following morning, when she could safely and legally come to shore (Thomas 1983:147). During the Japanese attack on 7 December 1941, the fort escaped relatively unscathed; only one motor pool structure was hit. Antiaircraft shells were fired from the fort, but were ineffective; at least one hit the town rather

R. J. Baker

DAY AND NIGHT—A COLUMN OF SMOKE

"The desert waterfront of Honolulu where there is a perpetual volcano," described this forsaken stretch of scrub covered coral wasteland between what would become the Ala Wai and Kewalo Basin. In the center of this desolation stood a refuse dump where, day and night, columns of smoke rose into the Hawaiian sky.

Figure 15. 1921 photograph of a City worker supervising open burning of trash understood to be on the west side of Kewalo Basin (original photograph by Ray Jerome Baker, reprinted in Scott 1968:578)

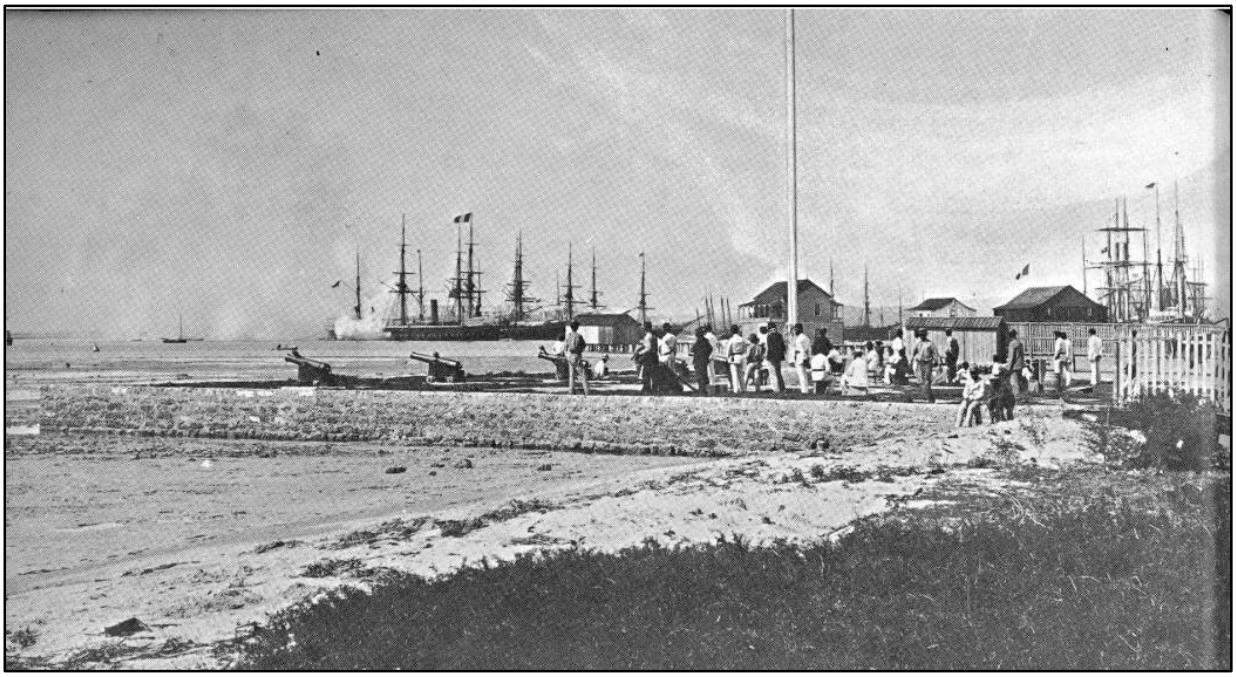

Figure 16. 1887 photograph of the Kaka‘ako Saluting Battery and flagstaff (original photograph taken by Karl Kortum and archived at the San Francisco Maritime Museum; reprinted in Scott 1968:176)

Figure 17. Colorized postcard (ca. 1911-1920) of Fort Armstrong (original black and white photograph at Hawai‘i State Archives; reprinted in Wisniewski 1984:18)

than any aircraft (Richardson 2005:34). In the 1950s, the federal government returned most of Fort Armstrong to the Territory of Hawai‘i, which used the area to expand the shipping piers of the harbor.

4.6 The McFarlane Tuna Cannery and the Sampan Fleet

In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo for the aim of “harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper” (Thrum 1920:147). As the area chosen for the harbor area was adjacent to several lumber yards, the basin was initially made to provide docking for lumber schooners, but by the time the wharf was completed in 1926, this import business had faded, so the harbor was used mainly by commercial fishermen. The dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate in the coastal area east of Ward Avenue (Hawai‘i Governor 1920:52). In 1941, the basin was dredged and expanded to its current 55 acres. In 1955, dredged material was placed along the *makai* side to form an 8-acre land section protected by a revetment. Figure 18 to Figure 21 depict these changes made to create the harbor and park.

At the dawn of the twentieth century, a single Japanese-style fishing vessel entered Hawaiian waters. Hans Van Tilburg describes the story of how this singular event led to the commercial *aku* fishing industry in Hawai‘i (Van Tilburg 2007:41–42). Mr. Nakasugi brought with him on the deck of the steamer a traditional 34-ft Japanese sailing *sampan* (Figure 22). The term *sampan*, like junk and dhow, vaguely connotes a type of vessel used by several Asian cultures. Mr. Nakasugi’s *sampan* featured a wooden hull and a light square-sailed rig, reminiscent of older Japanese fishing vessels with distinctive keels, planking, and bulkheads.

With continuing labor migration, Japanese vessels and their sailors found employment in the offshore fishing industry, soon unloading large catches of *ahi* and *aku* on the docks of Hawaiian shores. The Japanese fishermen opened the commercial tuna industry (Figure 23) in Hawai‘i in conjunction with the innovation of modern packing plants, and this enabled the expansion and modernization of the fishing fleet (Van Tilburg 2007:42). The small boat harbor of Kewalo Basin was developed in the 1920s to prevent the growing *aku* fishing fleet from overcrowding Honolulu Harbor (Kewalo Basin Harbor 2009). About 50 *sampan* used to congregate in the harbor near the River Street fish markets. The Hawaiian Dredging Company completed the Kewalo Basin wharf and channel in 1925, and all ships of the *aku* fishing fleet relocated to Kewalo Basin by 1930. The McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard in 1929 (corner of Cooke and Ala Moana) for their fishermen’s *sampan* fleet and a new tuna cannery at the basin in 1933 (Clark 1977:64). The *aku* and *ahi* from the *sampan* fleet was processed as tuna in tins:

> The sixty-five sampan belonging to the company tie up at the company wharf and unload into steel-bottom slatted cars on a narrow gauge railway. Weighed in the cars, the fish are cleaned on a concrete floor and cooked, a ton or two at a time, in steam-jacketed cookers. After three hours in the cookers, it takes them ten hours to cool before they are stripped and sliced, oiled and sterilized, and cooled again. [Gessler 1937:185]

World War II severely impacted the *sampan* fishing industry. Economic sanctions limited the operating of *aku sampan* to certain hours in a few near-shore areas, and this devastated the fishing

Figure 18. 1927 Kaka‘ako Coast Aerial Photograph (UH SOEST) depicting the project area; note the project area is on reef as well as Ala Moana Beach Park; a channel is to the west of the project area acting as a harbor and the beach is immediately *makai* of the roadway

Figure 19. 1939-1941 Kaka‘ako Coast Aerial Photograph (U.S. Army Air Corps) depicting project area and Ala Moana Beach Park, which is now on fill land; note the beach has been extended with fill, the road into Ala Moana Beach Park cuts through the current project area, and an artificial channel spanning soutwest to southeast of the project area

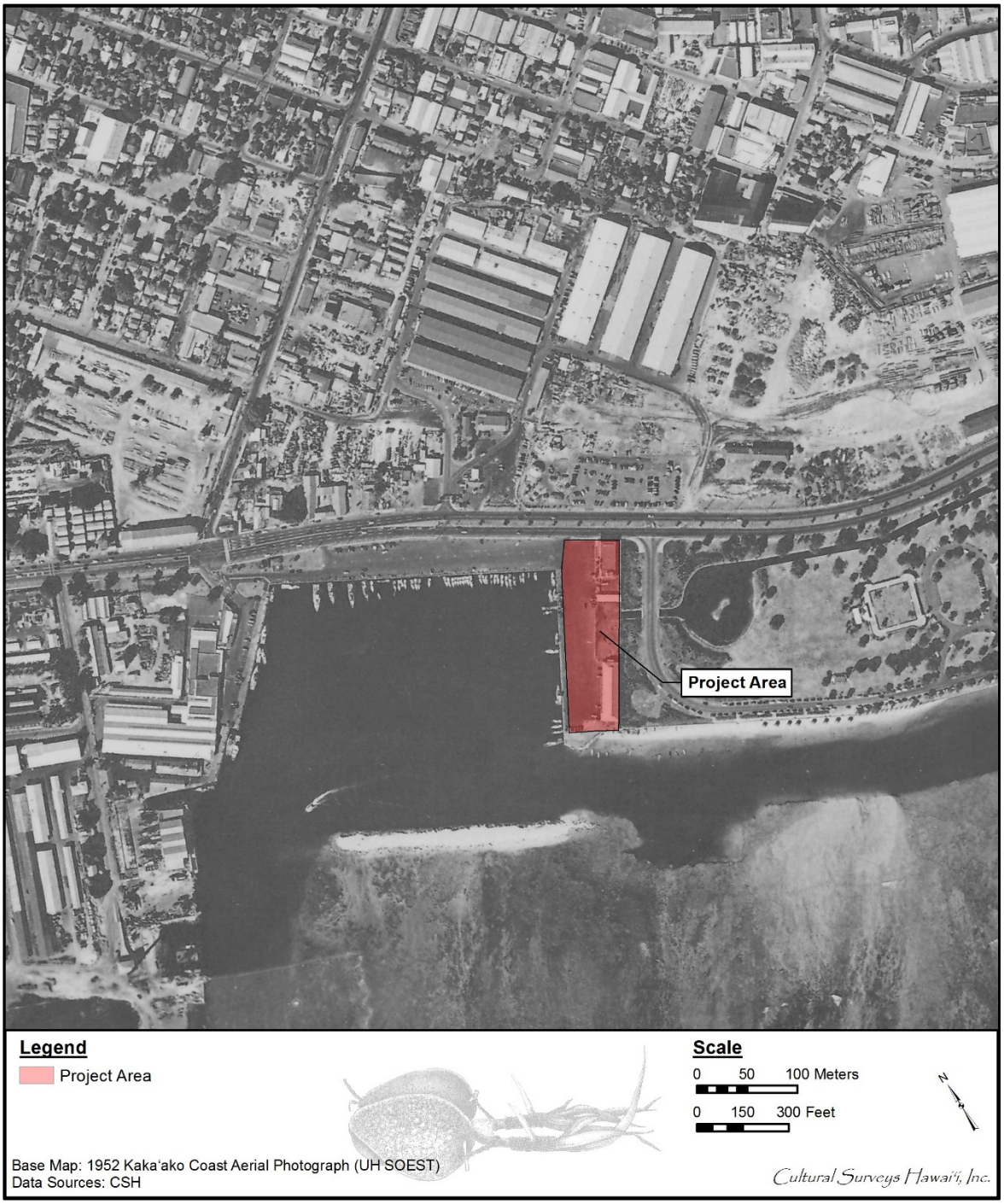

Figure 20. 1952 Kaka‘ako Coast Aerial Photograph (UH SOEST) with the project area; the road into Ala Moana Beach Park is now to the east of the project area; the Kewalo Basin Harbor area now consists of a parking lot; the channel spanning southwest to southeast has been dredged more

Figure 21. 1970 Kaka‘ako Coast Aerial Photograph (UH SOEST) with the project area; the project area consists of facilities and a parking lot; additional filling is evident to the southwest of the project area, which is Kewalo Basin Park today

Figure 22. Kewalo Basin with *sampans*, ca. 1940s (Hawai‘i State Archives)

Figure 23. Hawaiian Tuna Packers Cannery in Kaka‘ako, ca. 1930s photograph (Hawai‘i State Archives)

industry by reducing the annual yield by 99% in 1942. The government confiscated the *sampan* fleet in groundless fear that the mainly Japanese owners would use the boats for spying or sabotage. The blue paint of the *sampan* was covered with white, and the boats were converted for use as coastal watch vessels. The U.S. military converted the cannery into an assembly plant for aircraft auxiliary fuel tanks. The independent Japanese tuna fishermen in their *sampan* never recovered from the World War II confiscations. Wood shortages after the war prevented the construction of new boats and the cannery reopened at only a quarter of its former capacity. The tuna fish cannery closed in 1985 when the industry became unprofitable (Van Tilburg 2007:44–45).

4.7 Kaka‘ako and Kewalo Incinerators

In the early years of garbage disposal, all trash was dumped into low-lying ground or landfills, or burned in the open area. To reduce the volume of waste, plans were made to build incinerators, where “putrescible” (mainly animal and fish waste) trash could be burned, while non-animal material called “combustible” waste was still disposed of in the earlier method (Young 2005). Thomas Thrum reported on the first incinerator in the Kaka‘ako area in 1905:

> Early in the year was completed the long projected garbage crematory for the disposal, daily, of the city's refuse by a patent and sanitary process. It is located on the shore of Kakaako, adjoining the sewer pumping station; is two stories in height and built of brick. [Thrum 1906:177]
>
> The dredging of Honolulu harbor and its channel is completed as far as planned for the present, and excavations for the Alakea and Kinau slips finished, the material therefrom being used to fill in a large area of Kakaako and the flats in the vicinity of the sewer pumping station and garbage crematory. The amount of material removed by the Federal dredging was a million and a half cubic yards. [Thrum 1907:148–149]

For the incinerator, Thrum noted the following:

> The new station is built on piles on reclaimed land that is being filled in from the coral dredgings that is going on, and is gradually taking on a tropical appearance. . . . Adjoining its premises on the mauka side is the new building designed for the Planters’ Association for their labor bureau. [Thrum 1907:148–149]

In the early 1920s, trash was burned in the open at the Ala Moana Dump (landfill area *makai* of Ala Moana Boulevard). The Hawai‘i Public Works recommended that an incinerator should be built for the burning of “putrescible” waste. The Kewalo Incinerator (Incinerator Number 1) was built in the Italianate style at the intersection of Ahui and Olomehani streets in 1930 by the City and County of Honolulu (Figure 24). The facility was built to dispose of waste from the Ala Moana dump and the ash was used to fill the seawall in Ka‘ākaukukui in the late 1940s creating 29 additional acres of land adjacent to Fort Armstrong. It ceased operations in 1945 when a new incinerator was built on Ohe Street.

The building was used by the Marine Service Station in 1947. In the 1950s, the building was used by the Mitsuwa Kamaboko factory, which made *kamaboko*, a Japanese fishcake. In 1955, the adjacent property was purchased by the M. Otani Company, who built storehouses for the Smoked

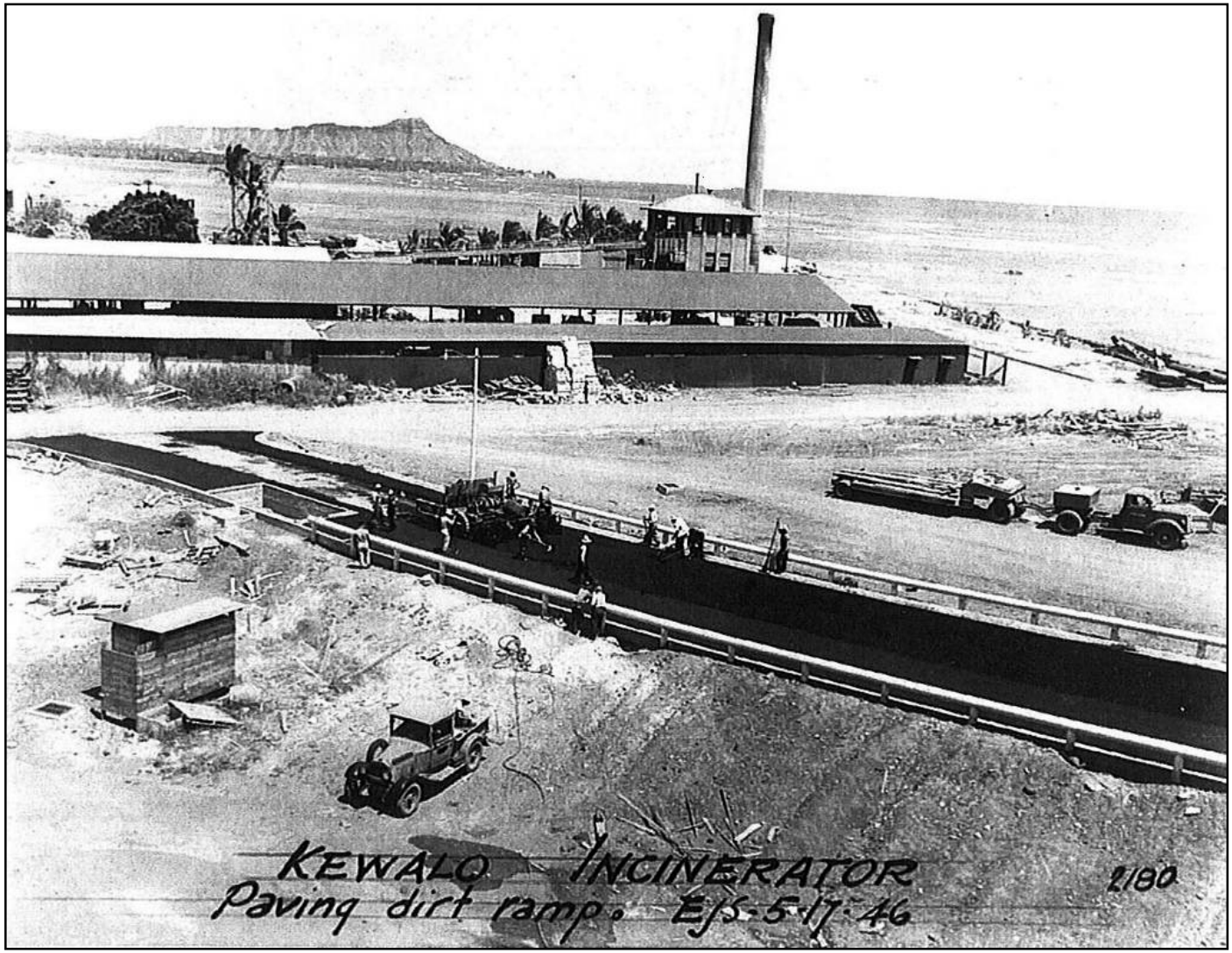

Figure 24. 1946 photograph of the Kewalo Incinerator No. 1, west side of Kewalo Harbor (Mason Architects 2002)

Fish Company, a fish market operated by the M. Otani Company. It is likely the smokestack for the incinerator was demolished at this time. Matsujiro Otani also founded the United Fishing Agency (UF) in 1952 to resolve disputes in the fishing industry. They operated a fish marketplace in A‘ala Park, but moved to the Kewalo area in the early 1980s. After 1978, the incinerator building was used as storage by the United Fishing Agency, which has offices next door to the old incinerator. The second incinerator, built on Ohe Street in 1946–1948 was used for waste burning until 1997. The building was adapted for use by the Children’s Discovery Center in 1990 (Mason Architects 2002).

4.8 Squattersville

A settlement of poor people, mainly Native Hawaiians, inhabited the area around Kewalo Basin during the early twentieth century. In the 1920s, on the east side of Kewalo Basin, they congregated near a camp named “Blue Pond,” named after a large and deep pond near the shore (some say this was Kewalo Basin itself). On the west side of the basin, in the Ka‘ākaukukui area (shortened to ‘Ākaukukui), they lived in shacks and sturdy houses in an area called “Squattersville,” named because they illegally lived on government land. This camp was generally around Olomehani Street near the shore, protected from the waves by a long sea wall. There were around 700 Hawaiians and part-Hawaiians living in these two camps in the mid-1920s, but by 1926, they were all gone. The government evicted the families and razed the houses (Clark 1977:64). Clark further reports on developments in the area after the demise of Squattersville:

> During the 1930’s and 1940’s, the Ka‘ākaukukui area continued to be heavily utilized as a fishing and swimming area, especially by children from the neighboring community of Kaka‘ako. The children surfed on redwood planks in the break they called ‘Stonewall.’ Many varieties of fish were abundant. Younger divers were warned by the old-time residents to stay away from the large shark hole on the Waikīkī side of Kewalo Channel. Many people came to this area to pick limu and wana [sea urchins], and also to catch squid on the shallow reef. [Clark 1977:64]

4.9 Dredging and Reclamation

The late nineteenth and early twentieth centuries were a time of intense development of the Honolulu and Waikīkī coasts. A number of reclamation projects involved the dredging of offshore areas to deepen and create boat harbors, with the dredged material used to fill in the former swampy land. The first efforts to deepen Honolulu Harbor were made in the 1840s. The idea to use the dredged material, composed of sand and crushed coral, to fill in low-lying lands, was quickly adopted. First to be filled were those areas closest to Honolulu town, then the lands toward Kaka‘ako (Griffin et al. 1987:13).

An 1887 photograph (Figure 25) of the Kawaiaha‘o Church shows in the background (Figure 26) the marshy nature of the area prior at the beginning of dredging and reclamation, with only scattered houses near the ponds or near the shore *makai* of Kawaiaha‘o Church (Hawai‘i State Archives, reprinted in Stone 1983:84-85). By the mid-1880s, filling in of the mud flats, marshes, and salt ponds in the Kaka‘ako and Kewalo area had begun. The first fill material may have been

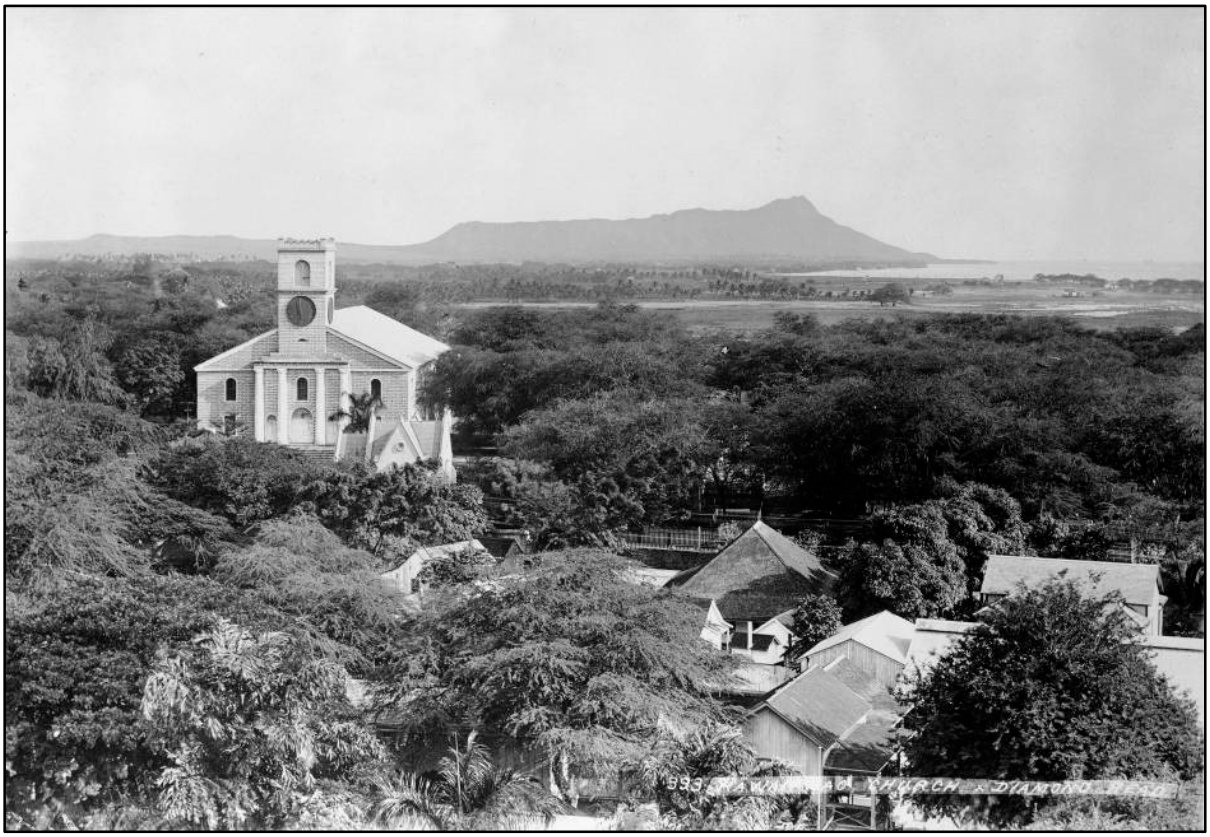

Figure 25. Photograph of Kaka‘ako area, ca. 1887; Honuakaha settlement at lower right across from Kawaiaha‘o Church at left center; Kukuluāe‘o coastal marsh lands in upper right background (original photograph at Hawai‘i State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

Figure 26. Inset of above photograph (right upper corner), showing sparsely-settled, marshy shore area of Kukuluāe‘o (now Kaka‘ako) (original photograph at Hawai‘i State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

set down for the Kaka‘ako Leper Branch Hospital (between Coral and Keawe streets), which had been built on a salt marsh. Laborers were hired to “haul in wagonloads of rubble and earth to fill up that end of the marsh” (Figure 27) (Hanley and Bushnell 1980:113).

According to Nakamura (1979), the main desire to fill in the lands of Honolulu, Kewalo, and Waikīkī was to provide more room for residential subdivisions, industrial areas, and finally tourist resorts. In the early part of the twentieth century, Kaka‘ako was becoming a prime spot for large industrial complexes, such as iron works, lumber yards, and draying companies, which needed large spaces for their stables, feed lots, and wagon sheds. In 1900, the Honolulu Iron Works, which produced most of the large equipment for the Hawaiian plantation sugar mills, moved from their old location at Queen and Merchant streets near downtown Honolulu to the shore at Kaka‘ako on land that had been filled from dredged material during the deepening of Honolulu Harbor (Thrum 1901:172).

Although the Board of Health could condemn a property and the Department of Public Works could then fill in the land, the process was rather arbitrary. In 1910, after an epidemic of bubonic plague, the Board of Health condemned a large section of Kewalo, consisting of 140 land parcels (including areas once known as Kukuluāe‘o and Ka‘ākaukukui), which had numerous ponds (Hawai‘i Department of Public Works 1914:196). The first land to be filled in was the portion of the Ward Estate’s Kukuluāe‘o property west of Ward Avenue, which was completely filled in by June 1913. By August 1913, the rest of the Ward Kukuluāe‘o lands west of Ward Avenue had been completely filled; and by February 1914, all of the land from South Street to Ward Street, and from Ala Moana to Queen Street had been filled (Hawai‘i Department of Public Works 1914:198).

Prior to dredging, Kewalo Basin was a natural deep pocket in the reef seaward of Ala Moana Boulevard between Ward Avenue and Kamake‘e Street that had been used as a canoe landing since pre-Contact times and probably used since the early historic period as an anchorage. In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo—now the Kewalo Basin Harbor—for the aim of “harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper” (Figure 28 through Figure 30) (Thrum 1920:147). In 1941, the government dredged and expanded the basin to its current 22 acres. In 1955, workers placed the dredged material along the *makai* side to form an 8-acre land section protected by a revetment—now the Kewalo Basin Park (Kewalo Basin Harbor 2009).

Southeast O’ahu was transformed when the construction of the Ala Wai Drainage Canal resulted in the draining and filling in of the remaining ponds and irrigated fields of Honolulu and Waikīkī. The canal was one element of a plan conceived in 1906 to urbanize Waikīkī and the surrounding districts. The final result of the project, begun in 1921, was a “canal three miles long, with an average depth of twenty-five feet and a breadth of two hundred fifty feet” (*Honolulu Advertiser* 1928:2,16). The first phase of construction dug a canal parallel to the coast along Waikīkī Beach. The dredged material was placed on adjacent properties from McCully Street to Kapi‘olani Park. This action affected several private land owners, including the Bishop and the Booth estates. The second phase of construction dredged a canal from the beach toward the reef. Construction workers pumped the dredged material to the new McKinley High School site, an area of former large ponds adjacent to the eastern boundary of the *mauka* portion of the Ward Estate (Hawai‘i Governor 1922:49-50). Additional dredged material was used to fill the area *makai* of the school grounds in 1930 (Hawai‘i Governor 1930:74).

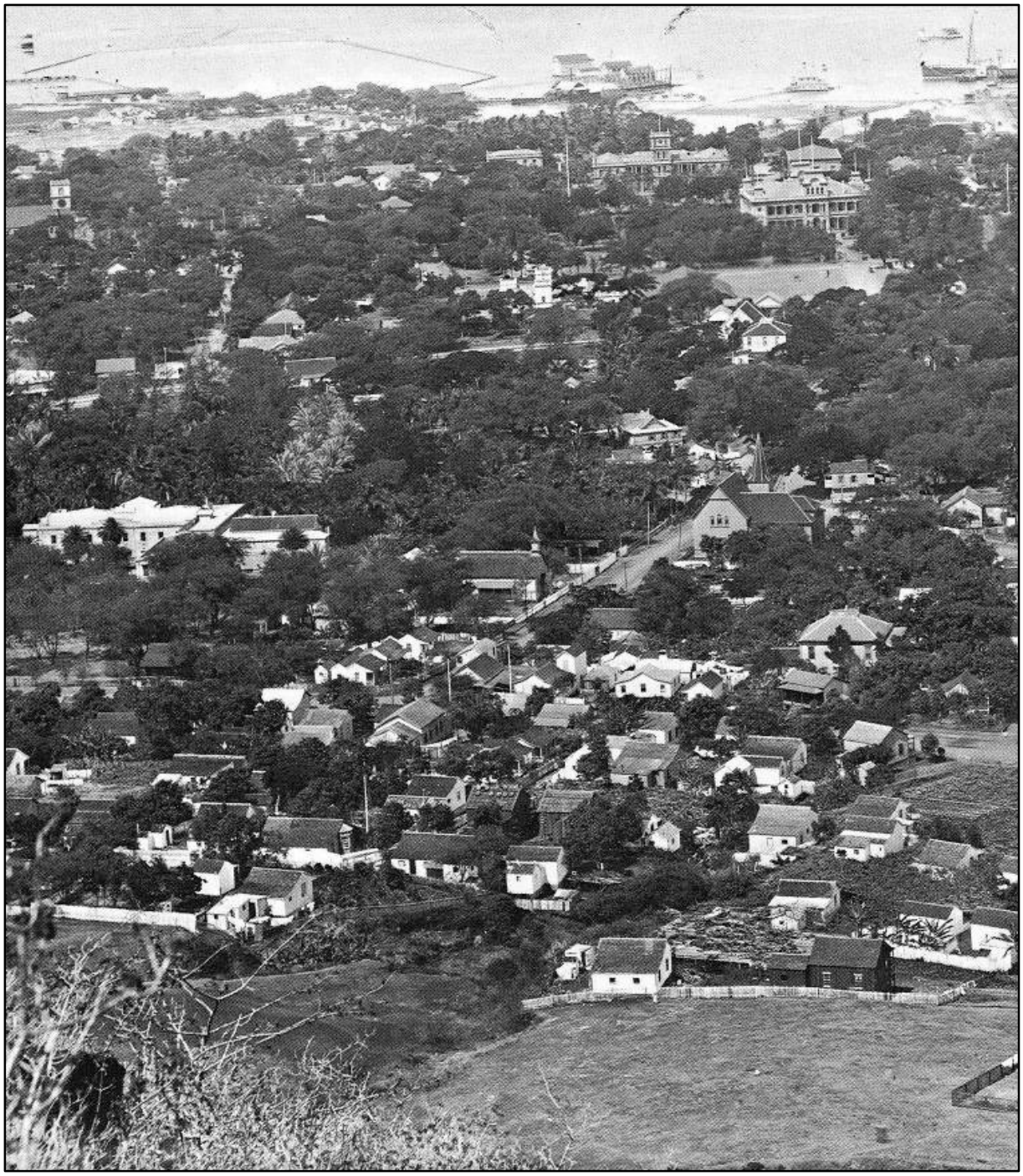

Figure 27. 1894 photograph of the Honolulu waterfront taken from the top of Punchbowl (Kawaiaha‘o Church and ‘Iolani Palace are clear landmarks); seaward land reclamation with a new seawall is quite pronounced at the upper left (original photograph at Hawai‘i State Archives; reprinted in Scott 1968:266)

Figure 28. 1927 aerial photograph showing the natural deep pocket in the reef (just prior to dredging) and the brand new in-progress land fill on the west side; a very narrow strip of sand is shown between the narrow beach road and the reef (Hawai‘i State Archives)

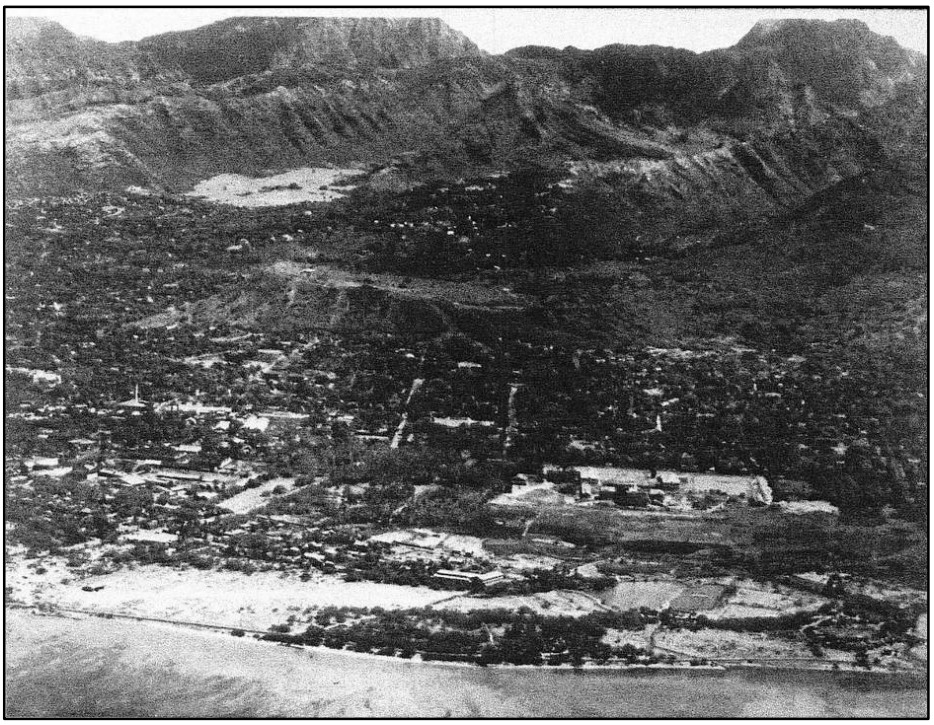

Figure 29. Aerial photograph of Kewalo Basin, about 1930 (left foreground) (Hawai‘i State Archives)

Figure 30. 1931 aerial photograph, showing dredged materials (white crushed coral) used in the construction of Kapi‘olani Boulevard and for fill in marshy areas of Honolulu and Waikīkī (Hawai‘i State Archives)

Section 5 Previous Oral History Research

This section draws from previous oral history research conducted by the University of Hawai‘i’s Center for Oral History (UHCOH) in 1978 to highlight the voices of several people who had deep knowledge of the culture and history of the area known as Kaka‘ako. Their *mo‘olelo* color the cultural and historical background with nuanced recollections and add depth to the information provided by *kūpuna* and *kama‘āina* interviewed for this CIA (Section 7). Summaries and excerpts from this collection of oral histories are presented below.

5.1 Henry Alves

The UHCOH documented the autobiography of Mr. Henry Alves on 1 February 1978. Of Portuguese descent, Mr. Alves was born in Kaka‘ako on 4 October 1923. He was raised in Kaka‘ako where he attended Pohukaina Elementary School and later attended St. Louis College. Mr. Alves moved out of Kaka‘ako in 1942 and by 1943 had joined the military. He later became a certified public accountant and relocated to Kailua, O‘ahu in 1963.

Mr. Alves shared how each ethnic group was somewhat gathered together in the neighborhood:

> I would say about 90—I keep on thinking about the plantation syndrome. But, I would say about 95 percent in that specific area were Portuguese. And, we had our own little Japanese camps down the street and towards the park—Mother Waldron Park. There was quite a number of Hawaiians that were living side by side. [UHCOH 1978:4]

When asked if he interacted with children of other ethnic groups, Mr. Alves continued,

> Well, yeah, we did at school. But rarely after school, I think, except to participate in sports against those particular individuals. There was no animosity. We had a good rapport in relationships with these inviduals. Very good.
>
> . . . because as I said, we concentrated our activities mostly at the church grounds and there wasn’t too many Japanese at that time that were Catholics and very few Hawaiians. [UHCOH 1978:4]

Mr. Alves father was an active member of Saint Agnes Church where he also served as president of the Holy Name. As a result, the Alves family was also very involved with the church and various Catholic festivities including the Holy Ghost festivities:

> Yes, when we were kids, we had sort of no choice. Our parents would insist that we had to at least participate, as far as the marching was concerned, you know. Was a fun thing, too. That was another place that was real fun because, you know, for several weeks prior to the fest itself, they’ll be activities on the grounds. Boys would be there. Girls would be there. And, it was another way of meeting people and going out.
>
> Yeah. There was a lot of the younger fellas used to come by as far as, you know, there were some games and so forth. And, they did. And, I know there was always a free lunch. And these fellas enjoyed it. They came in, you know, the old

> Portuguese soup, and meat, and whatever. Sweetbread. Yeah. Was part of the boys that used to come in and participate with us. [UHCOH 1978:12]

Another place in Kaka‘ako that the children would play together was at parks and at the beach:

> The Hawaiian fellas from the park. We were also fortunate that we weren’t too far from the beach, and we did a lot of surfing and swimming in the Ala Moana. And, again, you know, everybody would meet there, including the people; the Japanese boys, the Hawaiian boys, and you know. We didn’t [think] of people as being, you know, ethnic groups. It was just, we knew you as Jim, or John, and all that. And we met and we surfed. And, in those days, the Ward Estate owned that property fronting the beach itself. And, it used to be a—a baseball field there that we played in. And, in fact, going further back, it used to be an air-field. [UHCOH 1978:13]

Mr. Alves also recalled the area known as Squattersville inhabited by mostly Native Hawaiian families where the Ala Moana Center is today:

> Oh, my recollection. They were, except for areas towards Ala Moana and . . . we had an area that they designated as Squattersville. There was a lot of Hawaiians that lived there and most of the roads were unpaved.
>
> Yeah. Well, it’s in the area where Honolulu Ford is, and Gold Bond building. In that particular vicinity. Towards the beach and there used to be a school. I think the name of it was Opportunity School, that if you was in the regular public school. And, well, I don’t know how the—the criteria that was used, but these were people that were rather slow. The kids were rather slow so they would end up in this particular school. Special classes and so forth. And, that school was right on the water. [UHCOH 1978:17]

5.2 Edward K. Enos

Edward K. Enos, a retired Pearl Harbor Naval Shipyard cable splicer/instructor of Hawaiian-Portuguese descent, was interviewed by UHCOH staff on 16 February 1978. Mr. Enos moved to Kaka‘ako as an adult in 1930 where he became active in the community’s sports programs via the Mormon Church. He established the Police Activities League (PAL) for youth in Hawai‘i and later moved to Papakōlea where he continued assisting in organized sports leagues.

When Mr. Enos first moved to Kaka‘ako with his wife, they moved to Magoon Block. Mr. Enos describes Magoon Block:

> It was on South Queen Street, between (Coral Street and South Street) where Magoon Laundray used to be?
>
> Well, that little street is Coral Street. Well, Magoon Block extended from that corner of Coral Street up to South Street. It takes that whole block there.
>
> Yes. One long building. That’s it. A two-story building, it’s a long one all the way till that covers one block. And they have cottages in the rear of that Magoon Block. You know, rear of Magoon Bock they have cottages separating there. And they had

> about eight or ten cottages. They have a roadway that goes in between the two cottages. [UHCOH 1978:133]

The building that Mr. Enos lived in consisted of families of various ethnic backgrounds. Downstairs from Mr. Enos was a restaurant, grocery store, hardware store, etc. The close proximityof stores made shopping convenient. Mr. Enos also stressed that it was easy to get acquainted with neighbors and they often socialized on a daily basis and often shared food:

> Food. Yeah, mostly food. Maybe this unit furnish the food all. Then the next day, the other unit furnish. The next day, the other unit. Well, each unit take their turn, you know, in supplying food. During the noon hours or something. So, just before evening, well, the wives had to go home and prepare supper before their husbands come home, so they usually disperse about three o’clock, four o’clock in the afternoon. Well, when the husband leave for work bright and early, they usually yell ‘E Nei, where are you? What are you doing? Are you up?’ ‘Oh, you sleepy head, why don’t you get up?’ All that thing, you know. Just kidding one another. Before you knew it all the mothers coming out. There goes one group. One bunch here, one bunch there, one bunch there. It’s really a family gathering during the early days. Very nice people. Very sociable. You can associate with them and that just what they like. They make it just like a big family.
>
> . . . it’s a variety of food. Maybe this family will furnish maybe roast today, or maybe I’ll furnish chicken. Oh, next family, oh I’ll furnish, too. And the next family over, I’ll bring the steak, thing of that kind. Or they have sandwich, whatever they want. [UHCOH 1978:136]

Although there was a variety of food amongst the neighbors, their diet consisted mostly of fish and *poi*:

> Nah, not too much meat. Not too much meat. Mostly fish. Most of them, they like fishing, you see. And everytime when they come back with this school of fish, they all give different families fish. You know, whatever they can supply; whatever spares that they have.
>
> . . . Our main food is poi and rice. So we eat lots of that. Yes. Stew with poi and rice. That’s the main foods. Stew and poi and rice. [UHCOH 1978:136]

5.3 David Tai Loy Ho

Tai Loy Ho, a Chinese-Hawaiian, was born in Kaka‘ako on 16 March 1910 (UHCOH 1978:405). Mr. Ho was the third of 13 children. His mother was Hawaiian and came from Kōhala, Hawai‘i. His father was Chinese and from Honolulu, O‘ahu. Mr. Ho began working at a very young age. Jobs included picking *kiawe* (*Prosopis pallida*; algaroba) beans, shining shoes, and selling newspapers. He attended Pohukaina Elementary and McKinley High School. Mother Margaret Waldron, a strong community figure within Kaka‘ako, encouraged him to continue his education where he attended the University of Hawai‘i at Mānoa and graduated with a degree in agriculture. He served in World War II and later became a fireman.

To help support his family, Mr. Ho began working at the tender age of five years old. He recalled selling newspapers and collecting *kiawe* beans at the Ward Estate. The beans were used to feed horses and cattle. The Ward Estate was large, spanning from Queen Street to King Street. Mr. Ho recalled his adventures of trespassing on the Ward property:

> There were watchmen and we put somebody on guard, eh. There's only one man in there. But right across the old plantation, where the coconut trees were, where McKinley High School, where right now is the Neil Blaisdell Center, was a big pond and there were lot of coconut trees. And there was this old man staying there as a watchman for the grounds, groundskeeper. But we never did got in there because there was nothing in there. There was nothing for us to steal. Or, you know, sell. But, I suppose, I think there were mullets in the pond and that's why he was there. And where Gem [between Queen Street and Auahi Street] is, were all salt ponds. Salt ponds. [UHCOH 1978:408]

Mr. Ho also recalled the area known as Squattersville:

> Squattersville was, you know where the incinerator is now? Well, the incinerator. There was all kiawe trees over there, but the area went out like this, and came back, and came back this way [zig-zagged]. And nobody lived there. But as you came back this way, there was about 100 yards out, toward, sort of promontory, but was still land. Came back this way. And then all the way up to Fort Armstrong. And the pople went there to live as squatters, you know. And there's lot of fish, lot of limu and people lived there. I would say that they were people without jobs, I think. This is when, the 1930's. [UHCOH 1978:432]

Although Mr. Ho was Chinese-Hawaiian, he was raised with the Chinese culture more than his Hawaiian culture. Meals consisted of fish, meat, and soup. *Poi* (made from cooked taro corms, or rarely breadfruit, pounded and thinned with water) was not allowed to be eaten. In observance of Chinese New Year the Ho family celebrated with food:

> My father always observed Chinese New Years. From the day before, we had jai (Monks food), no meat. You cook a vegetable dish, and we get up 3 o'clock in the morning to eat it. And, of course, we're not used to getting up at 3 o'clock. But, after that dish is over, there's going to be chicken. Oh, what a wonderful day! And, whenever we got sick, we always had Chinese herbs. Always Chinese herbs. [UHCOH 1978:435]

Chinese herbs were bought from an herb doctor in Chinatown. Herbs to ingest varied based on symptoms of your sickness.

Section 6 Community Consultation

Throughout the course of this assessment, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about traditional cultural practices specifically related to the study area. This effort was made by letter, email, and telephone. The initial outreach effort began in March 2014 and ended in June 2014.

In the majority of cases, a letter (Appendix C), map, and an aerial photograph of the project area were mailed. In most cases, one to multiple attempts were made to contact individuals, organizations, and agencies apposite to the CIA for the project. The results of the community consultation process are presented in Table 2. Written statements from organizations, agencies, and community members are presented in Sections 6.1 and 6.2 below and summaries of interviews with individuals are presented in Section 7 .

Table 2. Community Contact Table

Name	Affiliation	Comments
Agard, Louis “Buzzy”	KAHEA, fisherman	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Ayau, Halealoha	Hui Mālama I Nā Kūpuna o Hawai‘i Nei	Letter and figures emailed 29 August 2014 Second letter and figures emailed o 30 September 2014
Crabbe, Kamana‘o	CEO, Office of Hawaiian Affairs	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Downer, Alan	Administrator, SHPD	Letter and figures emailed 29 August 2014 Second letter and figures email 30 September 2014
Faulkner, Kiersten	Historic Hawai‘i Foundation	Letter and figures emailed 29 August 2014 Ms. Megan Borthwick responded 4 September 2014 to CSH via email on behalf of Historic Hawai‘i Foundation; see Section 6.1 for an expanded version of Historic Hawai‘i Foundation’s reponse
Friends of Kewalo	Citizens’ group	Letter and figures emailed 29 August 2014
Higgins, Collette	Chair and Professor of History, Kapi‘olani Community College	Letter and figures emailed 29 August 2014 Second letter and figures email 30 September 2014

Name	Affiliation	Comments
Hughes, Claire	Hawaiian Living Treasure; columnist; first Native Hawaiian Registered Dietician in 1959; co-creator of Moloka‘i Diet	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Iwami, Ron	Friends of Kewalo	Letter and figures emailed 29 August 2014 Mr. Iwami responded 3 September 2014 via email to CSH with the following: *Friends of Kewalos would like to comment on the project from a park user's perspective. We would like to meet at the site to discuss this. Weekdays at 10 am are good except Tuesdays. Looking forward to meeting with you.* CSH responded 5 September 2014 to Mr. Iwami via email: *E kala mai Ron for the late response. I'm available next week to "talk story" about the project area on Monday, Wednesday, or Thursday at any time after 10AM. I am also CC'ing my colleague, Mahealani Liborio, who will be joining us. I look forward to meeting you and hearing the organization's ‘ike and mana‘o.* Mr. Iwami and CSH agreed to meet on 10 September 2014 at Kewalo Basin Park. Mr. Iwami and Mr. Tom Iwai of Friends of Kewalos were interviewed at Kewalo Basin park 10 September 2014. CSH sent Mr. Iwami and Mr. Iwai a draft transcription 22 September 2014. Mr. Iwami and Mr. Iwai approved their transcription 26 September 2014. CSH sent Mr. Iwami and Mr. Iwai a draft consultation summary 7 October 2014.
Kahele, Geri	*Kama‘āina*	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014

Name	Affiliation	Comments
Kaka‘ako Cares	Concerned citizens’ group	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Kakaako Do It Right	Concerned citizens’ group	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Kaka‘ako Ūnited	Concerned citizens’ group	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Kaleikini, Paulette	Lineal descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014 Ms. Kaleikini responded to CSH via email 25 September 2014; see Section 6.2 for an expanded response from Ms. Kaleikini
Kanaloa, Koko Mr.	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Kapua, Charles	Aha Kiole, grandfather owned fish market	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Kekaula, Ashford	Cultural descendant	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Kekaula, Mary K.	Cultural descendant	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Keli‘ipa‘akaua, Chase K.	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Keli‘ipa‘akaua, Justin K.	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Ma‘a Lapilio, Lani	Cultural liasion	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Nakayama, Perry	Researcher in Kaka‘ako	Letter and figures mailed 29 August 2014 Second letter and figures mailed on 12 September 2014

Name	Affiliation	Comments
Norman, Eileen	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Norman, Kaleo K.	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Norman, Keli‘inui K.	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Norman, Theodore	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Olds, Nalani	Cultural descendant	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Paik, Linda Kaleo	Aha Wahine, cultural practitioner	Letter and figures emailed 29 August 2014 Second letter and figures emailed 30 September 2014
Wong-Kalu, Hinaleimoana K.K.	Kona Representative, O‘ahu Burial Island Council	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014
Yamaguchi, Mae	c/o Pohukaina School	Letter and figures mailed 29 August 2014 Second letter and figures mailed 12 September 2014

6.1 Response from Historic Hawai‘i Foundation

CSH contacted Kiersten Faulkner of the Historic Hawai‘i Foundation on 29 August 2014 via email. Ms. Megan Borthwick responded on behalf of Ms. Faulkner and the Historic Hawai‘i Foundation via email on 4 September 2014, subsequently a hard copy response was received by CSH on 8 September 2014. Below is Historic Hawai‘i Foundation’s statement:

> Thank you for including Historic Hawai‘i Foundation (HHF) in the Cultural Impact Assessment consultation for the Kewalo Basin Multi-Use Complex Project. Since 1974, HHF has been a statewide leader for historic preservation with a mission to preserve and encourage the preservation of historic properties significant to the history of Hawai‘i.
>
> This Cultural Impact Assessment prepared for Good Luck International Corp and Hinamari Hawai‘i Inc., describes the proposed project as the construction of four two-story structures and a parking structure between Kewalo Basin Harbor and Ala

Moana Beach Park where a surface lot currently exists. New structrures would primarily consist of commercial uses.

Ala Moana Beach Park is designated as a historic property on the National Register of Historic Places. Commerical development along its boundaries has the potential to impact its historic integrity. Design of new construction should emphasize compatability with the historic setting and views. Please see the Secretary of the Interior’s Standards for the Rehabilitation of Historic Properties for standards and guidelines for new construction in a historic district to provide the framework for design and construction.

The surf break known as Kewalos is also accessed from this location. Surfing is not only a recreational activity, but is also a traditional cultural activity dating long before western contact to the Hawaiian Islands. We recommend that Kewalos be evaluated as a Traditional Cultural Property that may be eligible for the register of historic places. Contributing features could include access by land and sea, which should then be integrated into any development plans.

Thank you for this opportunity to comment on the historic and cultural resources and the potential effect on them. Megan Borthwick will be your point of contact for this project, feel free to contact her with questions or concerns.

6.2 Response from Paulette Ka‘anohi Kaleikini

CSH contacted Paulette Ka‘anohi Kaleikini, State of Hawai‘i recognized lineal descendant, on 29 August and 12 September 2014 via mail. Ms. Kaleikini responded to CSH via email with the following statement:

Aloha,

I apologize for taking so long to respond on this important project.

First, I would like to clarify that Kakaako is not an ahupuaa. Kakaako is an ili. This project will sit in the ahupuaa of Honolulu. Honolulu was known as the ancient name of Kou, named after a chief Kou who was of the Kakuhihewa clan.

The ancient pre-contact history of area of what is known today as Kewalo Basin is that the reef was used for canoe landings. The alii compound was mauka of Kewalo and this was the closest landing area for their canoes.

The reef was eventually destroyed and dredged and served many purposes such as wharfing and docking.

The 2.1 area of the proposed project is of the reef.

I am not aware of any spoken or written ancient history of cultural sites being located on the coral reef in Kewalo. However, to Native Hawaiians, the ocean was of cultural significance in and of itself. Their food was provided from that reef and ocean waters. Their very existence depended on the food coming from there. It was an important aquaculture center. In the ahupuaa of Honolulu, there were many,

many Native Hawaiians living there in the ancient times. This is evident by the in-situ flexed burials that have been found just mauka of Kewalo Basin on Ala Moana Boulevard. Native Hawaiians buried their people close to the ocean to be in the sand. There could be pockets of sand in the project area. Kewalo was an area where Kauwa (low class servants) were drowned by holding their heads under the water. Where did their bodies drift? If the bodies did not drift out to sea, it was possibly tucked in the reef.

I remember an enclosed area where the parking lot is now and this is where fishermen gathered and mended their nets.

There’s always families gathering at Ala Moana Park; just over the wall of this project area. As a child, I remember many family gatherings and school functions in this exact area. Families always had their fishing poles out in the water. I still see families gathering here. This particular area, on the Ala Moana Park side, is where the Aloha Week Parade usually begins. On the morning of the parade, many parade participants huddle under the tree for shade until the parade begins. Many families sit under the shade of these trees to watch the Aloha Week and Kamehameha Day parade.

I would recommend consultation with State recognized descendants after the CIA is completed and before an archaeological inventory survey plan id developed.

That’s all I have for now. Let me know if there are any questions.

Mahalo nui

kaanohi

Section 7 Interviews

The authors and researchers of this report extend our deepest appreciation to everyone who took time to speak and share their *mana‘o* (thought, idea, belief) with CSH whether in interviews or brief consultations, including contacts who opted not to contribute to the current cultural study but nevertheless spent time explaining their position on the proposed project. We request that if these interviews are used in future documents, the words of the contributors be reproduced accurately and not in any way altered, and that if large excerpts from interviews are used, report preparers obtain the prior written consent of the interviewee/s.

7.1 Friends of Kewalos

Interview summaries from Ron Iwami and Tom Iwai of Friends of Kewalos pending.

Section 8 Cultural Landscape

Traditional cultural practices are based on a profound awareness concerning harmony between man and his natural resources. The Hawaiians of old depended on these cultural practices for survival. Based on their familiarity with specific places and through much trial and error, Hawaiian communities were able to devise systems that fostered sustainable use of nature's resources. Many of these cultural practices have been passed down from generation to generation and are still practiced in some of Hawai‘i's communities today.

This project seeks to assess traditional cultural practices as well as resources pertaining to the project area within Honolulu Ahupua‘a. Discussions of specific types and aspects of traditional Hawaiian culture as they may relate to the project area are presented below. This section integrates information from Sections 3–7 in examining cultural resources, beliefs, and practices identified within or in proximity to the project area in the broader context of the encompassing Honolulu Ahupua‘a.

8.1 Wahi Pana

State of Hawai‘i recognized lineal descendant, Paulette Ka‘anohi Kaleikini, clarified that Kaka‘ako is not an *ahupua‘a* but an *‘ili*. The project area sits in the *ahupua‘a* of Honolulu. She added that Kou was the ancient name prior to its being called Honolulu. Kou was named after a chief from the Kakuhihewa line.

Pukui and Elbert translate *kākā‘āko* as "dull, slow" (Pukui and Elbert 1986:110). Thrum translates the word as "prepare the thatching" as *kākā* means "to chop, beat, or thresh" and *ako* means "thatch" (Thrum 1922:639). There is a possibility that Thrum translated the word correctly as the Kaka‘ako region was an excellent place to gather *pili* grass, which Hawaiians used traditionally to thatch their houses.

Several *‘ili* make up the area we call Kaka‘ako including Ka‘ākaukukui, a filled in reef extending a quarter mile along Ala Moana Park to Kewalo Basin; Kukuluāe‘o, *mauka* of Ka‘ākaukukui; Kolowalu, a small land section between Kukuluāe‘o and Kewalo that encompassed a large fishpond; Kewalo, between Cooke and Sheridan streets *mauka* of Queen Street and the coastal sections of Ka‘ākaukukui, Kukuluāe‘o, and Kālia; and Kō‘ula, the area around Thomas Square and the *mauka* portion of the Ward Estate.

8.2 Burials

There is no documented evidence from archaeological surveys, historical records, or oral traditions of pre-Contact *ilina* or *iwi kūpuna* within the project area. However, human skeletal remains were discovered at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002). Ms. Kaleikini also pointed out the in situ flexed burials that have been found *mauka* of Kewalo Basin on Ala Moana Boulevard.

Members of a pariah caste intended for sacrifice known as the *kauwā* were drowned at the area known as Kewalo. Ms. Kaleikini also shared information about the *kauwā* adding that they were drowned by holding their heads underwater. Ms. Kaleikini posed the questions, "Where did their

bodies drift?” She noted that if bodies did not drift out to sea, there is a possibility they were tucked in the reef.

8.3 Agriculture and Aquaculture

Kaka‘ako is located between two traditional centers of population, Kou (the ancient name for Honolulu) and Waikīkī. The *ahupua‘a* of Waikīkī boasted a system of irrigated taro *lo‘i* fed by streams descending from Makiki, Mānoa, and Pālolo valleys. The shorelines of Waikīkī consisted of a network of fishponds dotting the shoreline. Kou also possessed the same agricultural and aquacultural resources as Waikīkī. Reverend Hiram Bingham (1847) described Kaka‘ako from the top of Punchbowl in 1820 as

> having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of kalo in its various stages of growth. [Bingham 1847:92-93]

Ms. Kaleikini stated that “to Native Hawaiians, the ocean was of cultural significance in and of itself.” Food was provided from the coral reef that fronts Kewalo and the open ocean waters. Ms. Kaleikini continued, “Their [Native Hawaiians] very existence depended on the food coming from there. It was an important aquaculture center.”

According to LCA documents, the majority of the land in Kewalo and Kukuluāe‘o was used to produce *pa‘akai* or salt. Hawaiians used *pa‘akai* to flavor food, preserve fish by salting, for medicinal purposes, and for ceremonial purposes. Salt was also traded with other islands (Kamakau 1992:409). The export of salt declined in the late nineteenth century. By 1901, government agencies reported that most of the fishponds and salt pans *makai* of the Ward Estate were abandoned. By 1916, only one salt works was in business: the Honolulu Salt Company.

In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor at Kewalo to serve fishing fleets, provide docking for lumber schooners, and relieve Honolulu Harbor (Thrum 1920:147). The area chosen for the harbor was adjacent to several lumber yards, however, when the wharf was completed in 1926, the lumber import and export business had faded and the harbor was mainly used by commercial fishermen. At the dawn of the twentieth century, a single Japanese style fishing vessel known as a *sampan* entered Hawaiian waters. The 34-ft boat boasted a wooden hull and a light square-sailed rig. With continued labor migration, the Japanese fishing vessels and their sailors found employment in the offshore fishing industry and began to unload large catches of *ahi* and *aku* thus sparking the commercial tuna industry.

McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard in 1929 (at the corner of Cooke Street and Ala Moana Boulevard). A new tuna cannery opened at the basin in 1933 (Clark 1977:64). However, World War II severely impacted the *sampan* fishing industry limiting fishing locatons and hours. The government confiscated *sampans* in fear that Japanese boat owners were using the vessels for spying or sabotage. The tuna cannery closed in 1985 when the industry became unprofitable (Van Tilburg 2007:44-45).

8.4 Trails

John Papa ‘Ī‘ī mapped several trails that traverse the Honolulu plain including one that traveled north of the project area. This trail started from Waikīkī and ended in Honolulu. ‘Ī‘ī (1959:89) describes the trail traveling from Kālia through Kukuluāe‘o “then along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha. On the upper side of the trial was the place of Kinau, the father of Kekauonohi.” The grave site ‘Ī‘ī is referring to is at the *makai* corner of Halekauwila and South streets thus putting the trail close to the current alignment of Queen Street.

Section 9 Summary and Recommendations

CSH undertook this CIA at the request of Good Luck Corp. and Hinamari Hawai‘i, Inc. The research broadly covered the entire *ahupua‘a* of Kaka‘ako including the approximately 2.1-acre area of potential effect.

9.1 Results of Background Research

Background research for this project yielded the following results:

1. Kaka‘ako is located between two of the most intensely populated and cultivated areas in southeastern O‘ahu during the pre-Contact period: Waikīkī and Honolulu (also known as Kou). Hawaiians utilized the marshes and wetlands for salt making and farming of fishponds along with some limited wetland agriculture.
2. The Kaka‘ako area has been heavily modified over the last 150 years due to historic filling of the area for land reclamation.
3. Land Commission and other historic-era documents identify the Kewalo area between Cooke and Sheridan streets *mauka* of Queen Street and the coastal sections of Ka‘ākaukukui, Kukuluāe‘o, and Kālia. According to Pukui et al. (1974:109), members of the *kauwā* were drowned in the Kewalo area. At one time, the Kewalo area also had a sandy beach where various sports including surfing were held (Kekahuna 1958).
4. Pu‘ukea Heiau was located in the *‘ili* of Kukuluāe‘o according to Kamakau (1991:24). Pu‘ukea means “white hill” and is also the name of a smaller land division within Kukuluāe‘o ‘Ili that is mentioned in at least two Land Commission Awards (LCA): 1502 (not awarded) and 1504. LCA 1504 is located near the junction of Halekauwila and Cooke streets. There is a possibility the *heiau* platform or the area it was built on was one of the few elevated locations in the flat, low-lying swamp that surrounded it.
5. A trail traversed the Kaka‘ako area, ultimately connecting Waikīkī to Honolulu. ‘Ī‘ī (1959:89) described the middle trail (close to the current alignment of Queen Street) extending from Kālia to Kukuluāe‘o as passing “along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha. On the upper side of the trail was the place of Kinau, the father of Kekauonohi.”
6. The project area—the Kewalo Basin Harbor—was formerly a shallow reef that enclosed a deep section of water. The harbor was dredged and filled in the mid-1880s. No LCAs were awarded for the project area. There is no documented evidence that any *iwi kūpuna* were found within the project area. However, human remains were discovered near the coastline on the *mauka* side of Kewalo Basin at the intersection of Ala Moana Boulevard and Kamake‘e Street (Souza et al. 2002).
7. A majority of the land in Kewalo and Kukuluāe‘o was used to produce salt. Hawaiians used *pa‘akai* to flavor food, to preserve fish, to use for ceremonial purposes, and for medicinal purposes.

8. Hansen ’s disease was first reported in 1840 and definitively identified in 1853. In 1865, a hospital in Kalihi was set up to examine suspected lepers. If the disease was confirmed, patients were exiled to Kalaupapa on Moloka‘i. In 1881, a receiving station was built in Kaka‘ako for Hansen’s Disease patients, in a block now bound by Ala Moana, Auahi, Coral, and Keawe streets, under the direction of Saint Marianne Cope (Griffin et al. 1987:55).
9. During an 1853 smallpox epidemic, patients were isolated at a temporary quarantine camp in Kaka‘ako (Thrum 1897:98). Victims of the disease were buried at Honuakaha Cemetery, near the junction of Quinn and South streets (Griffin et al. 1987:13).
10. Kaka‘ako was also the location for a battery with three cannons used to salute visiting naval vessels. The small battery, Fort Armstrong, was set up on the Ka‘ākaukukui Reef as a station for the storage for underwater mines.
11. In 1919, the Hawai‘i Government appropriated $130,000 to improve the small harbor of Kewalo for a harbor extension that was to serve fishing fleets and to relieve Honolulu Harbor. The harbor was adjacent to several lumber yards, and was initially made to provide docking for lumber schooners. When the wharf was completed in 1926, the lumber business faded and the harbor was used mainly by commercial fishermen. Dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate. In 1941, the basin was dredged and expanded to its current 55 acres. In 1955, dredged material was placed along the *makai* side to form an 8-acre land section.
12. Japanese fishing vessels called *sampans* entered Hawaiian waters at the turn of the twentieth century. With continuing labor migration, Japanese fishing vessels and their sailors found employment with the offshore fishing industry, unloading large catches of *ahi* and *aku*. World War II severely impacted the *sampan* fishing industry by limiting hours in certain areas. The government confiscated the *sampan* fleet fearing that Japanese boat owners were using the vessels for spying or sabotage.

9.2 Results of Community Consultation

Based on information gathered from the community consultation, participants shared the following:

1. Ms. Kiersten Faulkner of Historic Hawai‘i Foundation stated Ala Moana Beach Park is designated on the National Register of Historic Places (SIHP # 50-80-14-1388). She noted that commercial development along the park boundaries “has the potential to impact its historic integrity.”
2. Ms. Faulkner also identified the surf break known as Kewalos, which is accessed south of the project area. Surfing is not only a recreational activity, but also a traditional cultural practice dating to pre-Contact times within the Hawaiian Islands.
3. State of Hawai‘i recognized lineal descendant Paulette Ka‘anohi Kaleikini clarified that Kaka‘ako is not an *ahupua‘a*. She stated the project area is in the *ahupua‘a* of Honolulu, which was once known as Kou. Kou was named after a chief of the Kakuhihewa line.

4. Ms. Kaleikini shared that during the pre-Contact period, the Kewalo Basin reef area has once been a site for canoe landings. An *ali‘i* compound was *mauka* of the Kewalo area and “this was the closest landing area for their canoes.”
5. The reef was destroyed and later dredged for docking purposes. Although the 2.1-acre proposed project area is on reef and Ms. Kaleikini is not aware of any spoken or written historical references of cultural sites on the reef, the ocean itself was of cultural significance. Food was provided from the reef and ocean.
6. Ms. Kaleikini recalled that as a child she saw families and school groups congregate near the project area. Families could often be seen fishing in the vicinity of the project in the past as well as today.
7. Honolulu Ahupua‘a was an epicenter of Hawaiian habitation in the pre-Contact period. In situ flexed burials *mauka* of Ala Moana Boulevard provide evidence that this area was heavily populated. Ms. Kaleikini added that Native Hawaiians buried the dead close to the ocean in sand. Ms. Kaleikini questioned the possibility that the project area contains pockets of sand.
8. Kewalo was also an area were the *kauwā* were drowned by holding their heads under water. Ms. Kaleikini posted the question, “Where did their bodies drift?” If bodies of the *kauwā* did not drift out to sea, she suggested they could possibly be tucked under the reef.

9.3 Community Recommendations

Based on information gathered from the community consultation, participants voiced the following concerns:

1. Kiersten Faulkner of Historic Hawai‘i Foundation stated the Ala Moana Beach Park is designated as a historic property (SIHP # 50-80-14-1388). She raised concerns about historic integrity and suggested that design and construction of the project area “should emphasize compatability with the historic setting and views” and references the Secretary of the Interior’s *Standards for the Rehabilitation of Historic Properties* for standards and guidelines for new construction within a historic district to provide framework.
2. The Historic Hawai‘i Foundation recommended evaluating the surf break, Kewalos, as a Traditional Cultural Property, which may be eligble for the Register of Historic Places. Contributing features could be accessed via land and sea, which should be integrated into the development plans.
3. Ms. Kaleikini recommended consultation with State of Hawai‘i recognized descendants after the CIA is completed and prior to an archaeological inventory survey plan being developed.

9.4 Impacts and Recommendations

Based on information gathered from the community consultation detailed in this CIA report, the proposed project may potentially impact Native Hawaiian burials, historic integrity of surrounding historic properties, and Hawaiian cultural beliefs, practices, and resources. CSH summarizes below the potential impacts and recommendations:

1. Although the project area is primarily comprised of Fill land, there is a possibility *iwi kūpuna*, ancestral bones, may be present within the project area and land-disturbing activities during construction may uncover presently undetected burials or other cultural finds. In addition, a community participant indicated the presence of burials just *mauka* of the proposed project area.
2. Personnel involved in the construction activities of the project should be informed of the possibility of inadvertent cultural finds, including human remains. Should burials or other cultural finds be identified during ground disturbance, the construction contractor should immediately cease all work and the appropriate agencies be notified pursuant to applicable law.
3. Project proponents should consult with State of Hawai‘i recognized lineal and cultural descendants to develop a reinterment plan and cultural preservation plan in the event that any human remains or cultural sites or artifacts are uncovered during construction or long-term maintenance for the project.
4. Project proponents should consult with the State Historic Preservation Division and refer to the Secretary of the Interior’s *Standards for the Rehabilitation of Historic Properties* in regards to possibly affecting the historic integrity and setting of neighboring historic properties such as Ala Moana Beach Park (SIHP # 50-80-14-1388).
5. Project proponents should consider an evaluation of Kewalo Basin as a Traditional Cultural Property, which may be eligible for the Register of Historic Places, as suggested by a community participant. In addition to the many surf breaks of Kewalo Basin, the surrounding area is rich in pre-Contact and historic events.

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Appendix A Glossary

To highlight the various and complex meanings of Hawaiian words, the complete translations from Pukui and Elbert (1986) are used unless otherwise noted. In some cases, alternate translations may resonate more strongly with Hawaiians today; these are placed prior to the Pukui and Elbert (1986) translations and marked with “(common).”

Diacritical markings used in the Hawaiian words are the *‘okina* and the *kahakō*. The *‘okina*, or glottal stop, is only found between two vowels or at the beginning of a word that starts with a vowel. A break in speech is created between the sounds of the two vowels; pronunciation of the *‘okina* is similar to the break when saying “oh-oh.” The *‘okina* is written as a backwards apostrophe. The *kahakō* is only found above a vowel. It stresses or elongates a vowel sound from one beat to two beats. The *kahakō* is written as a line above a vowel.

Hawaiian Word	English Translation
ahupua‘a	Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of a pig (*pua‘a*), or because a pig or other tribute was laid on the altar as tax to the chief
Akua	God, goddess, spirit, ghost, devil, image, idol, corpse; divine, supernatural, godly
ali‘i	Chief, chiefess, officer, ruler, monarch, peer, headman, noble, aristocrat, king, queen, commander
‘āpana	Piece, slice, portion, fragment, section, land parcel
‘auwai	Ditch
heiau	Pre-Christian place of worship, shrine; some *heiau* were elaborately constructed stone platforms, others simple earth terraces; many are preserved today
‘ili	Land section, next in importance to an *ahupua‘a* and usually a subdivision of an *ahupua‘a*
‘ili ‘āina	Land area; an *‘ili* land division whose chief pays tribute to the chief of the *ahupua‘a* of which it is a part, rather than directly to the king
‘ili kū	Short for *‘ili kūpono*; a nearly independent *‘ili* land division within an *ahupua‘a*, paying tribute to the ruling chief and not to the chief of the *ahupua‘a*
ilina	Grave, tomb, sepulcher, cemetery, mausoleum, plot in a cemetery
iwi	Bone; the bones of the dead, considered the most cherished possession, were hidden
kama‘āina	Native-born, one born in a place, host; native plant; acquainted, familiar, *lit.*, land child

Hawaiian Word	English Translation
kapu	Taboo, prohibition; special privilege or exemption from ordinary taboo
kula	Plain, field, open country, pasture; an act of 1884 distinguished dry or *kula* land from wet or taro land
kuleana	Native Hawaiian land rights (common); right, privilege, concern, responsibility, title, business, property, estate, portion, jurisdiction, authority, liability, interest, claim, ownership, tenure, affair, province
kupuna	Grandparent, ancestor, relative or close friend of the grandparent's generation
kūpuna	Plural of *kupuna*
lo‘i	Irrigated terrace, especially for taro, but also for rice; paddy
loko	Pond, lake, pool
Māhele	Land division of 1848
maka‘āinana	Commoner, populace, people in general
makai	Seaward
mauka	Inland
moku	District, island, islet, section
mo‘o	Narrow strip of land, smaller than an *‘ili*
mo‘olelo	Story, tale, myth, history, tradition, literature, legend, journal, log, yarn, fable, essay, chronicle, record, article; minutes, as of a meeting (from *mo‘o ‘ōlelo*, succession of talk; all stories were oral, not written)
pa‘akai	Salt
wahi pana	Storied place (common); legendary place

Appendix B Authorization and Release Form

Cultural Surveys Hawai‘i, Inc.
Archaeological and Cultural Impact Studies
Hallett H. Hammatt, Ph.D., President

P.O. Box 1114 Kailua, Hawai‘i 96734 Ph: (808) 262-9972 Fax: (808) 262-4950

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AUTHORIZATION AND RELEASE FORM

Cultural Surveys Hawai‘i (CSH) appreciates the generosity of the *kāpuna* and *kama‘āina* who are sharing their knowledge of cultural and historic properties, and experiences of past and present cultural practices for the proposed Kewalo Basin Multi-Use Complex Project, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, Island of O‘ahu, TMK: [1] 2-1-058:128 por.

We understand our responsibility in respecting the wishes and concerns of the interviewees participating in our study. Here are the procedures we promise to follow:

1. The interview will not be tape-recorded without your knowledge and explicit permission.
2. If recorded, you will have the opportunity to review the written transcript of our interview with you. At that time you may make any additions, deletions or corrections you wish.
3. If recorded, you will be given a copy of the interview notes for your records.
4. You will be given a copy of this release form for your records.
5. You will be given any photographs taken of you during the interview.

For your protection, we need your written confirmation that:

1. You consent to the use of the complete transcript and/or interview quotes for reports on cultural sites and practices, historic documentation, and/or academic purposes.
2. You agree that the interview shall be made available to the public.
3. If a photograph is taken during the interview, you consent to the photograph being included in any report/s or publication/s generated by this cultural study.

I, _____, agree to the procedures outlined above and, by my
(Please print your name here)
signature, give my consent and release for this interview to be used as specified.

_____
(Signature)

_____
(Date)

Appendix C Community Outreach Letter

Cultural Surveys Hawai‘i, Inc.
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August 29, 2014

Aloha e,

At the request of Good Luck International Corp. and Hinamari Hawaii, Inc., Cultural Surveys Hawai‘i, Inc. (CSH) is preparing a cultural impact assessment (CIA) for the Kewalo Basin Multi-Use Complex Project, Kaka‘ako Ahupua‘a, Honolulu (Kona District), Island of O‘ahu, TMK: [1] 2-1-058:128 por. Please see accompanying USGS, Aerial and TMK maps.

The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park in what is now a surface parking lot. The facility consists of four, two-level buildings with the majority of the second level equipped with an open deck and viewing spaces. Combined, the four buildings include almost 50,000 square feet of waterfront retail stores; small restaurants, cafes and bars; commercial office space; a live entertainment venue; and a large observation deck and signature multipurpose venue on the second floor. Additionally, the proposed project includes a 250-stall, multi-level parking structure.

We are seeking your kōkua and guidance regarding the following aspects of our study:

- **General history and present and past land use of the project area.**
- **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**
- **Knowledge of gathering practices in the project area, both past and ongoing.**
- **Cultural associations of the project area, such as legends and traditional uses.**
- **Referrals of kūpuna and kama‘āina who might be willing to share their cultural knowledge of the project area and the surrounding ahupua‘a lands.**
- **Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.**

We invite you to contact us at (808) 262-9972 or (e-mail: nishihara@culturalsurveys.com or mliborio@culturalsurveys.com) if you have any information you would like to share.

Mahalo nui loa,

Cultural Surveys Hawai‘i Inc.
Archaeological and Cultural Impact Studies
P.O. Box 1114
Kailua, Hawai‘i 96734 Ph.: (808) 262-9972

APPENDIX C

TRANSPORTATION IMPACT ANALYSIS REPORT

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Kewalo Basin

Restaurant and Retail Project

Transportation Impact Analysis Report

Prepared for:

Kewalo Waterfront Partners, Inc.

October 2014

SD14-0137

FEHR PEERS

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EXECUTIVE SUMMARY

This report presents the results of the transportation impact analysis report (TIAR) for the proposed Kewalo Basin restaurant and retail development located in Kaka'ako on the island of Oahu. The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park on the site of an existing surface parking lot. The multi-use facility will consist of four two-level buildings and a planned 250-space parking structure providing approximately 12,060 square feet of quality restaurant space, including accommodations for events for up to 200 people, 18,440 square feet of café space, and 4,300 square feet of retail space. The project will fully replace the existing 109 surface parking spaces that occupy the project site and will also provide the code-required parking supply for the new uses.

The impacts of the proposed project to the surrounding transportation system were evaluated following the best practices and methods preferred by the Hawaii Department of Transportation, Highways Division (HDOT) and the City & County of Honolulu Department of Planning & Permitting (DPP) Traffic Review Branch staff. Traffic operations of seven (7) key intersections were evaluated with level of service calculations during the weekday evening (PM) and Saturday mid-day (Sat) peak periods for Existing, Existing plus Project, Cumulative Year 2017, and Cumulative Year 2017 plus Project conditions.

The project, a mix of restaurant and retail land uses, is anticipated to generate approximately 1,860 weekday vehicle trips, including 214 vehicle trips during the weekday PM peak hour; and 2,460 Saturday daily trips, including 225 in the midday peak hour. Because the mix of land uses proposed on the site would result in much more site-generated traffic in the Saturday midday peak hour than in the weekday AM peak hour, and because a review of recent TIARs shows that AM peak hour levels of service in the project area are generally better than in the PM peak hour, this study focuses on the peak hours listed above. The project will increase delays at the seven study intersections; however no significant traffic impacts were identified at any of the study intersections.

Generally, the proposed project is not expected to substantially increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities. The installation of bicycle racks is recommended to provide secure bicycle storage within sight of employees and customers.

1. INTRODUCTION

This report presents the results of the transportation impact analysis report (TIAR) for the proposed Kewalo Basin restaurant and retail development located in Kaka'ako on the island of Oahu. The proposed project is a multi-use facility encompassing approximately 2.1 acres within Kewalo Basin and located between Kewalo Basin Harbor and Ala Moana Beach Park on the site of an existing surface parking lot. The multi-use facility will consist of four two-level buildings and a planned 250-space parking structure providing approximately 12,060 square feet of quality restaurant space, including accommodations for events for up to 200 people, 18,440 square feet of café space, and 4,300 square feet of retail space. The project will fully replace the existing 109 surface parking spaces that occupy the project site and will also provide the code-required parking supply for the new uses.

PROJECT STUDY AREA

The purpose of this analysis is to identify impacts of the proposed project on the surrounding transportation system. **Figure 1** illustrates the analyzed intersections and surrounding study area in Kaka'ako, and **Figure 2** displays the proposed site plan.

STUDY INTERSECTIONS

The transportation analysis evaluated the operations of the following seven signalized intersections in the project vicinity, following consultation with HDOT and DPP staff:

1) Ward Ave / Kapiolani Blvd
2) Kamakee St / Kapiolani Blvd
3) Piikoi St / Kapiolani Blvd
4) Ward Ave / Ala Moana Blvd
5) Kewalo Basin Dwy / Ala Moana Blvd
6) Kamakee St / Ala Moana Blvd
7) Piikoi St / Ala Moana Blvd

For the purposes of this report, Kapiolani Boulevard and Ala Moana Boulevard are treated as east-west roadways, while Ward Avenue, Kamakee Street, and Piikoi Street are treated as north-south streets.

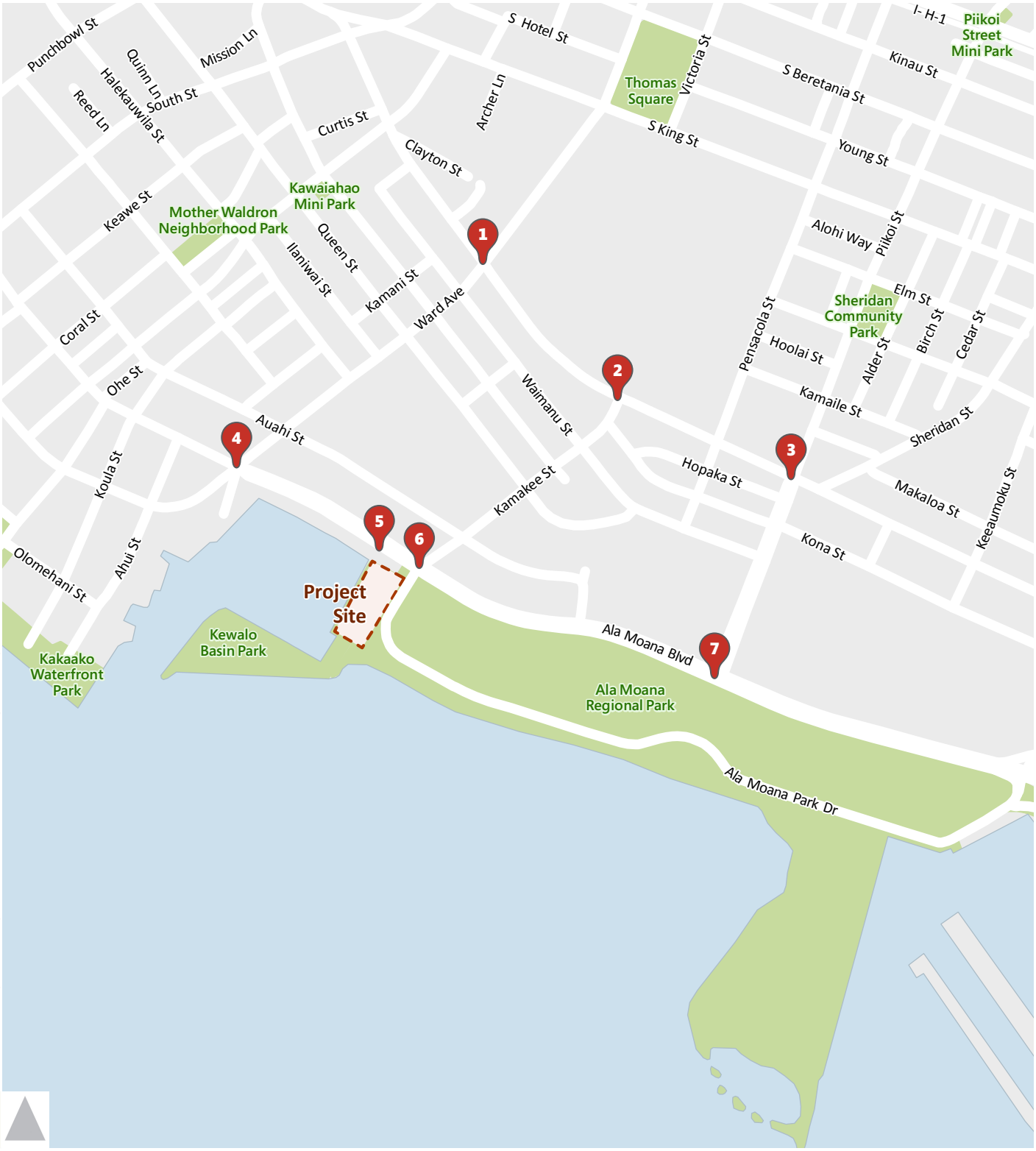

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Figure 1

Study Area and Analyzed Study Intersections

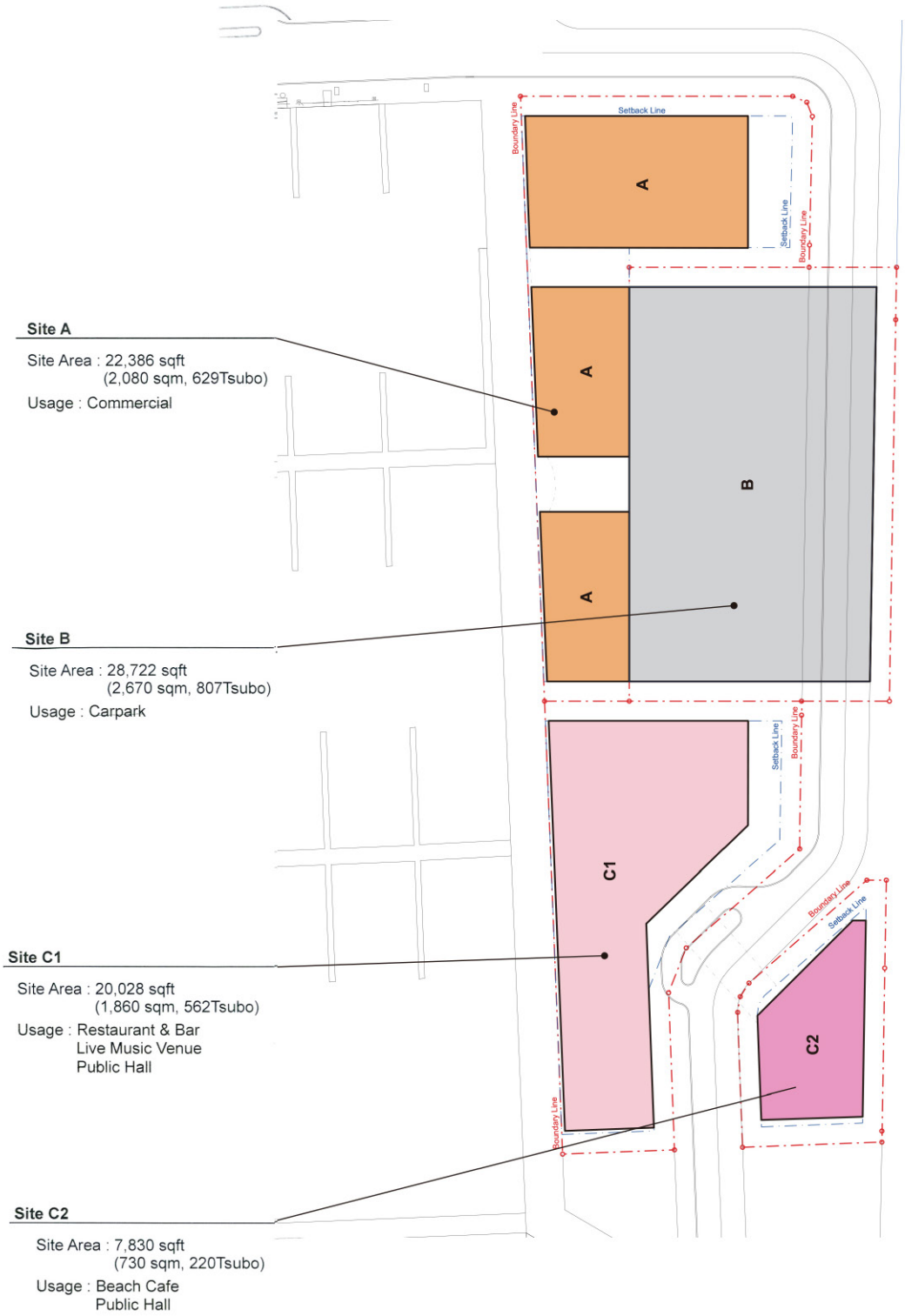


Figure 2

Proposed Project Site Plan

INTERSECTION ANALYSIS SCENARIOS

The operations of the study intersections were evaluated during the weekday afternoon peak hour (the highest volume in any one-hour period between 4:00 pm and 6:00 pm) and the Saturday midday peak hour (the highest volume in any one-hour period between 12:00 Noon to 2:00 pm) peak hours for the following scenarios:

- **Scenario 1: Existing Conditions** – Existing volumes obtained from new counts.
- **Scenario 2: Existing Plus Project Conditions** – Traffic volumes from Scenario 1 plus traffic estimated and anticipated from project build-out and full occupancy.
- **Scenario 3: Cumulative Year 2017 Conditions** – Existing volumes increased by an annual growth factor and additional traffic anticipated from related projects in the study area expected to be constructed and occupied by the Cumulative Year 2017.
- **Scenario 4: Cumulative Year 2017 Plus Project Conditions** – Traffic volumes from Scenario 3 plus traffic estimated and anticipated from project build-out and full occupancy.

TRAFFIC ANALYSIS METHODS

The operations of roadway facilities are described with the term level of service (LOS). LOS is a qualitative description of traffic flow based on such factors as speed, travel time, delay, and freedom to maneuver. Six levels are defined from LOS A, with the least congested operating conditions, to LOS F, with the most congested operating conditions. LOS E represents "at-capacity" operations. Operations are designated as LOS F when volumes exceed capacity, resulting in stop-and-go conditions. The methodology for signalized intersections is described below.

The method described in Chapter 16 of the 2000 *Highway Capacity Manual* (HCM) (Special Report 2009, Transportation Research Board) was used to prepare the LOS calculations for the signalized study intersections. This LOS method analyzes a signalized intersection's operation based on average control delay per vehicle. Control delay includes the initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. The average control delay for signalized intersections is calculated using Synchro analysis software and is correlated to a LOS designation as shown in **Table 1**.

TABLE 1 SIGNALIZED INTERSECTION LEVEL OF SERVICE DEFINITIONS		
Level of Service	**Description**	**Average Control Delay Per Vehicle (Seconds)**
A	Operations with very low delay occurring with favorable progression and/or short cycle lengths.	≤ 10.0
B	Operations with low delay occurring with good progression and/or short cycle lengths.	10.1 to 20.0
C	Operations with average delays resulting from fair progression and/or longer cycle lengths. Individual cycle failures begin to appear.	20.1 to 35.0
D	Operations with longer delays due to a combination of unfavorable progression, long cycle lengths, and high V/C ratios. Many vehicles stop and individual cycle failures are noticeable.	35.1 to 55.0
E	Operations with high delay values indicating poor progression, long cycle lengths, and high V/C ratios. Individual cycle failures are frequent occurrences.	55.1 to 80.0
F	Operations with delays unacceptable to most drivers occurring due to over-saturation, poor progression, or very long cycle lengths.	> 80.0

Source: *Highway Capacity Manual*, Transportation Research Board, 2000.

SIGNIFICANT IMPACT CRITERIA

The analysis of future conditions compares baseline scenarios without and with project traffic to determine whether the project traffic would result in a significant impact on the surrounding roadways. Based on previous studies conducted for the City & County of Honolulu, the minimum desirable operating standard for a signalized intersection is LOS D. Additionally, the Hawaii Department of Transportation (HDOT) strives to universally maintain LOS D conditions and in the Draft *Best Practices for Traffic Impact Reports* (HDOT 37) defines a significant impact when the operations of an intersection, turning movement, or roadway segment changes from LOS D or better to LOS E or F. Also when evaluating intersection approach LOS at any location, other factors should be considered in the analysis, such as traffic volumes, volume-to-capacity (V/C) ratios (should ideally be less than 1.00), and secondary impacts to pedestrian, bicycle, and transit travel.

Each of the identified significant impacts could be further categorized as either a cumulative impact or a project-related impact. If the addition of project traffic is expected to degrade acceptable service levels (LOS D or better) to unacceptable service levels (LOS E or F) then the project is considered to have a project-specific impact. Whereas, if the LOS for any roadway element is LOS E or F without the project and the project adds traffic to this location, causing the delay to increase by 5% or more, then this would be characterized as a cumulative impact.

The City and County of Honolulu does not specify impact criteria for pedestrian, bicycle, and transit impacts. However, these impacts are generally evaluated based on whether a proposed project would: 1) conflict with existing or planned pedestrian, bicycle, or transit facilities, or 2) create walking, bicycling, or transit use demand without providing adequate and appropriate facilities for non-motorized mobility. The existing amenities for pedestrians, bicycles, and transit users were inventoried to evaluate the quality of the facilities in place today. The assessment of planned facilities outlined in planning documents, including the draft Oahu Bike Plan for the City & County of Honolulu adopted in August 2012, were used to evaluate future conditions for non-automobile modes.

REPORT ORGANIZATION

The remainder of this report is divided into six chapters. The existing transportation system serving the project site, located at the intersection of the Kewalo Basin Driveway and Ala Moana Boulevard, and the current operating conditions of the key intersections are described in **Chapter 2**. **Chapter 3** presents the analysis and results for Existing plus Project Conditions. **Chapter 4** summarizes the methodologies used to forecast Cumulative Year 2017 traffic volumes and intersection operations. **Chapter 5** presents the analysis and results for Cumulative Year 2017 plus Project conditions. **Chapter 6** summarizes the project-specific and cumulative impacts to the study area and discusses potential mitigation measures.

2. EXISTING CONDITIONS

This chapter describes the existing roadway network and includes a discussion of the bicycle, pedestrian, and transit facilities located in the project study area. This chapter also includes a discussion of the existing intersection LOS results.

EXISTING TRANSPORTATION FACILITIES

This section describes the relevant roadway facilities within the study area, as well as the existing transit, bicycle, and pedestrian facilities.

EXISTING STREET SYSTEM

Local access to the project site is provided by Ala Moana Boulevard, and the key roadways providing access to the site are described below. Figure 1 illustrates the project location and the surrounding roadway system.

Ward Avenue is a north-south roadway providing access between Ala Moana Boulevard and the H-1 Freeway. The street provides two lanes in each direction, with a center left-turn lane. Ward Avenue terminates south of Ala Moana Boulevard at the intersection with Ahui Street. Both sides of the street are lined by commercial retail land uses, and on-street parallel parking is provided on both sides between Ala Moana Boulevard and Queen Street. The posted speed limit is 25 mph.

Kamakee Street is a north-south street providing access connecting Ala Moana Boulevard with Kapiolani Boulevard where it terminates. Both sides of the street are lined by commercial retail land uses. South of Kapiolani Boulevard, Kamakee Street is two lanes in each direction. South of Queen Street the roadway adds a third lane southbound, and the Auahi Street intersection features separate right-turn, through, and left-turn lanes on the southbound approach. South of Auahi Street, Kamakee Street has a shared through and left-turn lane, and a separate right-turn lane at the southbound approach for the Ala Moana Boulevard intersection. South of Ala Moana Boulevard, Kamakee Street becomes Ala Moana Park Drive, an internal roadway within Ala Moana Park. On-street parallel parking is provided along sections of Kamakee Street, at least on one side of the street. The posted speed limit is 25 mph.

Piikoi Street is a north-west roadway that provides a connection between Ala Moana Boulevard and the H-1 Freeway. North of Kapiolani Boulevard, the facility is one-way with four northbound travel lanes and on-street parking on both sides. South of Kapiolani Boulevard, the facility is two-way with four northbound

travel lanes and two southbound travel lanes. On-street parking is provided on the west side of the roadway. Both sides of the facility are lined by commercial retail land uses. The posted speed limit is 25 mph.

Kapiolani Boulevard is an east-west roadway that connects between King Street, Kalakaua Avenue, and University Avenue. The facility also operates a contra-flow lane during the peak hours so that the AM peak period has four through lanes westbound, and during the PM peak period has four through lanes eastbound. Eastbound left-turns are prohibited at all times, while westbound left-turns are prohibited on Kapiolani Boulevard during the weekday evening peak period. Both sides of the facility are lined by commercial retail and office land uses. The posted speed limit is 35 mph.

Ala Moana Boulevard is an east-west facility which becomes Nimitz Highway on the western end and Kalakaua Avenue on the eastern end. In the vicinity of the project site, the roadway provides three lanes in each direction with a raised center median. The facility is mauka of Ala Moana Beach Park and is otherwise bordered by commercial retail land uses. The posted speed limit is 35 mph.

EXISITING TRANSIT SERVICES

"The Bus" is Oahu's primary form of public transit. This system provides access within the greater urban area of Honolulu, as well as in communities on the North Shore and Windward Coast. The study area is well served by bus stops and wide range of bus lines as illustrated in **Figure 3**. The bus stops serving the project site include stops along Ala Moana Boulevard, Ward Avenue, Kapiolani Boulevard, Piikoi Street, and Auahi Street. Nearly each line of the extensive bus transit service in the area operates seven days per week, including state holidays. They connect the surrounding Kaka'ako area with destinations such as Waikiki, downtown, and the University of Hawaii at Manoa. Most bus routes provide service at headways of between 10 and 20 minutes. Others, such as the Route 18 bus service beween Ala Moana Center and University Avenue provide service at 60-minute headways.

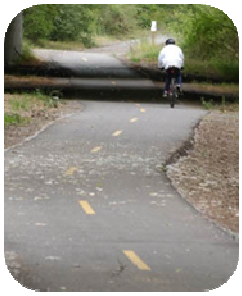
There are 23 fixed-route bus lines that serve the study area:

- Route 3
- Route 6
- Route 8
- Route 9
- Route 13
- Route 17
- Route 18
- Route 19
- Route 20
- Route 23
- Route 40
- Route 42
- Route 52
- Route 53
- Route 55
- Route 56
- Route 57, 57A
- Route 62
- Route 65
- Route 88A
- Route A
- Route C

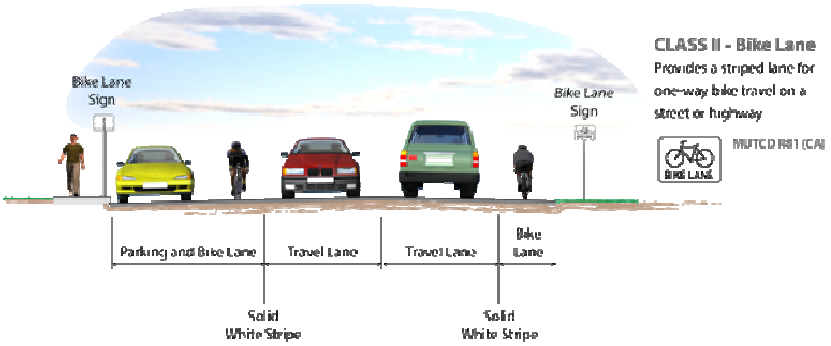
EXISTING BICYCLE FACILITIES

Bicycle facilities generally consist of three types of facilities, which are outlined below:

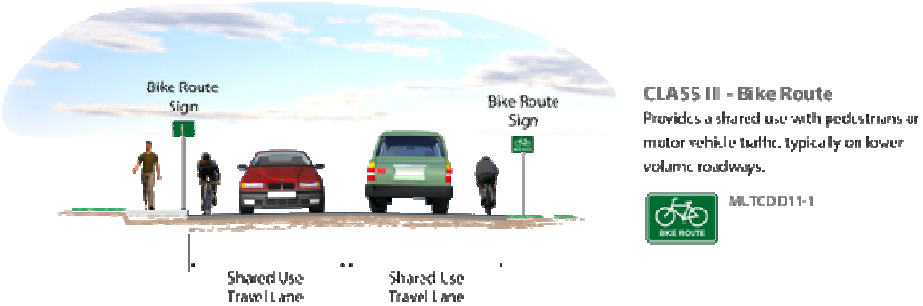
- *Bike or Shared Use Paths* provide a completely separate right-of-way and is designated for the exclusive use of bicycles and pedestrians with vehicle and pedestrian cross-flow minimized. Generally, the recommended pavement width for a two-directional shared use path is ten (10) feet.



- *Bike Lanes* provide a restricted right-of-way and is designated for the use of bicycles with a striped lane on a street or highway. Bicycle lanes are generally five (5) feet wide. Adjacent vehicle parking and vehicle/pedestrian cross-flow are permitted.



- *Bike Route or Signed Shared Roadways* provide for a right-of-way designated by signs or pavement markings for shared use with pedestrians or motor vehicles.



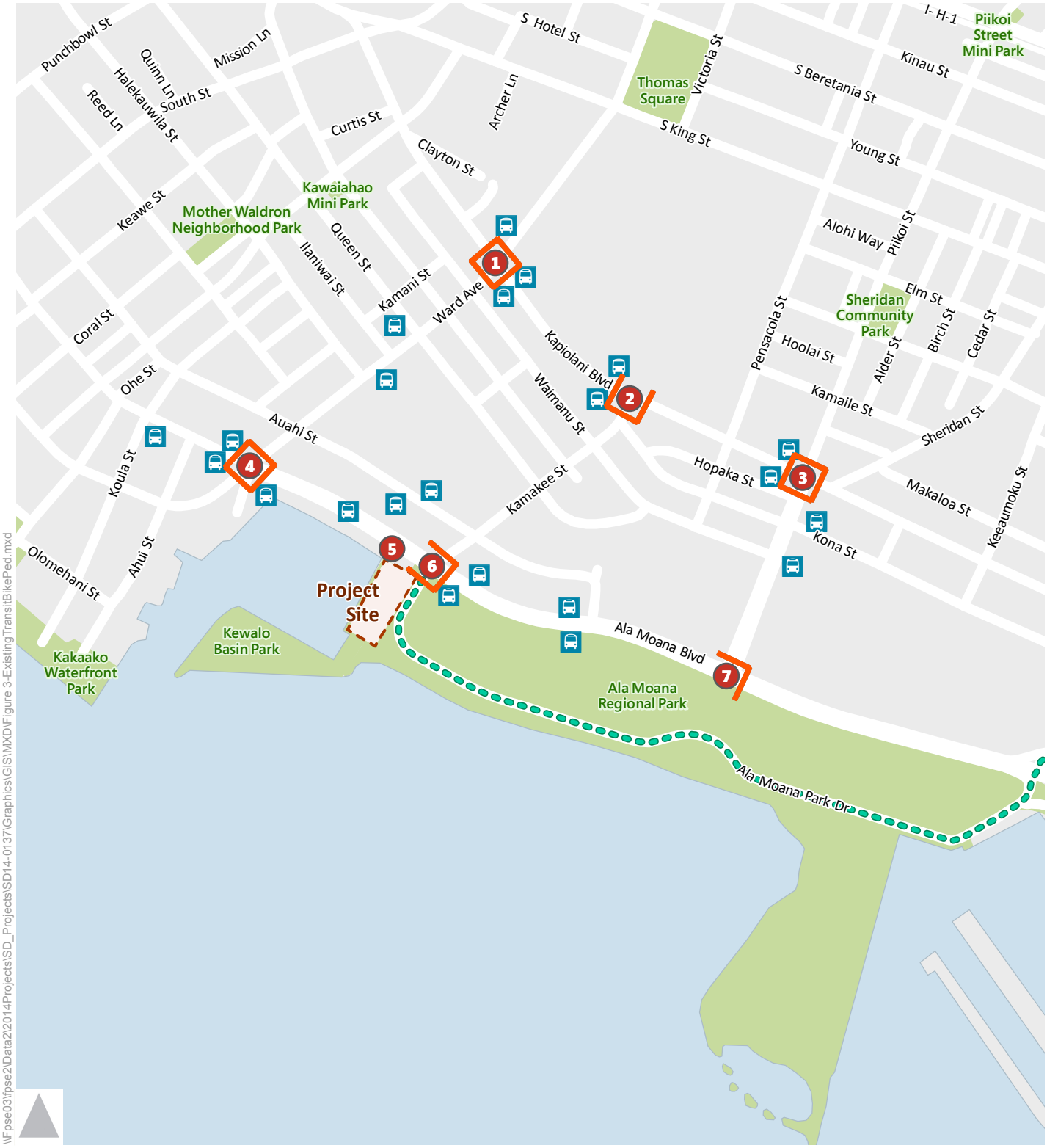
While there is a network of bike paths in Ala Moana Beach Park, there is little bicycle infrastructure elsewhere in the Kaka'ako and Ala Moana area.

EXISTING PEDESTRIAN FACILITES

Pedestrian facilities consist of sidewalks, crosswalks, and pedestrian signals at signalized intersections. Pedestrian facilities are available throughout the project study area. For example, sidewalks are provided on both sides of Ward Avenue, Ala Moana Boulevard, Kapiolani Boulevard, and Piikoi Street.

Pedestrian facilities at the existing study intersections are described below:

- Intersection 1: Ward Avenue & Kapiolani Boulevard
    - Signalized with marked crosswalks and pedestrian signals on all four legs
- Intersection 2: Kamakee Street & Kapiolani Boulevard
    - Signalized with marked crosswalk and pedestrian signals on all three legs, north leg provides a sidewalk.
- Intersection 3: Piikoi Street & Kapiolani Boulevard
    - Signalized with marked crosswalks and pedestrian signals on all four legs
- Intersection 4: Ward Avenue & Ala Moana Boulevard
    - Signalized with marked crosswalks and pedestrian signals on all four legs, north and south legs have a raised refuge island breaking up the crosswalk.
- Intersection 5: Kewalo Basin Driveway & Ala Moana Boulevard
    - Signalized with marked crosswalk and pedestrian signals on south leg only
- Intersection 6: Kamakee Street & Ala Moana Boulevard
    - Signalized with marked crosswalks and pedestrian signals on three legs, north leg has a raised refuge island breaking up the crosswalk.
- Intersection 7: Piikoi Street & Ala Moana Boulevard
    - Signalized with marked crosswalks and pedestrian signals on two legs, both provide refuge areas in raised center median.



\\Fpse03\fpse2\Data2\2014Projects\SD_Projects\SD14-0137\Graphics\GIS\MXD\Figure 3-ExistingTransitBikePed.mxd

Figure 3

Existing Bicycle, Pedestrian, and Transit Facilities

EXISTING INTERSECTION VOLUMES AND LANE CONFIGURATIONS

The operations of the seven (7) study intersections were evaluated during the weekday evening (4:00 pm to 6:00 PM) and Saturday mid-day (12:00 noon to 2:00 pm) peak-period conditions. Traffic counts were conducted during the PM and Saturday mid-day peak periods at the study intersections on Tuesday, September 30th, 2014 and Saturday, October 4th, 2014 with local schools and colleges in session. Existing lane configurations, signal cycle lengths and signal controls were obtained through field observations. **Figure 4** presents the existing PM and Saturday mid-day peak-hour turning movement volumes, corresponding lane configurations and traffic control devices. The raw traffic counts are contained in Appendix A.

FIELD OBSERVATIONS

A field visit was completed in September 2014 to verify existing lane configurations, traffic controls, and operating conditions. These observations showed generally minimal delays at the study intersections. During the PM peak period, some queues were observed for eastbound vehicles at the Kamakee Street / Ala Moana Boulevard intersection which extended into the adjacent signalized intersection at Kewalo Basin Driveway / Ala Moana Boulevard which is approximately 300 feet east. However, these queues were only observed once or twice during the hour and since the signals are coordinated on Ala Moana Boulevard between Ward Avenue, Kewalo Basin Driveway, and Kamakee Street, the queues do not become excessive, and vehicles for the most part are able to clear the intersection.

While Kapiolani Boulevard and Ala Moana Boulevard experiences frequent pedestrian activity as a result of the commercial retail uses, which exist throughout the study area, it does not significantly impact the traffic operations at the study intersections. Vehicles do not experience extensive delay in their turning movements, and are able to safely share the roadway with the few bicyclists observed.

EXISTING INTERSECTION LEVELS OF SERVICE

Existing peak-hour volumes and lane configurations were used to calculate levels of service for each of the study intersections. The results of the existing LOS analysis are presented in **Table 2** and the corresponding LOS calculation sheets are included in Appendix B. The results of the LOS calculations indicate that all of the study intersections operate at acceptable service levels (LOS D or better).

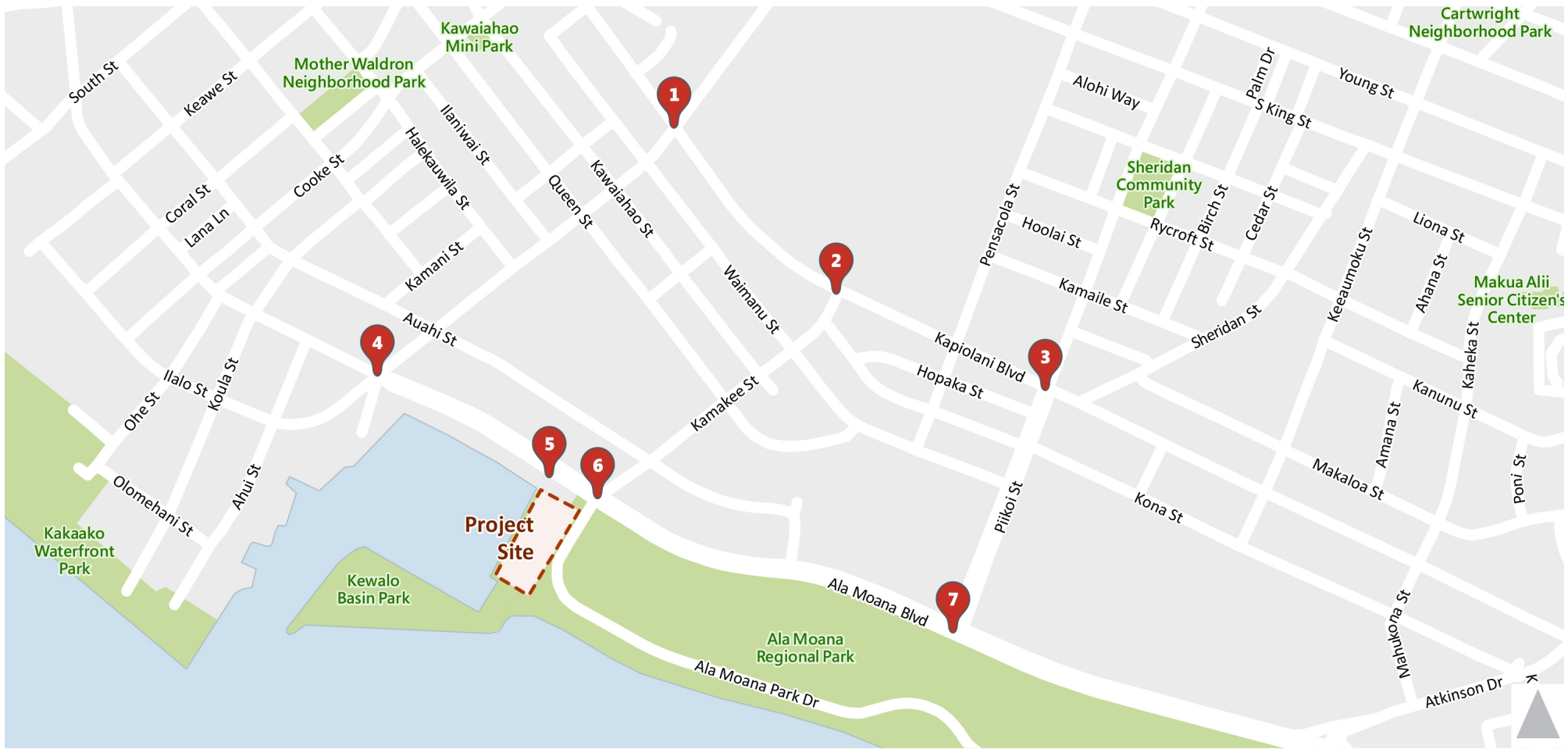
The field observations at the Kewalo Basin Driveway / Ala Moana Boulevard intersection are generally consistent with the calculated level of service results. While eastbound vehicle queues from the Kamakee Street / Ala Moana Boulevard intersection did extend back to the Kewalo Basin Driveway, this occurred only once or twice over the course of the hour.

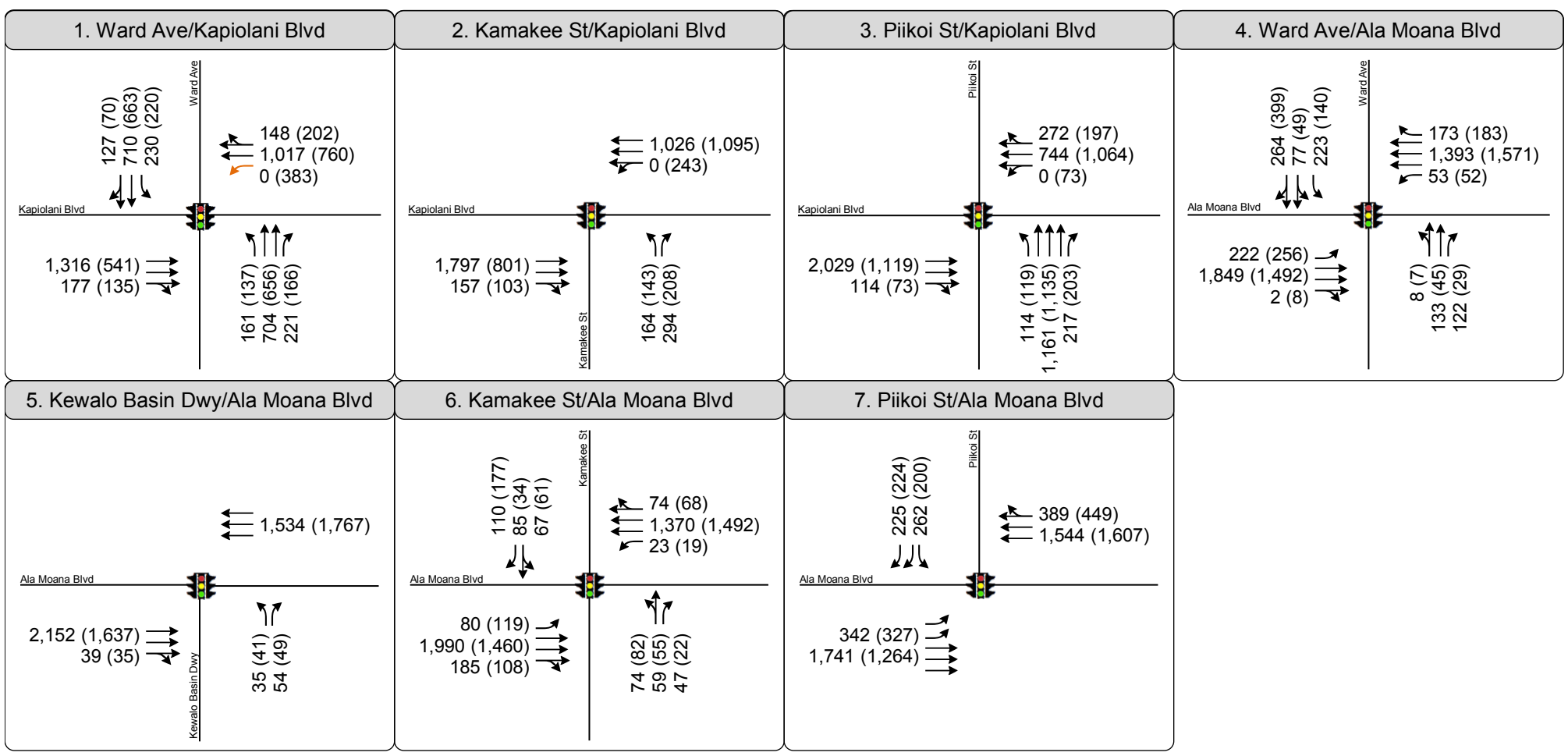
TABLE 2 EXISTING INTERSECTION PEAK HOUR LOS RESULTS

No.	Intersection	Control	Existing Without Project			
			Weekday PM		Saturday	
			Delay[1]	LOS[2]	Delay[1]	LOS[2]
1	Ward Ave / Kapiolani Blvd	Signalized	33.3	C	45.5	D
2	Kamakee St / Kapiolani Blvd	Signalized	11.8	B	8.4	A
3	Piikoi St / Kapiolani Blvd	Signalized	21.0	C	17.0	B
4	Ward Ave / Ala Moana Blvd	Signalized	38.6	D	30.3	C
5	Kewalo Basin Dwy / Ala Moana Blvd	Signalized	4.0	A	4.6	A
6	Kamakee St / Ala Moana Blvd	Signalized	19.4	B	16.3	B
7	Piikoi St / Ala Moana Blvd	Signalized	34.5	C	20.9	C

Source: Fehr & Peers, 2014.
Note:
1. Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized intersections.
2. LOS calculations performed using the *2000 Highway Capacity Manual (HCM)* method.

As the table above shows, all study intersections are currently operating at acceptable levels of service during both the weekday PM and the Saturday mid-day peak hours.





Legend

XX (XX) PM (Saturday)

Eastbound contra flow lane during PM peak

Figure 4

Peak Hour Traffic Volumes and Lane Configurations - Existing Conditions

3. EXISTING PLUS PROJECT CONDITIONS

PROJECT TRIP ESTIMATES

The amount of traffic added to the roadway system by proposed development is estimated using a three-step process: (1) trip generation, (2) trip distribution, and (3) trip assignment. The first step estimates the amount of traffic added to the roadway network. The second step estimates the direction of travel to and from the project site. The new trips are assigned to specific street segments and intersection turning movements during the third step. The results of the process for the proposed project are described in the following sections.

TRIP GENERATION ESTIMATES

Trip generation for the project was estimated based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in Trip Generation Manual, 9th Edition (2012). These rates are based on counts "collected at suburban locations having little or no transit service, nearby pedestrian amenities, or travel demand management (TDM) programs." A trip reduction based on the proximity of transit was based in part on a recently approved study, 600 Ala Moana Boulevard (June 2013) which is comprised of both residential and retail land uses. This project is slightly more than one-half mile from Kewalo Basin, and the transit reduction was applied to both the residential and retail uses. There are approximately 35 different bus lines which operate within ¾ mile of Kewalo Basin, and 23 bus stops, which indicates an above average transit service. While the ITE rates do account for transit in their estimations, these studies are based on sites in various locations throughout the country where transit service is probably very different from Kewalo Basin. The trip generation methodology developed by ITE also includes provisions for pass-by trips and internal capture of trips. Pass-by trips are generated when vehicles that would be traveling through the area whether or not the project was developed make an intermediate stop at the project site between their origin and primary destination. Internal capture of trips accounts for vehicles that visit more than one destination within the same area without adding external vehicular trips to the surrounding major roadways. These factors may reduce the number of vehicular trips added to the surrounding major roadways, and the trip generation characteristics for the proposed project were adjusted to account for the influence of these factors.

A 10% transit credit was applied to all land uses, while a 20% pedestrian credit was applied to all land uses with the exception of the Quality Restaurant, which was estimated as a 10% pedestrian credit. It was assumed that customers attending the Quality Restaurant might be less inclined to walk and so there would be less of a trip reduction.It should be noted that the City and County of Honolulu is planning to

develop a fixed-guideway transit system that will extend from Kapolei to the central Honolulu area, thereby providing an alternate mode of travel through the Kaka'ako area. That project will include a transit station within easy walking distance of the project site near Ward Avenue / Halekauila Street. However, the schedule for opening light rail transit service to this station is 2019. As such, the influence of the resulting increased transit service in the project vicinity will not be incorporated into the 2017 analysis for this study. A portion of the trips generated by the proposed project will be made by vehicles that are currently traveling by or near the site today. These "pass-by" trips are not new trips to the study area but are already traveling on streets fronting the site (i.e., Ala Moana Boulevard). These "pass-by" trips will access the site either by turning right into the Kewalo Basin Driveway or by making a u-turn at the Ward Avenue / Ala Moana Boulevard intersection to make a right-turn into the Kewalo Basin Driveway, and they will exit at the same point to continue to their original path of travel. Based on data for this land use in the ITE *Trip Generation Handbook (9th Edition),* 25 percent of the total project trips resulting from the retail land uses and 35 percent of the total project trips resulting from the restaurant land uses are estimated to be pass-by trip. The remaining trips are "primary" trips that are made by vehicles that will originate from outside the immediate project vicinity for the specific reason of visiting the new use on the project site. Although the ITE data would allow a greater reduction for pass-by trips for both retail and restaurant uses, a maximum of 25 and 35 percent was applied to provide a more conservative analysis.

The project's trip generation estimates are presented in **Table 3** and include approximately 1,860 weekday vehicle trips, including 107 in the AM peak hour and 214 in the PM peak hour; and 2,459 Saturday daily trips including 225 in the midday peak hour. These trip generation estimates are for discussion and may be modified as the detailed mix of uses is finalized and the study proceeds.

The net new project trips will be distributed and assigned to the roadway network as described in the trip distribution and study intersection sections below.

TABLE 3 PROJECT TRIP GENERATION

	Units	Daily		PM Peak Hour				Saturday Daily		Saturday Peak Hour			
		Rate[1]	Trips	Rate[1]	Total	In	Out	Rate[1]	Trips	Rate[1]	Total	In	Out
Specialty Retail *(A)*	4.31 ksf	44.32	191	2.71	12	6	6	42.04	181	4.06	17	9	8
Internal Capture[2] (B)		*10%*	*(19)*	*10%*	*(2)*	*(1)*	*(1)*	*10%*	*(18)*	*10%*	*(2)*	*(1)*	*(1)*
Transit Credit[3] (C)		*10%*	*(17)*	*10%*	*(2)*	*(1)*	*(1)*	*10%*	*(16)*	*10%*	*(2)*	*(1)*	*(1)*
Pedestrian Credit[4] (D)		*20%*	*(31)*	*20%*	*(2)*	*(1)*	*(1)*	*20%*	*(29)*	*20%*	*(2)*	*(1)*	*(1)*
Pass-by Credit[5] (E)		*25%*	*(31)*	*25%*	*0*	*0*	*0*	*25%*	*(29)*	*25%*	*(2)*	*(1)*	*(1)*
Gross Project Trips *(F) where F=A–B-C-D-E*			**93**		**6**	**3**	**3**		**89**		**9**	**5**	**4**
Restaurant – Dinner (A)	12.1 ksf	89.95	1,085	7.49	90	60	30		1,138	10.82	130	77	53
Transit Credit[3] (B)		10%	(109)	10%	(9)	(6)	(3)	10%	(114)	10%	(13)	(8)	(5)
Pedestrian Credit[4] (C)		10%	(98)	10%	(8)	(5)	(3)	10%	(102)	10%	(12)	(7)	(5)
Pass-by Credit[5] (D)		35%	(307)	35%	(25)	(17)	(8)	35%	(358)	35%	(36)	(21)	(15)
Gross Project Trips *(E) where E=A-B-C-D*			**571**		**48**	**32**	**16**		**564**		**69**	**41**	**28**
Restaurant – Café (A)	18.4 ksf	127.15	2,344	9.85	182	110	72		2,920	8.44	156	82	74
Transit Credit[3] (B)		10%	(234)	10%	(18)	(10)	(8)	10%	(292)	10%	(17)	(9)	(8)
Pedestrian Credit[4] (C)		20%	(423)	20%	(34)	(20)	(14)	20%	(526)	20%	(29)	(15)	(14)
Pass-by Credit[5] (D)		35%	(737)	35%	(42)	(26)	(16)	35%	(734)	35%	(35)	(19)	(16)
Gross Project Trips *(E) where E=A-B-C-D*			**950**		**88**	**54**	**34**		**1,368**		**75**	**39**	**36**
Event Space	N/A												
240 Guests (A)		0.8	192	0.3	72	72	0	1.6	384	0.3	72	0	72
30 Staff (B)		1.8	54	0.0	0	0	0	1.8	54	0.0	0	0	0
Gross Project Trips *(C) where C=A+B*			**246**		**72**	**72**	**0**		**438**		**72**	**0**	**72**
Net New Project Trips			**1,860**		**214**	**161**	**53**		**2,459**		**225**	**85**	**140**

Notes:
1. Based on ITE Trip Generation Manual 9th Edition
2. Applied reduction based on multiple trips within the site
3. Applied reduction based on established transit routes within vicinity of project
4. Applied reduction based on hotels, shopping, and restaurants within walking distance
5. Applied reduction to account for drivers making intermediate stops

Source: Fehr & Peers, 2014

TRIP DISTRIBUTION AND ASSIGNMENT

Trip distribution is defined as the directions of approach and departure that vehicles would use to arrive and depart from the site. The trip distribution was developed based on the location of complementary land uses, as well as trip distribution assumptions used in recent TIARs for other projects in the vicinity. These assumptions are as follows:

- H-1 Highway via Ward Avenue or Kamakee Street – 25%
- Within Kaka'ako – 25%
- Ewa-bound on Ala Moana Boulevard – 25%
- Diamondhead-bound on Ala Moana Boulevard or Kapiolani Street – 25%

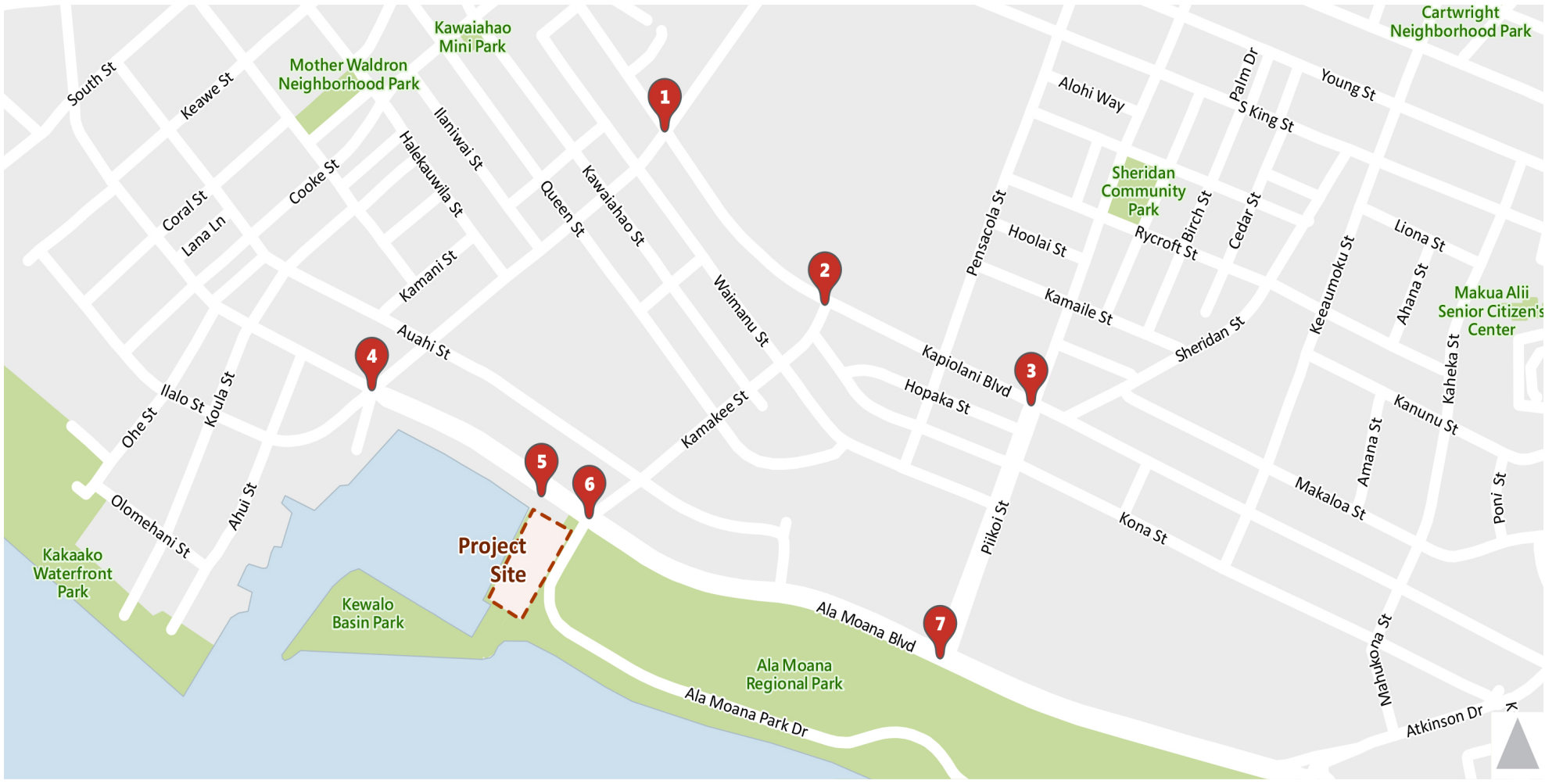
Distribution patterns do differ between the analyzed peak hours due to the prohibited westbound left-turns on Kapiolani Boulevard during the weekday PM peak period. This movement is permitted during the Saturday mid-day peak period and therefore trips to and from the Diamondhead direction would be expected to use different routes in each of the two analyzed peak hours.

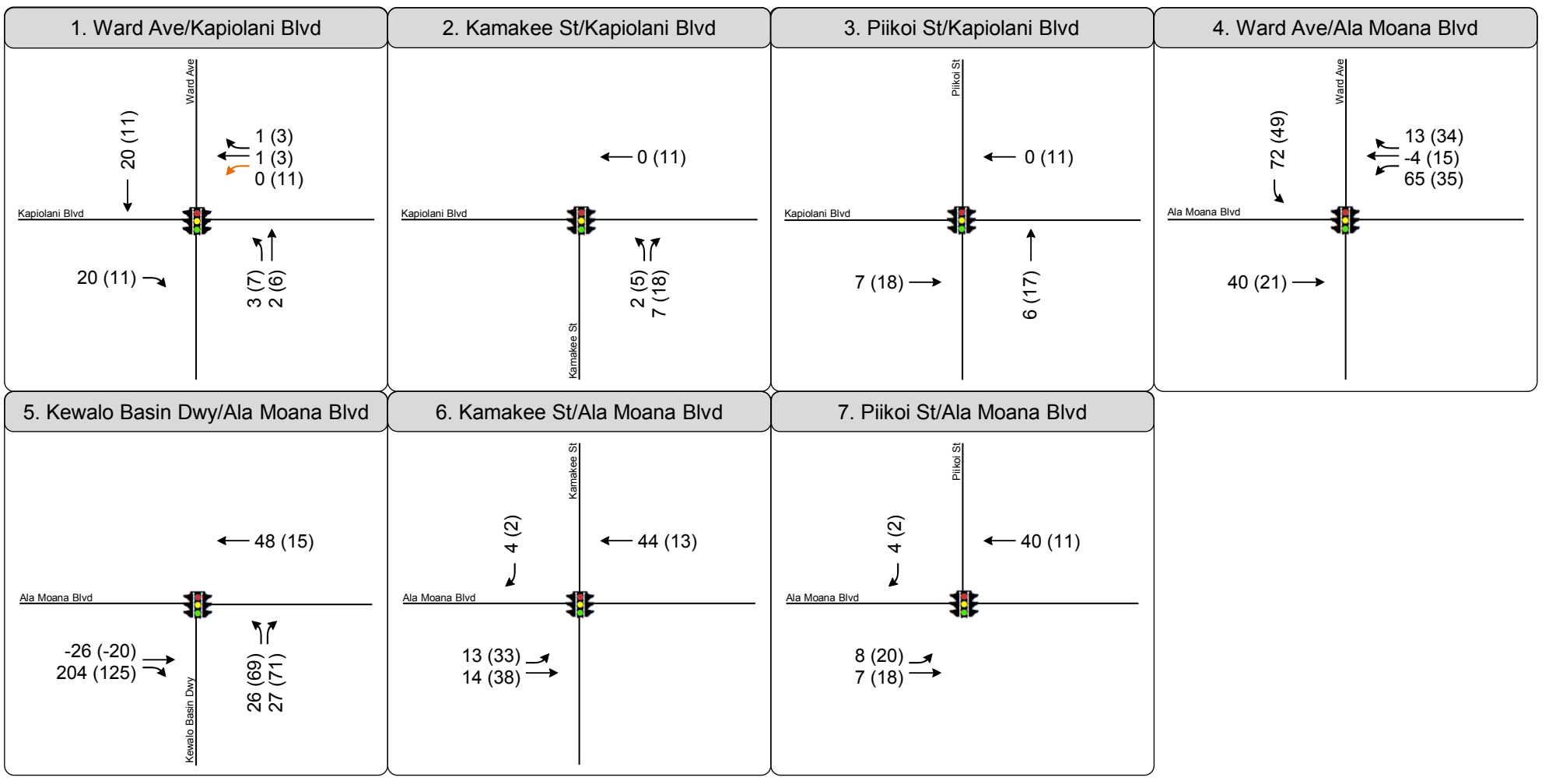
The project trips were assigned to the roadway network based on the trip distribution pattern discussed above and shown in **Figure 5** below. **Figure 6** shows the PM and Saturday mid-day peak-hour project trips assigned to each turning movement at the study intersections.

Figure 7 illustrates the Existing plus Project turning movement volumes, and **Table 4** displays the results of the Existing plus Project intersection operations analysis. The table shows that all study intersections will continue to operate at acceptable levels of service under Existing plus Project Conditions, with the project. As a result, the proposed project does not cause any significant impacts to the roadway network under Existing Conditions.

Figure 5

Project Trip Distribution





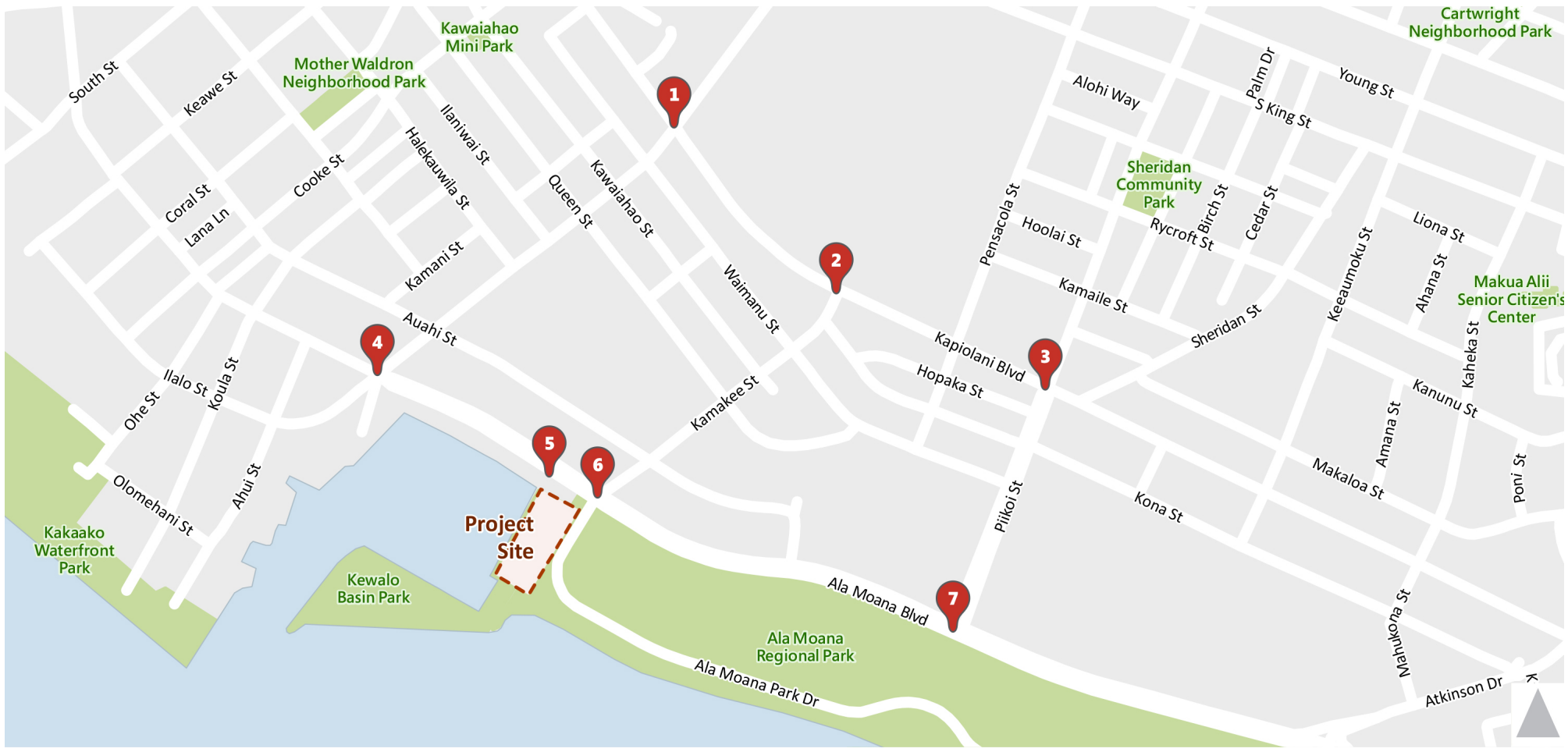
Legend

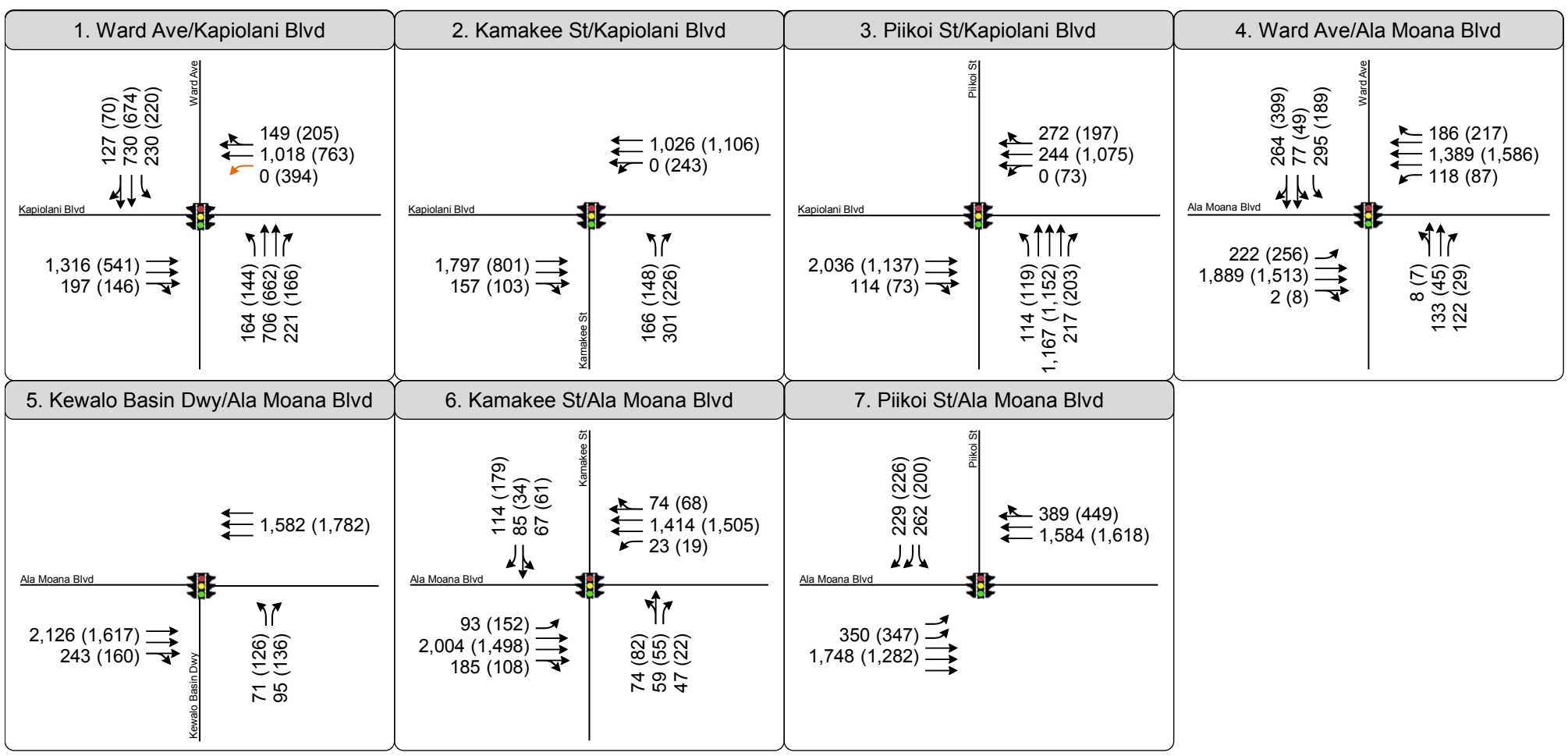
XX (XX) PM (Saturday)

Westbound contra flow lane during PM peak

Figure 6

Project Trip Assignment





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XX (XX) PM (Saturday)

Eastbound contra flow lane during PM peak

Figure 7

Peak Hour Traffic Volumes and Lane Configurations - Existing Plus Project Conditions

TABLE 4 EXISTING PLUS PROJECT INTERSECTION PEAK HOUR LOS RESULTS

#	Intersection	Control	Weekday PM						Saturday Mid-day					
			Without Project		With Project		Δ	S?	Without Project		With Project		Δ	S?
			Delay	LOS	Delay	LOS			Delay	LOS	Delay	LOS		
1	Ward Ave / Kapiolani Blvd	Signalized	33.3	C	33.8	C	0.5	N	45.5	D	46.7	D	1.2	N
2	Kamakee St / Kapiolani Blvd	Signalized	11.8	B	12.1	B	0.3	N	8.4	A	8.7	A	0.3	N
3	Piikoi St / Kapiolani Blvd	Signalized	21.0	C	21.1	C	0.1	N	17.0	B	17.3	B	0.3	N
4	Ward Ave / Ala Moana Blvd	Signalized	38.6	D	43.5	D	4.9	N	30.3	C	33.6	C	3.3	N
5	Kewalo Basin Dwy / Ala Moana Blvd	Signalized	4.0	A	5.4	A	1.4	N	4.6	A	6.6	A	2.0	N
6	Kamakee St / Ala Moana Blvd	Signalized	19.4	B	19.8	B	0.4	N	16.3	B	17.1	B	0.8	N
7	Piikoi St / Ala Moana Blvd	Signalized	34.5	C	34.5	C	0.0	N	20.9	C	21.3	C	0.4	N

Source: Fehr & Peers, 2014
Note:
1. Whole intersection weighted average stopped delay expressed in seconds per vehicle for signalized intersections.
2. LOS calculations performed using the *2000 Highway Capacity Manual (HCM)* method.

The table above shows that all study intersections will continue to operate acceptably during both peak hours under Existing plus Project Conditions. The project will not result in any significant traffic impacts under this scenario.

No significant traffic impacts are anticipated with development and operation of the proposed project. Intersections will to operate unacceptably during the Cumulative Year 2017 without and with the project. The resulting increase in average vehicle delay is less than five percent and therefore the impacts to the roadway are less than significant. The distribution and assignment of project traffic analysis was completed assuming normal travel patterns and driver choices regarding the street network and access to and from the H-1 Highway. Vehicles traveling both ewa- and diamondhead-bound on H-1 will access the site via ramps at Punchbowl Street, Piikoi Street, or Ward Avenue. Additionally, the street network within Kaka'ako provides a sufficient grid-like network such that vehicles can distribute evenly throughout the area to avoid congestion on major streets such as Ala Moana Boulevard, Kapiolani Boulevard, and Ward Avenue.

4. CUMULATIVE YEAR 2017 WITHOUT PROJECT CONDITIONS

This chapter presents the results of transportation analysis under Cumulative Year 2017 conditions without the project. Cumulative Year 2017 conditions are defined as conditions at the anticipated year of project build-out and full occupancy. Traffic volumes for Cumulative Year 2017 conditions comprise of existing volumes plus the ambient growth in traffic volumes calculated based on an annual growth factor plus cumulative traffic from related projects to be constructed and occupied by 2017.

CUMULATIVE YEAR 2017 TRAFFIC ESTIMATES

The following section summarizes the growth assumptions used to develop projections for Cumulative Year 2017 conditions.

REGIONAL GROWTH ASSUMPTIONS

A one percent annual growth factor was applied to the traffic to each roadway individually in order to account for future regional growth. This growth rate was determined based on methodology used in recently approved projects from the City & County of Honolulu for developments with similar buildout timeframes. This growth rate is considered reasonable given the built out nature of the surrounding neighborhoods and adjacent areas. This growth rates were compounded over the three (3) year timeframe for full development of the proposed Kewalo Basin restaurant and retail project (2014 to 2017).

Additionally, Cumulative Year 2017 analysis accounts for related projects in the study area expected to add vehicles to the roadway network. Related projects include those projects which are approved, and which could be constructed and occupied within the Cumulative Year 2017 timeframe. Their associated traffic is accounted for in the Cumulative Year 2017 traffic volumes. **Table 5** shows the trip generation associated with these related projects.

TABLE 5 RELATED PROJECTS TRIP GENERATION					
Project	**Land Use**	**Density**	**PM Peak Hour**		
			Total	**In**	**Out**
803 Waimanu	Condo, Townhouse	153 DU	85	57	28
801 South Street	Condo, Daytime Parking	1,045 DU, 175 stalls	914	334	580
600 Ala Moana Boulevard	Condo, Townhouse, Retail	467 DU, 12 ksf	210	119	91
Halekauwila Place	Multi-Family	204 DU	72	44	28
Keauhou Lane	Multi-Family, Retail	590 DU, 34.8 ksf	347	207	140
OM Kapiolani	Multi-Family, Retail, Restaurant	420 DU, 150 ksf, 5 ksf	609	297	312
Waihonua at Kewalo	Multi-Family	341 DU	120	73	47
Victoria Ward Development	Condo, Multi-Family, Retail	1,620 DU, 279 ksf	2,216	1,222	994
Total			**4,573**	**2,353**	**2,220**

The following projects were identified on the Hawaii Community Development Association (HCDA) website and are shown in **Figure 8**:

- 801 South Street
- OM Kapiolani
- Keauhou Lane
- Halekauwila Place
- 803 Waimanu
- 600 Ala Moana Boulevard
- Victoria Ward Development
- Waihonua at Kewalo

\\Fpse03\fpse2\Data2\2014Projects\SD_Projects\SD14-0137\Graphics\GIS\MXD\Figure 8-RelatedProject.mxd

Figure 8

Related Project Locations

CUMULATIVE YEAR 2017 LEVELS OF SERVICE

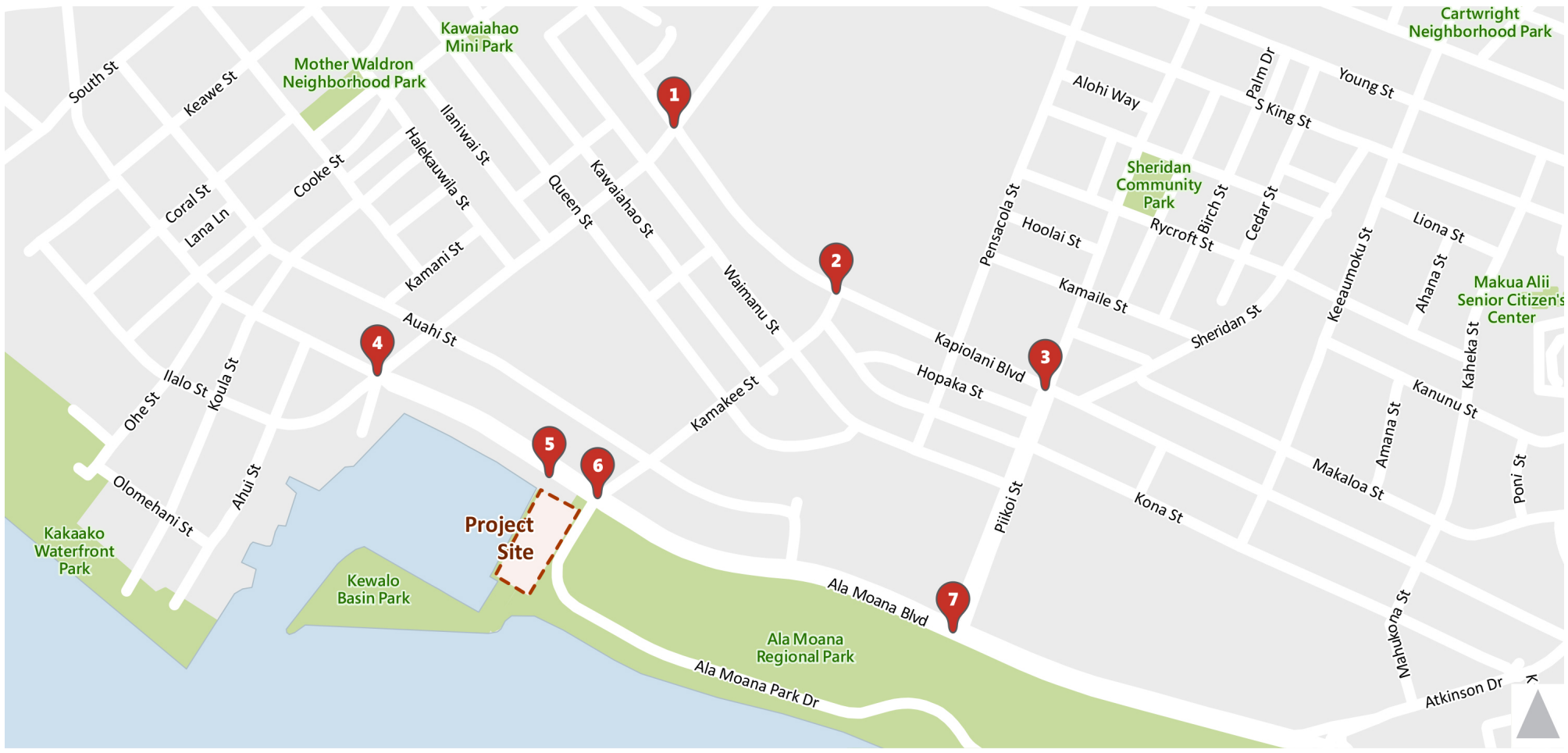
Levels of service calculations were conducted to evaluate the operating levels of the study intersections under Cumulative Year 2017 Conditions. **Figure 9** displays the Cumulative Year 2017 traffic volumes. The results of the LOS analysis for the study intersections are presented in **Table 5**. The corresponding LOS calculation sheets are included in Appendix B.

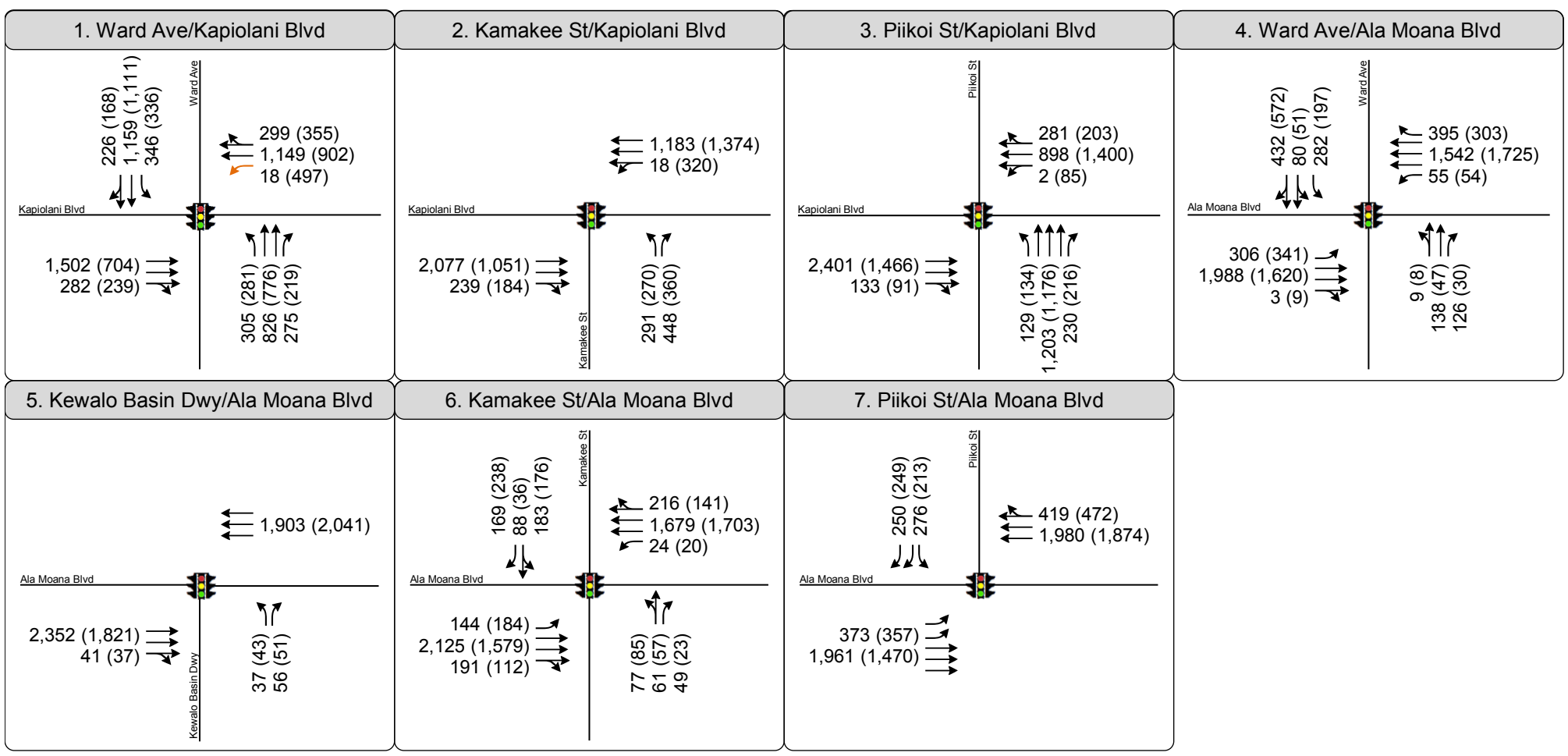
TABLE 5 CUMULATIVE YEAR 2017 INTERSECTION PEAK HOUR LOS RESULTS

No.	Intersection	Control		Cumulative Year 2017 Without Project			
				Weekday PM		Saturday	
				Delay	LOS	Delay	LOS
1	Ward Ave / Kapiolani Blvd	Signalized	Total	**100.2**	**F**	**135.8**	**F**
			NB	**71.4**	**E**	**100.9**	**F**
			SB	**169.4**	**F**	**272.9**	**F**
			EB	34.1	C	**66.5**	**E**
			WB	**126.4**	**F**	**72.4**	**E**
2	Kamakee St / Kapiolani Blvd	Signalized		29.0	C	17.6	B
3	Piikoi St / Kapiolani Blvd	Signalized		25.6	C	25.2	C
4	Ward Ave / Ala Moana Blvd	Signalized		48.4	D	41.3	D
5	Kewalo Basin Dwy / Ala Moana Blvd	Signalized		4.1	A	4.3	A
6	Kamakee St / Ala Moana Blvd	Signalized		35.9	D	30.5	C
7	Piikoi St / Ala Moana Blvd	Signalized		47.0	D	25.8	C

Source: Fehr & Peers, 2014.
Note:
1. Average stopped delay expressed in seconds per vehicle for signalized intersections.
2. LOS calculations performed using the *2000 Highway Capacity Manual (HCM)* method.
3. Unacceptable LOS highlighted in **bold.**

The table above shows that under Cumulative Year 2017 Conditions, all intersections will operate at acceptable levels of service during both the weekday PM and Saturday Mid-day peak hours, with the exception of the Ward Avenue / Kapiolani Boulevard intersection. This intersection is projected to operate at LOS F in both the weekday PM and Saturday mid-day peak hours. The table above also reports the LOS by approach for this intersection, and all approaches are projected to operate unacceptably during both peak hours, with the exception of the eastbound approach, which is projected to operate at LOS C during the weekday PM peak hour. The Ward Avenue / Kapiolani Boulevard intersection is a major intersection providing access to and from the H-1 Highway. The development anticipated in the Kaka'ako area is mainly retail and residential. The retail will attract customers from other parts of the island, while residents living in Kaka'ako will use the H-1 Highway to get to work. This increase in local development will result in increased congestions throughout the study area.





Legend

XX (XX) PM (Saturday)

Eastbound contra flow lane during PM peak

Figure 9

Peak Hour Traffic Volumes and Lane Configurations - Year 2017 Conditions

5. CUMULATIVE YEAR 2017 PLUS PROJECT CONDITIONS

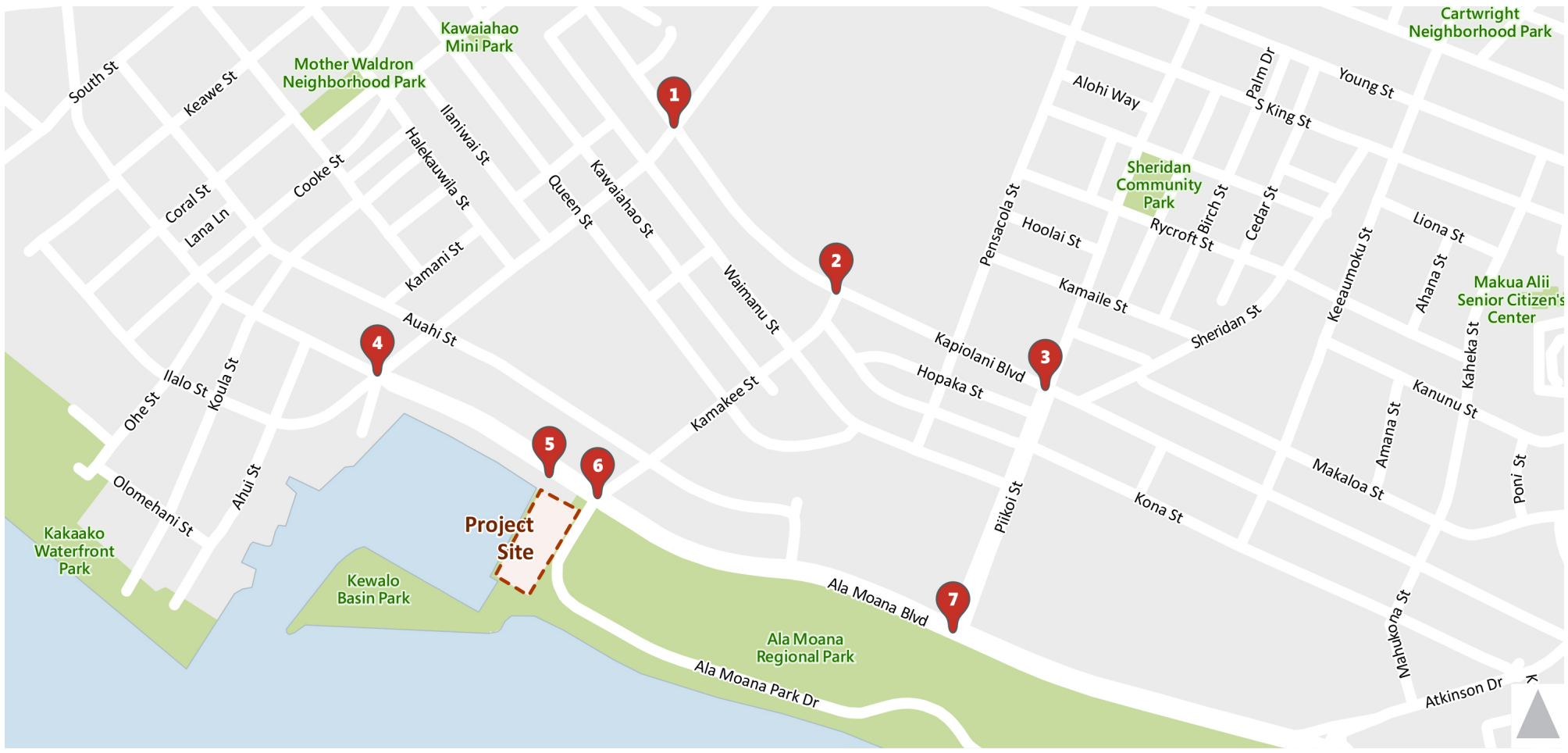
This chapter presents the results of the level of service calculations under Cumulative Year 2017 plus Project conditions with the project. Cumulative Year 2017 plus Project conditions are defined as Cumulative Year 2017 conditions plus new traffic generated by the proposed Kewalo Basin restaurant and retail development.

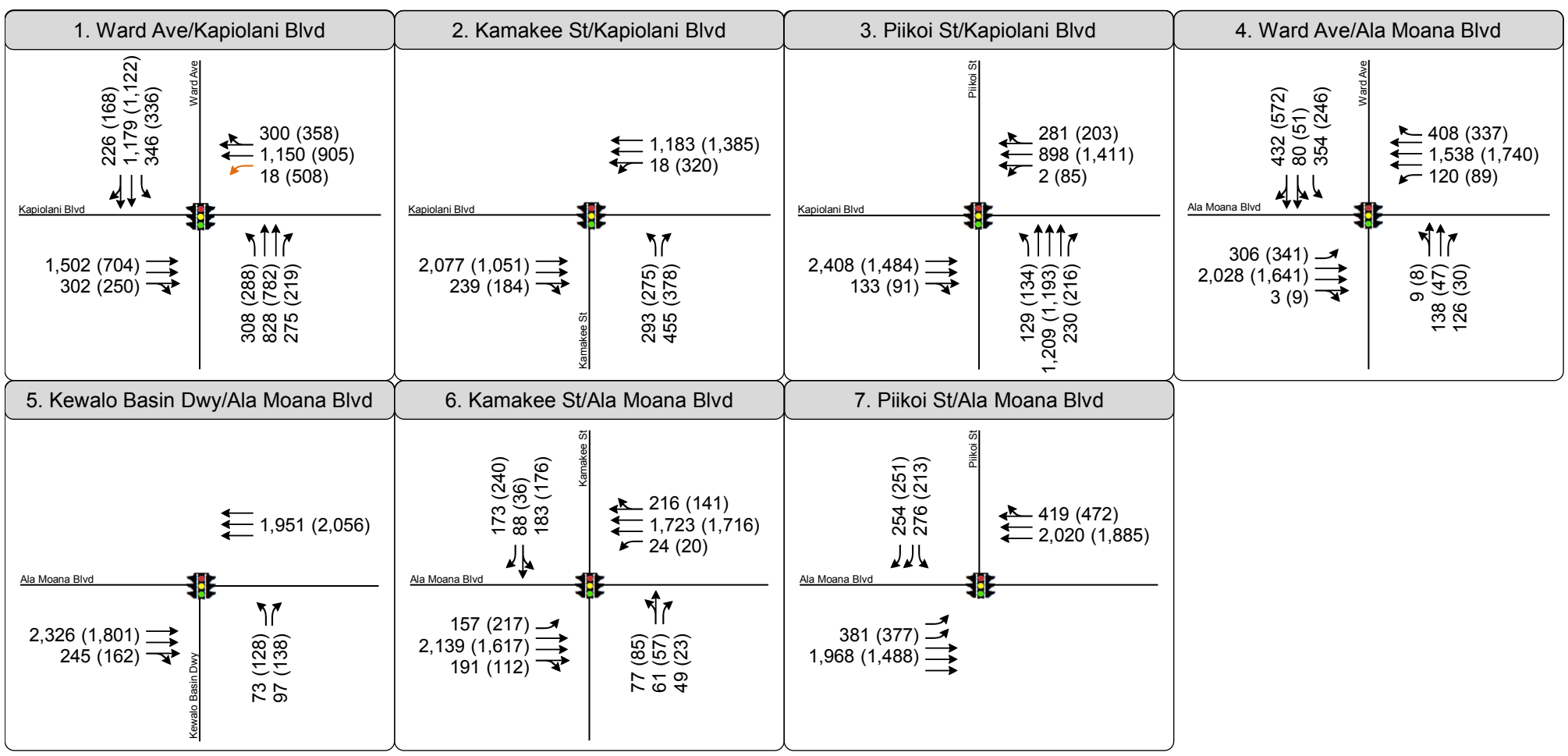
CUMULATIVE YEAR 2017 PLUS PROJECT TRAFFIC VOLUMES

Forecasted trips from the proposed project, estimated in Chapter 3 above were added to the Cumulative Year 2017 traffic projections to develop traffic volumes for Cumulative Year 2017 plus Project conditions. The resulting volumes are shown on **Figure 10**.

CUMULATIVE YEAR 2017 PLUS PROJECT INTERSECTION LEVELS OF SERVICE

Intersection levels of service calculations were conducted to evaluate the operating levels of the study intersections under Cumulative Year 2017 plus Project conditions. **Table 6** presents the level of service calculations for the study intersections under Cumulative Year 2017 and Cumulative Year 2017 plus Project conditions. Appendix B contains the corresponding level of service calculation sheets.





Legend

XX (XX) PM (Saturday)

Eastbound contra flow lane during PM peak

Figure 10

Peak Hour Traffic Volumes and Lane Configurations - Year 2017 Plus Project Conditions

TABLE 6 CUMULATIVE YEAR 2017 PLUS PROJECT INTERSECTION PEAK HOUR LOS RESULTS

No.	Intersection	Control		Weekday PM						Saturday Mid-day					
				Without Project		With Project		Δ	S?	Without Project		With Project		Δ	S?
				Delay[1]	LOS[2]	Delay[1]	LOS[2]			Delay[1]	LOS[2]	Delay[1]	LOS[2]		
1	Ward Ave / Kapiolani Blvd	Signalized	Total	**100.2**	**F**	**102.4**	**F**	2.2	N	**135.8**	**F**	**139.6**	**F**	3.8	N
			NB	**71.4**	**E**	**72.5**	**E**	1.1	N	**100.9**	**F**	**105.2**	**F**	4.1	N
			SB	**169.4**	**F**	**175.9**	**F**	6.5	N	**272.9**	**F**	**277.7**	**F**	4.8	N
			EB	34.1	C	34.5	C	0.4	N	**66.5**	**E**	**67.9**	**E**	1.4	N
			WB	**126.4**	**F**	**127.1**	**F**	0.7	N	**72.4**	**E**	**76.4**	**E**	4.0	N
2	Kamakee St / Kapiolani Blvd	Signalized		29.0	C	30.0	C	1.0	N	17.6	B	19.3	B	1.7	N
3	Piikoi St / Kapiolani Blvd	Signalized		25.6	C	25.7	C	0.1	N	25.2	C	25.7	C	0.5	N
4	Ward Ave / Ala Moana Blvd	Signalized		48.4	D	55.0	D	6.6	N	41.3	D	44.7	D	3.4	N
5	Kewalo Basin Dwy / Ala Moana Blvd	Signalized		4.1	A	6.2	A	2.1	N	4.3	A	7.0	A	2.7	N
6	Kamakee St / Ala Moana Blvd	Signalized		35.9	D	37.4	D	1.5	N	30.5	C	32.5	C	2.0	N
7	Piikoi St / Ala Moana Blvd	Signalized		47.0	D	49.7	D	2.7	N	25.8	C	26.6	C	0.8	N

Source: Fehr & Peers, 2014
Note:
1. Average stopped delay expressed in seconds per vehicle for signalized intersections.
2. LOS calculations performed using the *2000 Highway Capacity Manual (HCM)* method.
4. Undesirtable LOS highlighted in **bold.**

The table above shows that all study intersections will continue to operate at acceptable levels of service under Cumulative Year 2017 plus Project Conditions with the exception of the Ward Avenue / Kapiolani Boulevard intersection which will continue to operate at LOS F during the weekday PM and Saturday Mid-day peak hours with the project in place.

The table above also shows the individual approaches of the Ward Avenue / Kapiolani Boulevard intersection, three of which are projected to operate at poor LOS during both analyzed peak hours with and without the addition of project traffic. While the Ward Avenue / Kapiolani Boulevard intersection is projected to operate poorly, the increase in average vehicle delay is not greater than five percent, and therefore it is concluded that the project would not result in any significant impacts at the intersection.

No significant traffic impacts are anticipated with development and operation of the proposed project. Intersections will to operate unacceptably during the Cumulative Year 2017 without and with the project. The resulting increase in average vehicle delay is less than five percent and therefore the impacts to the roadway are less than significant. The distribution and assignment of project traffic analysis was completed assuming normal travel patterns and driver choices regarding the street network and access to and from the H-1 Highway. Vehicles traveling both ewa- and diamondhead-bound on H-1 will access the site via ramps at Punchbowl Street, Piikoi Street, or Ward Avenue. Additionally, the street network within Kaka'ako provides a sufficient grid-like network such that vehicles can distribute evenly throughout the area to avoid congestion on major streets such as Ala Moana Boulevard, Kapiolani Boulevard, and Ward Avenue.

Bicycle, Pedestrian, and Transit Impacts

The Oahu Bike Plan calls for bikeways to be added to most of the major streets in the Kaka'ako area. The plan identifies projects as priority one, priority two, or priority three based on the importance of the facility and the anticipated construction date. Priority One projects are expected within the next 5-10 years, priority two and priority three projects are expected once priority one projects are completed. A connection between the existing mauka and makai bike paths in Ala Moana Beach Park is planned, as well as an extension to Kewalo Basin. This is identified as a priority one project. A bicycle path is planned for Ala Moana Boulevard between Atkinson Drive and Ala Wai Canal as a priority one project. A bicycle route is planned for Auahi Street between Ala Moana Boulevard and South Street, for Ward Avenue between Ala Moana Boulevard and Prospect Street, and for Halekauwila Street between Ala Moana Boulevard and Ward Avenue as priority two projects. A bicycle lane is planned for Kamakee Street between Ala Moana Boulevard and McKinley High School as a priority two project. A bicycle lane is planned for Ala Moana Boulevard between Kalakaua Avenue and Fort Street Mall as a priority three project. The funding for these projects is not yet known.

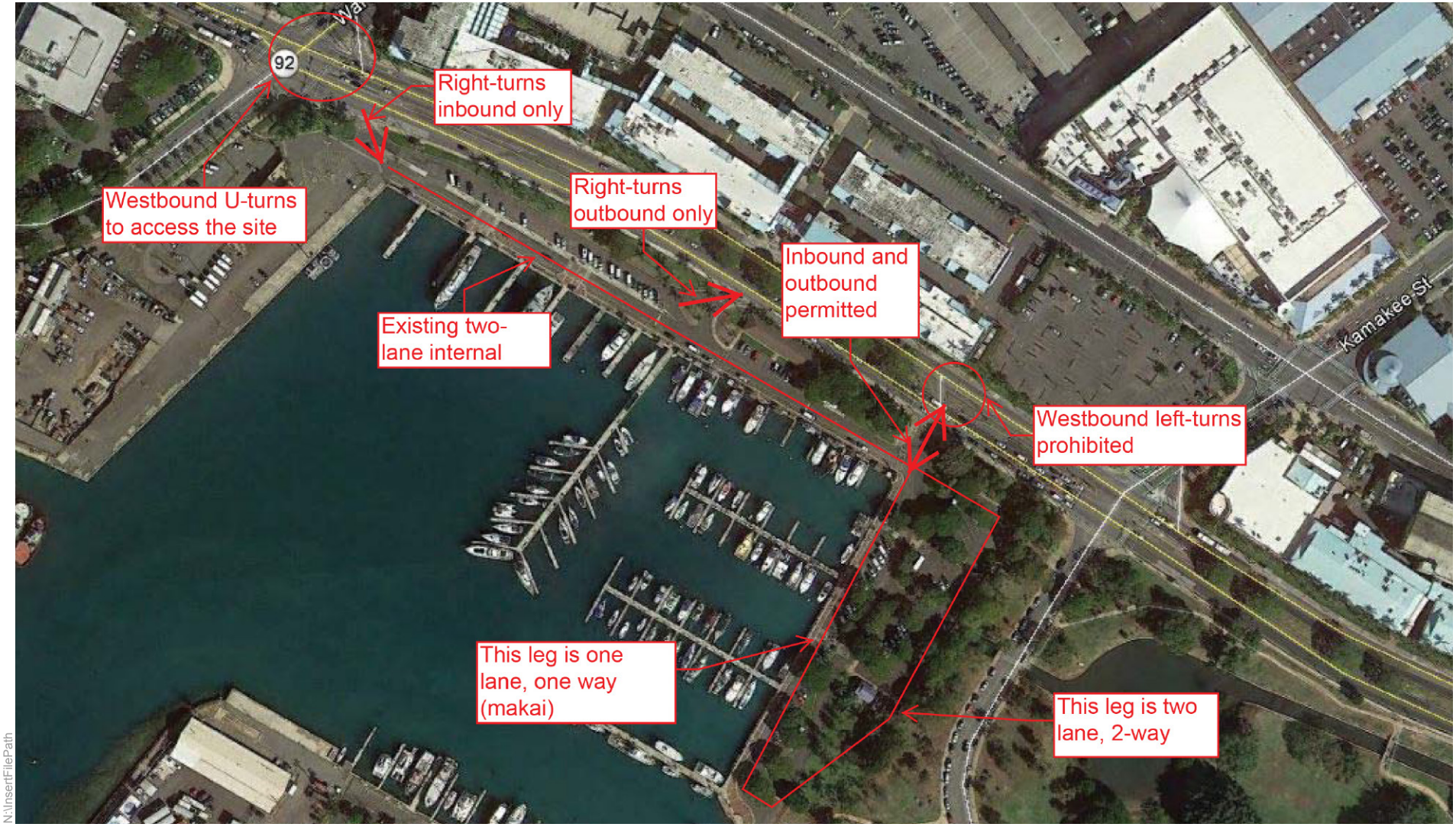
Construction of the Honolulu Rail Project is currently underway and by 2019 will result in a 20-mile rail system beginning in East Kapolei, connecting to Honolulu International Airport and downtown Honolulu, and ending at Ala Moana Center. The project includes 21 stations with bicycle and pedestrian amenities. Current plans are for trains to operate between 4:00 AM and Midnight daily, with five-minute headways during peak travel times and 10 minute headways during off-peak hours. The Kaka'ako Station is planning near the intersection of Halekauila Street and Ward Avenue, and will allow users to travel to the East Kapolei Station in 40 minutes, and to Honolulu International Airport in 14 minutes. The station will provide ADA pedestrian access, bicycle parking, and connections to local bus service through Kaka'ako.

The proposed project is not expected to increase the walking, biking, or transit demand to a level where it could not be accommodated by existing or planned facilities. Chapter 6 discusses site access and provides additional recommendations to facilitate bicycle and pedestrian travel, as well as maintain an effective and secure environment. The project's impacts to pedestrian, bicycle, and transit facilities and services are therefore considered *less-than-significant*.

6. SITE ACCESS/CIRCULATION

The following section provides a summary of the site access, circulation, and parking at the proposed Kewalo Basin restaurant and retail project site. Primary access to the site will be via the existing signalized driveway at Ala Moana Boulevard. All vehicles will access the project site via Ala Moana Boulevard. The signalized driveway, located at the northwest corner of the site is designated as inbound and outbound, and prohibits westbound left-turns into the site. Westbound vehicles coming to the site will continue to the Ward Avenue / Ala Moana Boulevard intersection to make a U-turn before making a right-turn into the driveway. Vehicles will also continue to have access to the site via two existing driveways west of the site and an internal roadway. Immediately east of the Ward Avenue / Ala Moana Boulevard intersection is an existing, inbound only driveway. Vehicles will then travel eastbound to the site via an internal two-lane roadway. Approximately 320 feet west of the signalized Kewalo Basin Driveway intersection is a second existing driveway which only permits outbound right-turns onto Ala Moana Boulevard. **Figure 11** illustrates the site access and circulation and shows a two-way internal roadway which travels along the perimeter of the site and borders Ala Moana Beach Park on the eastern edge, replacing the existing north-south internal roadway that runs directly along the edge of the Kewalo Basin. No vehicular connection is proposed at this time between the project site and adjacent area of the Kewalo Basin and the adjacent Ala Moana Beach Park. Such a connection, if made, would reduce the need for westbound drivers on Ala Moana Boulevard to make U-turns at Ward Avenue to reach the project site.

The area immediately surrounding the project site is well-served by pedestrian facilities, including the sidewalks and crosswalks shown in Figure 3. The sidewalks on Ala Moana Boulevard, which border the project site, continue along Ala Moana Boulevard ewa to Ward Avenue and diamondhead to Kamakee Street. Both the Ward Avenue and Kamakee Street intersections with Ala Moana Boulevard have marked crosswalks and pedestrian push buttons to support safe crossings by pedestrians. The proposed project is adjacent to the Ala Moana Beach Park which provides multi-use paths and recreational facilities. There is a pedestrian connection at the southeast corner of the site which provides access to Ala Moana Beach Park.



N:\InsertFilePath

Figure 11

Site Access and Circulation

APPENDIX A: TRAFFIC DATA

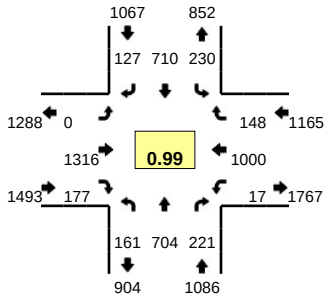
Type of peak hour being reported: Intersection Peak

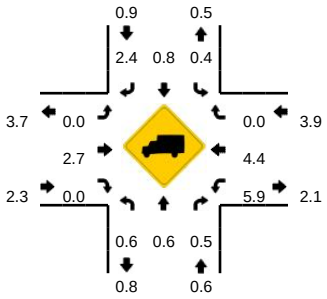
Method for determining peak hour: Total Entering Volume

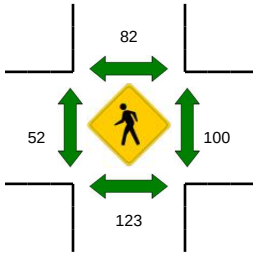
LOCATION: Ward Ave -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

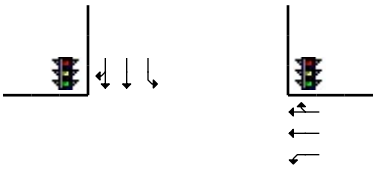
QC JOB #: 13008005
DATE: Tue, Sep 30 2014

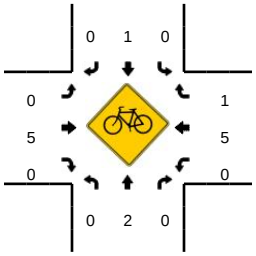
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

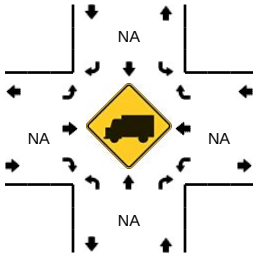


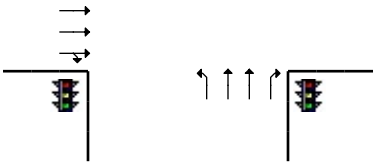


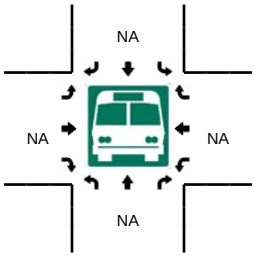












15-Min Count Period Beginning At	Ward Ave (Northbound)				Ward Ave (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	34	161	53	0	52	161	33	0	0	223	38	0	1	247	27	0	1030	
4:15 PM	24	170	52	0	52	157	19	0	0	268	54	0	0	240	30	0	1066	
4:30 PM	46	178	45	0	47	166	32	0	0	325	42	0	1	259	36	0	1177	
4:45 PM	37	164	60	0	60	180	29	0	0	347	42	0	0	265	36	0	1220	4493
5:00 PM	31	193	59	0	67	206	24	0	0	322	42	0	1	219	36	0	1200	4663
5:15 PM	47	169	57	0	56	158	42	0	0	322	51	0	15	257	40	0	1214	4811
5:30 PM	36	141	49	0	64	198	36	0	0	245	35	0	51	163	28	0	1046	4680
5:45 PM	24	140	52	0	60	150	21	0	0	234	43	0	64	153	25	0	966	4426

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	148	656	240	0	240	720	116	0	0	1388	168	0	0	1060	144	0	4880
Heavy Trucks	0	0	0		0	8	0		0	56	0		0	48	0		112
Pedestrians		116				88				56				140			400
Bicycles	0	0	0		0	0	0		0	1	0		0	5	1		7
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

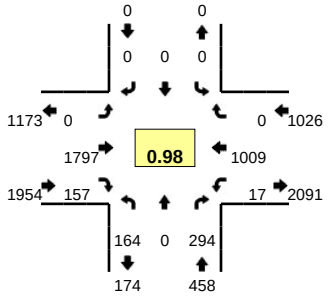
Type of peak hour being reported: Intersection Peak

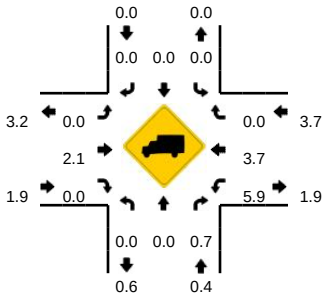
Method for determining peak hour: Total Entering Volume

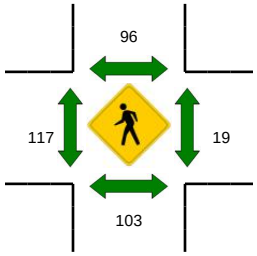
LOCATION: Kamakee St -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

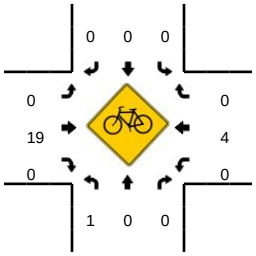
QC JOB #: 13008007
DATE: Tue, Sep 30 2014

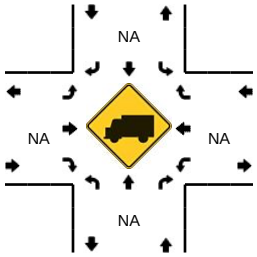
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 4:45 PM -- 5:00 PM

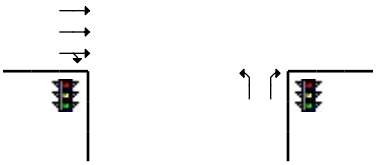


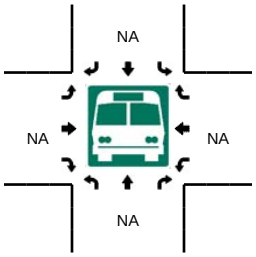












15-Min Count Period Beginning At	Kamakee St (Northbound)				Kamakee St (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	34	0	61	0	0	0	0	0	0	303	40	0	1	245	0	1	685	
4:15 PM	35	0	68	0	0	0	0	0	0	354	25	0	3	238	0	0	723	
4:30 PM	48	0	66	0	0	0	0	0	0	447	45	0	3	256	0	0	865	
4:45 PM	35	0	77	0	0	0	0	0	0	478	44	0	1	244	0	0	879	3152
5:00 PM	40	0	83	0	0	0	0	0	0	433	35	0	2	243	0	0	836	3303
5:15 PM	41	0	68	0	0	0	0	0	0	439	33	0	11	266	0	0	858	3438
5:30 PM	35	0	68	0	0	0	0	0	0	326	26	0	45	173	0	0	673	3246
5:45 PM	25	0	51	0	0	0	0	0	0	300	30	0	56	198	0	0	660	3027

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	140	0	308	0	0	0	0	0	0	1912	176	0	4	976	0	0	3516
Heavy Trucks	0	0	4		0	0	0		0	56	0		0	40	0		100
Pedestrians		76				100				136				8			320
Bicycles	0	0	0		0	0	0		0	7	0		0	3	0		10
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

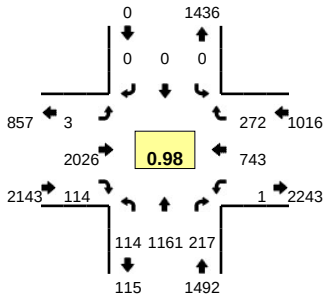
Type of peak hour being reported: Intersection Peak

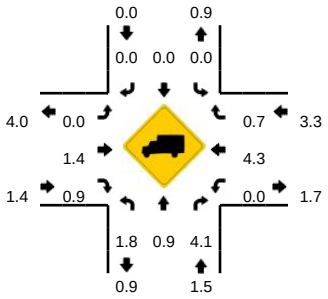
Method for determining peak hour: Total Entering Volume

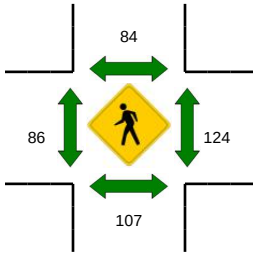
LOCATION: Piikoi St -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

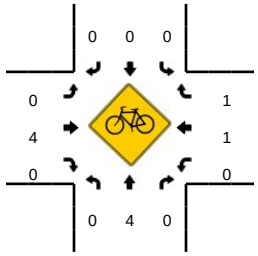
QC JOB #: 13008003
DATE: Tue, Sep 30 2014

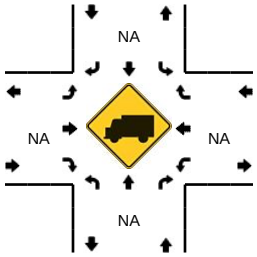
Peak-Hour: 4:30 PM -- 5:30 PM
Peak 15-Min: 5:00 PM -- 5:15 PM

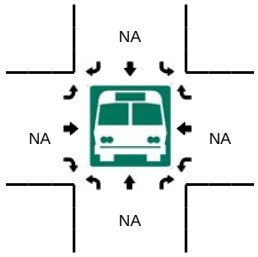












15-Min Count Period Beginning At	Piikoi St (Northbound)				Piikoi St (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	28	245	46	0	0	0	0	0	2	408	23	0	2	162	52	0	968	
4:15 PM	25	272	55	0	0	0	0	0	0	408	21	0	0	152	66	0	999	
4:30 PM	29	286	55	0	0	0	0	0	1	493	25	0	0	194	66	0	1149	
4:45 PM	22	283	48	0	0	0	0	0	1	502	31	0	0	171	67	0	1125	4241
5:00 PM	30	295	58	0	0	0	0	0	0	513	30	0	1	194	69	0	1190	4463
5:15 PM	33	297	56	0	0	0	0	0	1	518	28	0	0	184	70	0	1187	4651
5:30 PM	29	272	57	0	0	0	0	0	1	385	35	0	16	183	56	0	1034	4536
5:45 PM	29	276	52	0	0	0	0	0	1	387	20	0	20	173	72	0	1030	4441

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	120	1180	232	0	0	0	0	0	0	2052	120	0	4	776	276	0	4760
Heavy Trucks	4	16	12		0	0	0		0	28	0		0	32	0		92
Pedestrians		108				84				64				128			384
Bicycles	0	0	0		0	0	0		0	2	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

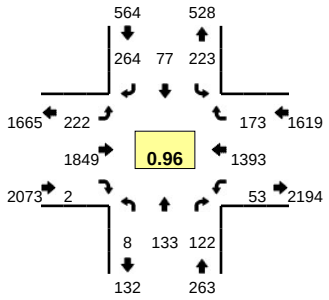
Type of peak hour being reported: Intersection Peak

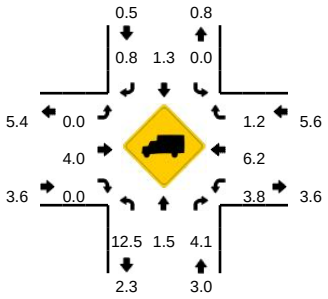
Method for determining peak hour: Total Entering Volume

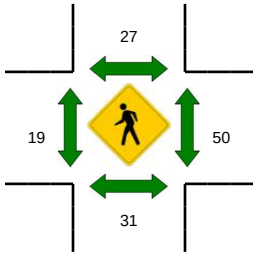
LOCATION: Ala Moana Blvd -- Ward Ave
CITY/STATE: Urban Honolulu, HI

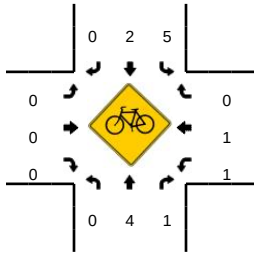
QC JOB #: 13008013
DATE: Tue, Sep 30 2014

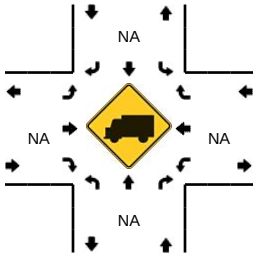
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

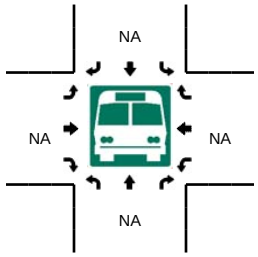












15-Min Count Period Beginning At	Ala Moana Blvd (Northbound)				Ala Moana Blvd (Southbound)				Ward Ave (Eastbound)				Ward Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	3	33	20	0	39	17	49	0	61	381	1	0	14	325	40	0	983	
4:15 PM	3	27	24	0	66	8	47	0	57	481	2	0	8	377	47	0	1147	
4:30 PM	4	38	28	0	54	12	73	0	55	371	0	0	12	314	49	0	1010	
4:45 PM	1	33	33	0	51	20	56	0	49	455	1	0	11	366	46	0	1122	4262
5:00 PM	1	36	22	0	59	21	73	0	58	481	1	0	16	360	42	0	1170	4449
5:15 PM	5	31	33	0	66	22	58	0	57	419	0	0	9	321	35	0	1056	4358
5:30 PM	1	33	34	0	47	14	77	0	58	494	0	0	17	346	50	0	1171	4519
5:45 PM	0	22	11	0	60	15	72	0	76	453	1	0	15	347	40	0	1112	4509

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	4	132	136	0	188	56	308	0	232	1976	0	0	68	1384	200	0	4684
Heavy Trucks	0	4	4		0	0	4		0	72	0		0	44	4		132
Pedestrians		20				44				4				28			96
Bicycles	0	1	0		2	1	0		0	0	0		1	0	0		5
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

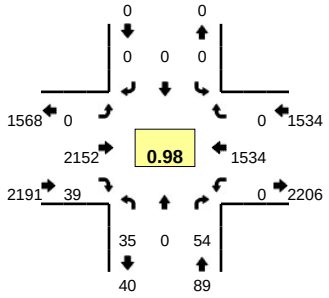
Type of peak hour being reported: Intersection Peak

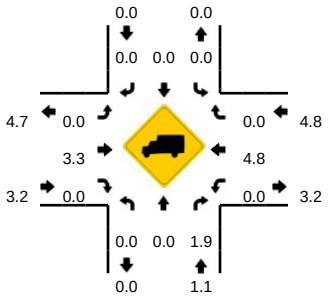
Method for determining peak hour: Total Entering Volume

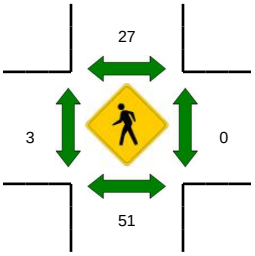
LOCATION: Kewalo Basin Dwy -- Ala Moana Blvd
CITY/STATE: Urban Honolulu, HI

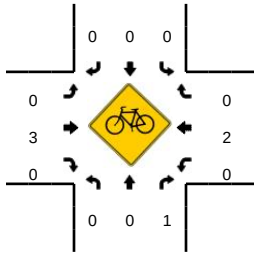
QC JOB #: 13008011
DATE: Tue, Sep 30 2014

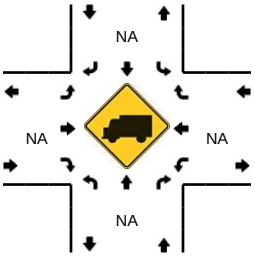
Peak-Hour: 5:00 PM -- 6:00 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

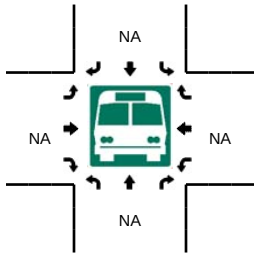












15-Min Count Period Beginning At	Kewalo Basin Dwy (Northbound)				Kewalo Basin Dwy (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	8	0	9	0	0	0	0	0	0	500	8	1	0	405	0	0	931	
4:15 PM	13	0	14	0	0	0	0	0	0	502	13	0	0	427	0	0	969	
4:30 PM	8	0	11	0	0	0	0	0	0	497	13	0	0	412	0	0	941	
4:45 PM	5	0	13	0	0	0	0	0	0	535	8	0	0	375	0	0	936	3777
5:00 PM	6	0	18	0	0	0	0	0	0	526	13	0	0	383	0	0	946	3792
5:15 PM	11	0	9	0	0	0	0	0	0	556	13	0	0	363	0	0	952	3775
5:30 PM	12	0	12	0	0	0	0	0	0	543	8	0	0	400	0	0	975	3809
5:45 PM	5	0	15	1	0	0	0	0	0	527	5	0	0	388	0	0	941	3814

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	48	0	48	0	0	0	0	0	0	2172	32	0	0	1600	0	0	3900
Heavy Trucks	0	0	4		0	0	0		0	80	0		0	56	0		140
Pedestrians		56				36				4				0			96
Bicycles	0	0	1		0	0	0		0	1	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

Type of peak hour being reported: Intersection Peak

Method for determining peak hour: Total Entering Volume

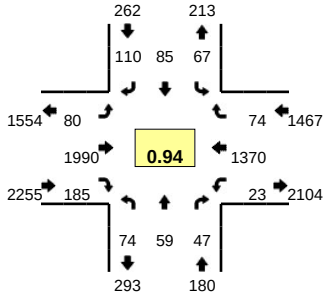
LOCATION: Kamakee St/Ala Moana Park Dr -- Ala Moana Blvd

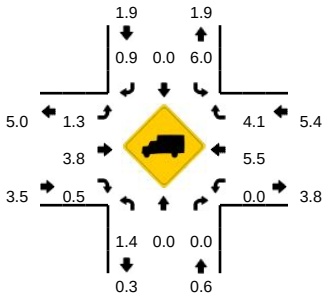
QC JOB #: 13008009

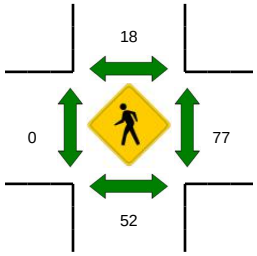
CITY/STATE: Urban Honolulu, HI

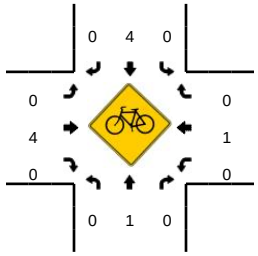
DATE: Tue, Sep 30 2014

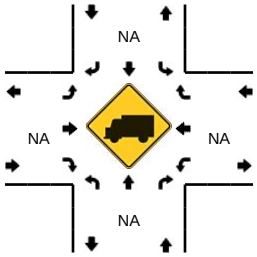
Peak-Hour: 4:45 PM -- 5:45 PM
Peak 15-Min: 5:30 PM -- 5:45 PM

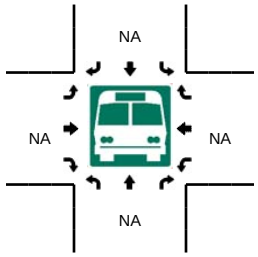












15-Min Count Period Beginning At	Kamakee St/Ala Moana Park Dr (Northbound)				Kamakee St/Ala Moana Park Dr (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	16	12	5	0	15	23	25	0	22	432	39	0	6	330	20	0	945	
4:15 PM	9	12	9	0	4	18	24	0	18	478	52	0	5	424	16	0	1069	
4:30 PM	16	16	4	0	20	17	22	0	17	449	34	0	6	356	21	0	978	
4:45 PM	12	9	13	0	14	12	28	0	16	497	44	0	2	329	18	0	994	3986
5:00 PM	19	15	7	0	21	34	22	0	19	477	55	0	7	367	19	0	1062	4103
5:15 PM	22	18	18	0	17	18	19	0	19	491	44	0	6	316	14	0	1002	4036
5:30 PM	21	17	9	0	15	21	41	0	26	525	42	0	8	358	23	0	1106	4164
5:45 PM	28	8	11	0	17	18	40	0	33	450	38	0	6	323	20	0	992	4162

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	84	68	36	0	60	84	164	0	104	2100	168	0	32	1432	92	0	4424
Heavy Trucks	0	0	0		4	0	4		4	76	0		0	56	8		152
Pedestrians		76				4				0				72			152
Bicycles	0	0	0		0	0	0		0	2	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

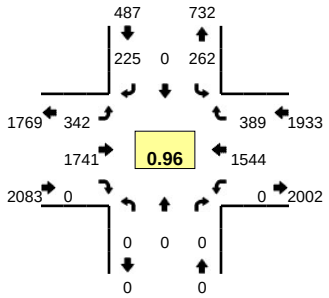
Type of peak hour being reported: Intersection Peak

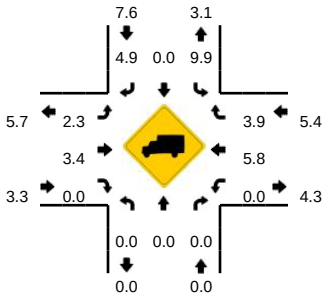
Method for determining peak hour: Total Entering Volume

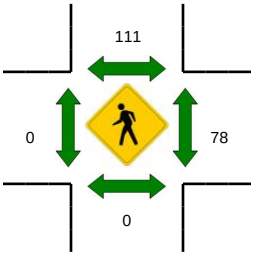
LOCATION: Piikoi St -- Ala Moana Blvd
CITY/STATE: Urban Honolulu, HI

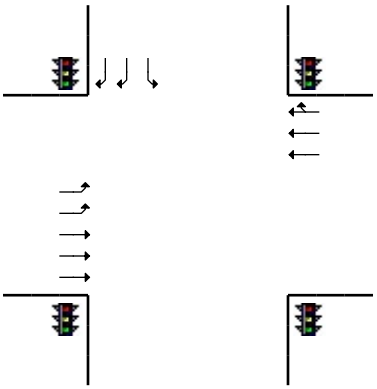
QC JOB #: 13008001
DATE: Tue, Sep 30 2014

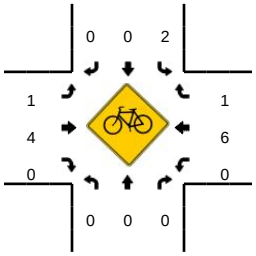
Peak-Hour: 4:15 PM -- 5:15 PM
Peak 15-Min: 4:30 PM -- 4:45 PM

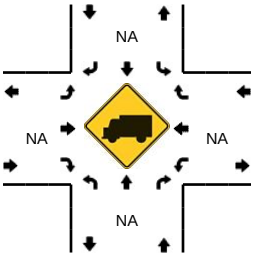


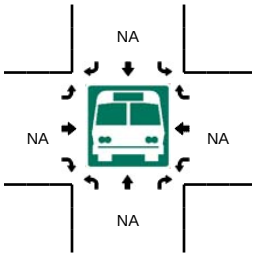












15-Min Count Period Beginning At	Piikoi St (Northbound)				Piikoi St (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
4:00 PM	0	0	0	0	55	0	48	0	81	388	0	0	0	361	62	1	996	
4:15 PM	0	0	0	0	56	0	45	0	102	402	0	0	0	431	109	0	1145	
4:30 PM	0	0	0	0	60	0	57	0	70	451	0	0	0	428	104	0	1170	
4:45 PM	0	0	0	0	67	0	53	0	86	436	0	0	0	331	97	0	1070	4381
5:00 PM	0	0	0	0	78	0	70	1	84	452	0	0	0	354	79	0	1118	4503
5:15 PM	0	0	0	0	61	0	47	0	105	466	0	1	0	331	91	0	1102	4460
5:30 PM	0	0	0	0	76	0	77	0	77	446	0	0	0	315	103	0	1094	4384
5:45 PM	0	0	0	0	70	0	47	0	84	490	0	0	0	343	111	0	1145	4459

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	240	0	228	0	280	1804	0	0	0	1712	416	0	4680
Heavy Trucks	0	0	0		32	0	4		8	48	0		0	92	20		204
Pedestrians		0				92				0				48			140
Bicycles	0	0	0		1	0	0		0	1	0		0	0	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

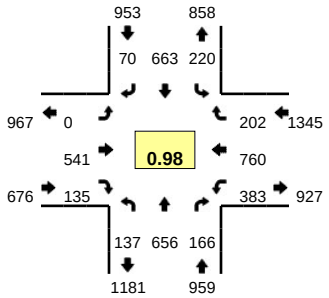
Type of peak hour being reported: Intersection Peak

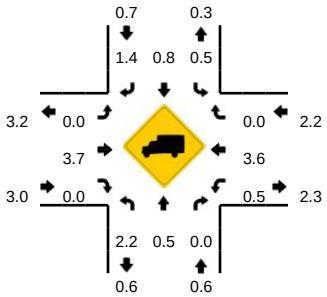
Method for determining peak hour: Total Entering Volume

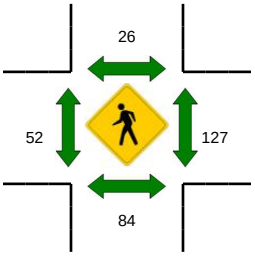
LOCATION: Ward Ave -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

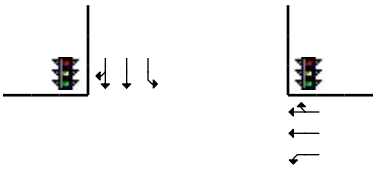
QC JOB #: 13008006
DATE: Sat, Oct 04 2014

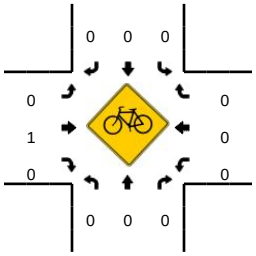
Peak-Hour: 12:00 PM -- 1:00 PM
Peak 15-Min: 12:30 PM -- 12:45 PM

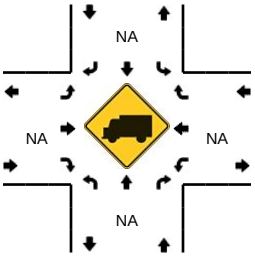


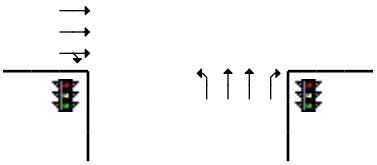


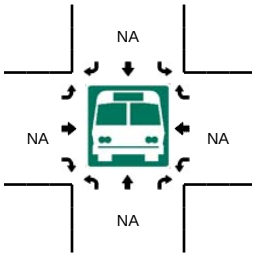












15-Min Count Period Beginning At	Ward Ave (Northbound)				Ward Ave (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	29	155	40	0	51	168	16	0	0	144	31	0	104	177	49	0	964	
12:15 PM	35	165	42	0	60	130	20	0	0	144	41	0	86	214	51	0	988	
12:30 PM	35	178	42	0	56	192	19	0	0	124	26	0	92	192	52	0	1008	
12:45 PM	38	158	42	0	53	173	15	0	0	129	37	0	101	177	50	0	973	3933
1:00 PM	30	147	29	0	58	174	12	0	0	154	37	0	81	186	44	0	952	3921
1:15 PM	48	186	31	0	50	174	13	0	0	124	40	0	94	161	36	0	957	3890
1:30 PM	37	148	39	0	57	176	14	0	0	147	33	0	80	151	34	0	916	3798
1:45 PM	33	161	39	0	53	194	12	0	0	134	37	0	70	122	29	0	884	3709

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	140	712	168	0	224	768	76	0	0	496	104	0	368	768	208	0	4032
Heavy Trucks	0	4	0		4	8	0		0	24	0		4	16	0		60
Pedestrians		48				32				64				164			308
Bicycles	0	0	0		0	0	0		0	1	0		0	0	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

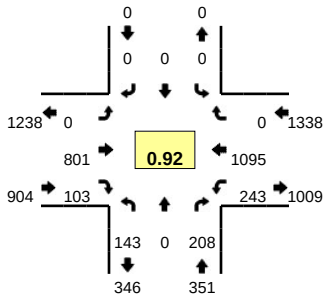
Type of peak hour being reported: Intersection Peak

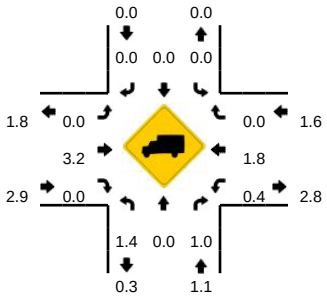
Method for determining peak hour: Total Entering Volume

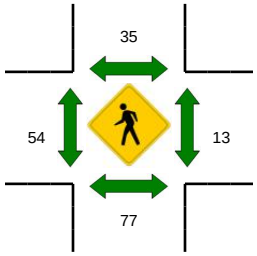
LOCATION: Kamakee St -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

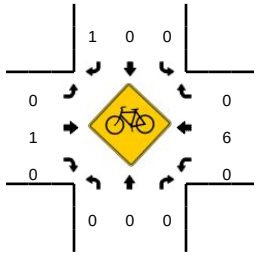
QC JOB #: 13008008
DATE: Sat, Oct 04 2014

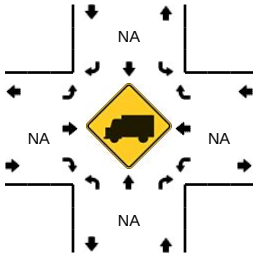
Peak-Hour: 12:15 PM -- 1:15 PM
Peak 15-Min: 12:15 PM -- 12:30 PM

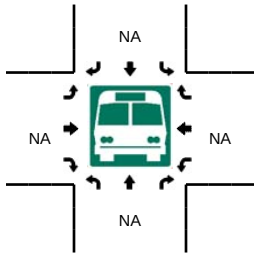












15-Min Count Period Beginning At	Kamakee St (Northbound)				Kamakee St (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	23	0	18	0	0	0	0	0	0	132	29	0	56	299	0	0	557	
12:15 PM	40	0	64	0	0	0	0	0	0	222	33	0	52	291	0	0	702	
12:30 PM	36	0	48	0	0	0	0	0	0	185	24	0	64	294	0	0	651	
12:45 PM	39	0	44	0	0	0	0	0	0	193	25	0	61	246	0	0	608	2518
1:00 PM	28	0	52	0	0	0	0	0	0	201	21	0	66	264	0	0	632	2593
1:15 PM	24	0	55	0	0	0	0	0	0	173	34	0	80	268	0	0	634	2525
1:30 PM	29	0	41	0	0	0	0	0	0	218	27	0	63	203	0	0	581	2455
1:45 PM	32	0	54	0	0	0	0	0	1	193	28	0	62	181	0	0	551	2398

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	160	0	256	0	0	0	0	0	0	888	132	0	208	1164	0	0	2808
Heavy Trucks	0	0	4		0	0	0		0	20	0		0	8	0		32
Pedestrians		80				20				52				8			160
Bicycles	0	0	0		0	0	0		0	0	0		0	0	0		0
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

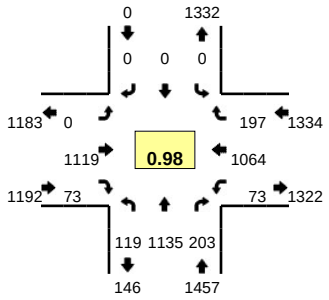
Type of peak hour being reported: Intersection Peak

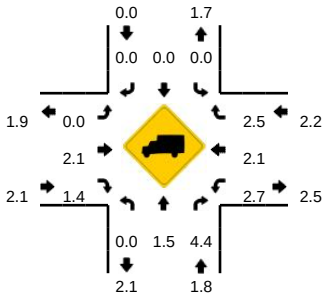
Method for determining peak hour: Total Entering Volume

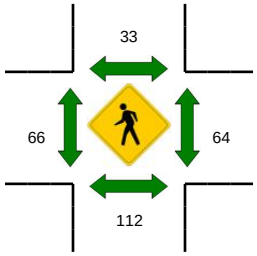
LOCATION: Piikoi St -- Kapiolani Blvd
CITY/STATE: Urban Honolulu, HI

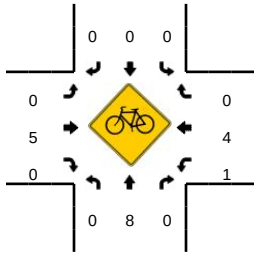
QC JOB #: 13008004
DATE: Sat, Oct 04 2014

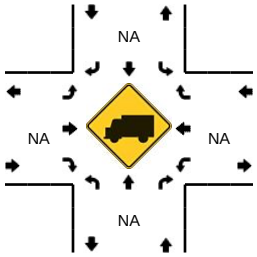
Peak-Hour: 12:15 PM -- 1:15 PM
Peak 15-Min: 12:45 PM -- 1:00 PM

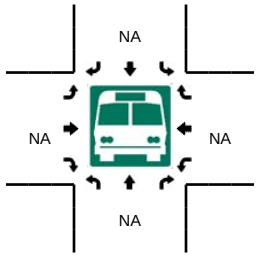












15-Min Count Period Beginning At	Piikoi St (Northbound)				Piikoi St (Southbound)				Kapiolani Blvd (Eastbound)				Kapiolani Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	43	273	47	0	0	0	0	0	0	263	17	0	14	269	34	0	960	
12:15 PM	34	256	56	0	0	0	0	0	0	319	20	0	19	259	39	0	1002	
12:30 PM	24	303	40	0	0	0	0	0	0	268	14	0	14	283	57	0	1003	
12:45 PM	34	302	55	0	0	0	0	0	0	275	19	0	20	254	58	0	1017	3982
1:00 PM	27	274	52	0	0	0	0	0	0	257	20	0	20	268	43	0	961	3983
1:15 PM	34	272	49	0	0	0	0	0	0	269	17	0	14	244	44	0	943	3924
1:30 PM	34	291	45	2	0	0	0	0	0	271	13	0	10	189	56	0	911	3832
1:45 PM	25	282	49	0	0	0	0	0	0	273	19	0	13	173	49	0	883	3698

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	136	1208	220	0	0	0	0	0	0	1100	76	0	80	1016	232	0	4068
Heavy Trucks	0	28	12		0	0	0		0	12	0		0	40	4		96
Pedestrians		164				24				88				44			320
Bicycles	0	2	0		0	0	0		0	2	0		0	0	0		4
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

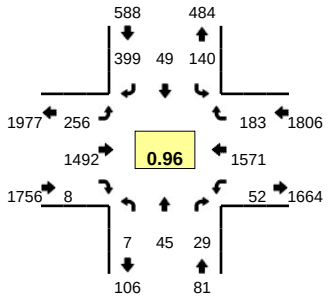
Type of peak hour being reported: Intersection Peak

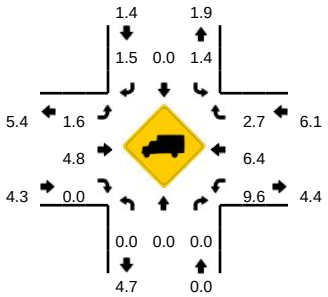
Method for determining peak hour: Total Entering Volume

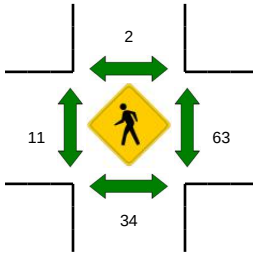
LOCATION: Ala Moana Blvd -- Ward Ave
CITY/STATE: Urban Honolulu, HI

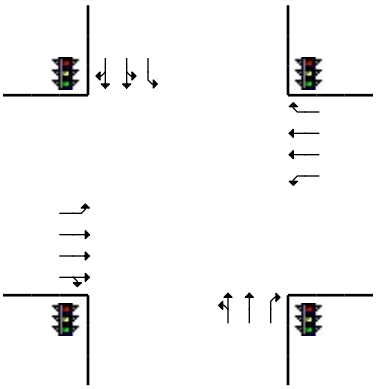
QC JOB #: 13008014
DATE: Sat, Oct 04 2014

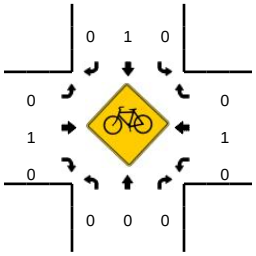
Peak-Hour: 12:00 PM -- 1:00 PM
Peak 15-Min: 12:30 PM -- 12:45 PM

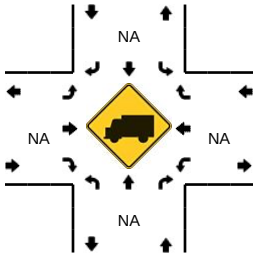


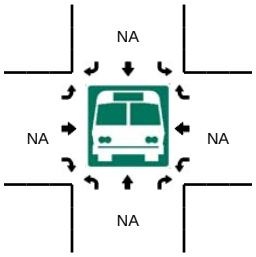












15-Min Count Period Beginning At	Ala Moana Blvd (Northbound)				Ala Moana Blvd (Southbound)				Ward Ave (Eastbound)				Ward Ave (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	1	9	7	0	37	11	81	0	61	375	0	0	17	401	45	1	1046	
12:15 PM	3	9	10	0	30	13	104	0	69	344	5	0	10	359	46	1	1003	
12:30 PM	2	19	7	0	41	17	108	0	57	378	2	0	13	415	45	0	1104	
12:45 PM	1	8	5	0	32	8	106	0	69	395	1	0	9	396	47	1	1078	4231
1:00 PM	6	15	10	0	32	8	83	0	66	314	0	0	15	370	62	1	982	4167
1:15 PM	2	14	10	0	32	14	97	0	60	379	1	0	17	345	38	0	1009	4173
1:30 PM	3	8	17	0	35	10	94	0	62	361	4	0	11	345	61	0	1011	4080
1:45 PM	2	6	9	0	38	10	95	0	60	319	1	0	8	345	43	1	937	3939

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	8	76	28	0	164	68	432	0	228	1512	8	0	52	1660	180	0	4416
Heavy Trucks	0	0	0		4	0	4		8	68	0		4	144	12		244
Pedestrians		28				0				4				32			64
Bicycles	0	0	0		0	0	0		0	1	0		0	1	0		2
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

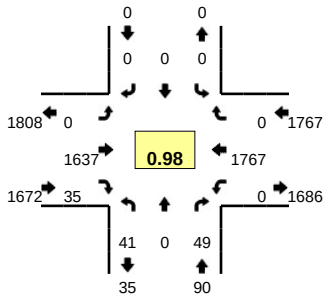
Type of peak hour being reported: Intersection Peak

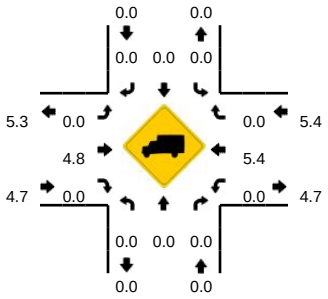
Method for determining peak hour: Total Entering Volume

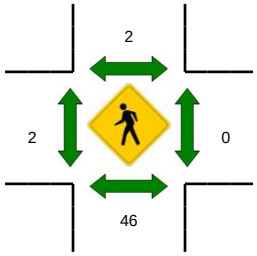
LOCATION: Kewalo Basin Dwy -- Ala Moana Blvd
CITY/STATE: Urban Honolulu, HI

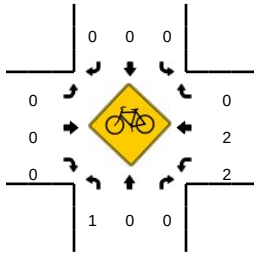
QC JOB #: 13008012
DATE: Sat, Oct 04 2014

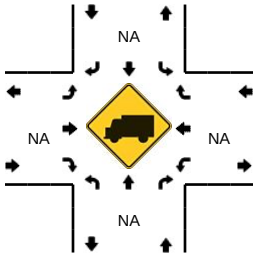
Peak-Hour: 12:00 PM -- 1:00 PM
Peak 15-Min: 12:30 PM -- 12:45 PM

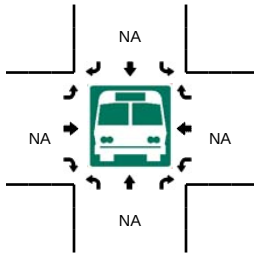












15-Min Count Period Beginning At	Kewalo Basin Dwy (Northbound)				Kewalo Basin Dwy (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	7	0	15	0	0	0	0	0	0	409	14	0	0	442	0	0	887	
12:15 PM	11	0	7	0	0	0	0	0	0	395	6	0	0	424	0	0	843	
12:30 PM	8	0	15	0	0	0	0	0	0	416	7	0	0	456	0	0	902	
12:45 PM	15	0	12	0	0	0	0	0	0	417	8	0	0	445	0	0	897	3529
1:00 PM	17	0	12	0	0	0	0	0	0	360	10	0	0	409	0	0	808	3450
1:15 PM	16	0	7	0	0	0	0	0	0	404	13	0	0	431	0	0	871	3478
1:30 PM	13	0	12	0	0	0	0	0	0	355	10	0	0	371	0	0	761	3337
1:45 PM	10	0	8	0	0	0	0	0	0	401	6	1	0	380	0	0	806	3246

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	32	0	60	0	0	0	0	0	0	1664	28	0	0	1824	0	0	3608
Heavy Trucks	0	0	0		0	0	0		0	84	0		0	128	0		212
Pedestrians		40				0				8				0			48
Bicycles	0	0	0		0	0	0		0	0	0		0	1	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

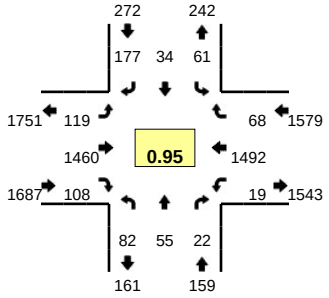
Type of peak hour being reported: Intersection Peak

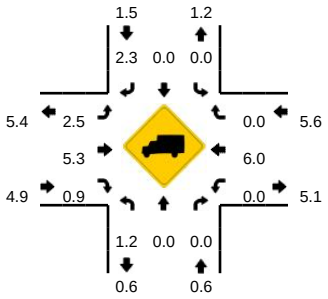
Method for determining peak hour: Total Entering Volume

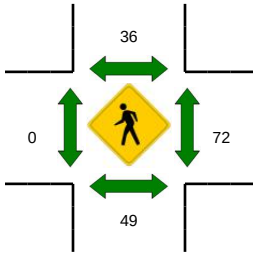
LOCATION: Kamakee St/Ala Moana Park Dr -- Ala Moana Blvd
CITY/STATE: Urban Honolulu, HI

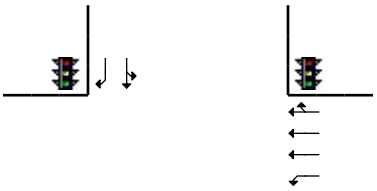
QC JOB #: 13008010
DATE: Thu, Sep 04 2014

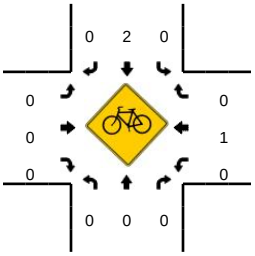
Peak-Hour: 12:00 PM -- 1:00 PM
Peak 15-Min: 12:30 PM -- 12:45 PM

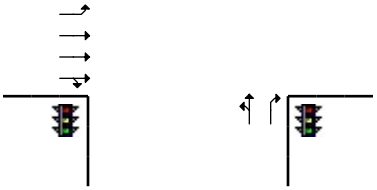


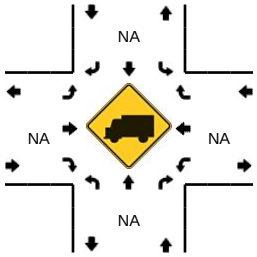


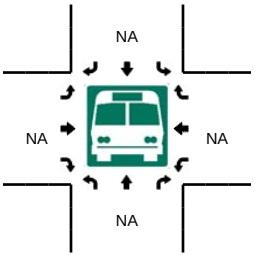












15-Min Count Period Beginning At	Kamakee St/Ala Moana Park Dr (Northbound)				Kamakee St/Ala Moana Park Dr (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	28	14	6	0	14	9	48	0	24	378	25	0	4	366	19	0	935	
12:15 PM	18	9	5	0	13	13	29	0	30	333	32	0	8	367	18	0	875	
12:30 PM	16	18	6	0	17	5	50	0	27	382	27	0	2	402	17	0	969	
12:45 PM	20	14	5	0	17	7	50	0	38	367	24	0	5	357	14	0	918	3697
1:00 PM	17	9	5	0	11	4	45	0	21	335	27	0	7	390	31	0	902	3664
1:15 PM	19	6	6	0	18	14	43	0	26	332	18	0	6	323	17	0	828	3617
1:30 PM	24	6	6	0	12	8	31	0	30	348	33	0	4	345	22	0	869	3517
1:45 PM	16	9	3	0	19	9	46	0	21	322	29	0	3	314	24	1	816	3415

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	64	72	24	0	68	20	200	0	108	1528	108	0	8	1608	68	0	3876
Heavy Trucks	0	0	0		0	0	0		0	84	4		0	132	0		220
Pedestrians		24				40				0				68			132
Bicycles	0	0	0		0	0	0		0	0	0		0	1	0		1
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

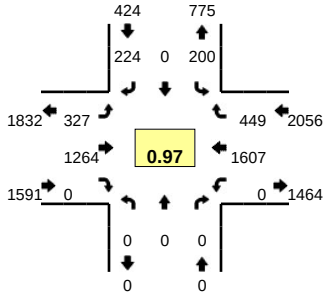
Type of peak hour being reported: Intersection Peak

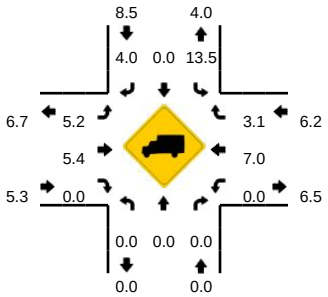
Method for determining peak hour: Total Entering Volume

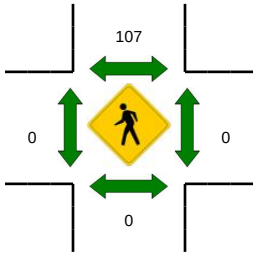
LOCATION: Piikoi St -- Ala Moana Blvd
CITY/STATE: Urban Honolulu, HI

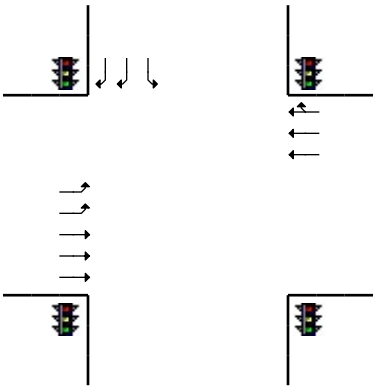
QC JOB #: 13008002
DATE: Sat, Oct 04 2014

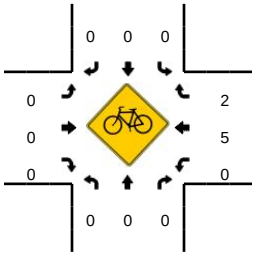
Peak-Hour: 12:15 PM -- 1:15 PM
Peak 15-Min: 1:00 PM -- 1:15 PM

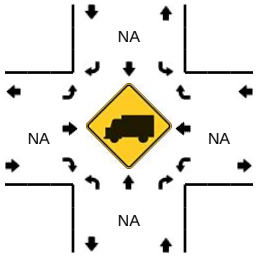


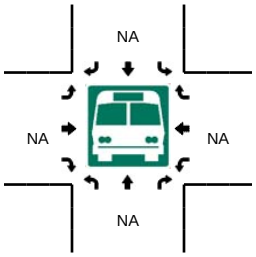












15-Min Count Period Beginning At	Piikoi St (Northbound)				Piikoi St (Southbound)				Ala Moana Blvd (Eastbound)				Ala Moana Blvd (Westbound)				Total	Hourly Totals
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U		
12:00 PM	0	0	0	0	52	0	46	0	83	310	0	0	0	383	91	0	965	
12:15 PM	0	0	0	0	53	0	52	0	81	303	0	0	0	388	106	0	983	
12:30 PM	0	0	0	0	42	0	59	0	78	317	0	0	0	427	118	0	1041	
12:45 PM	0	0	0	0	54	0	58	0	99	310	0	0	0	360	115	0	996	3985
1:00 PM	0	0	0	0	51	0	55	0	68	334	0	1	0	432	110	0	1051	4071
1:15 PM	0	0	0	0	58	0	61	0	73	301	0	0	0	335	105	0	933	4021
1:30 PM	0	0	0	0	47	0	48	0	83	311	0	0	0	363	109	0	961	3941
1:45 PM	0	0	0	0	50	0	56	0	71	322	0	0	0	355	75	0	929	3874

Peak 15-Min Flowrates	Northbound				Southbound				Eastbound				Westbound				Total
	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	Left	Thru	Right	U	
All Vehicles	0	0	0	0	204	0	220	0	272	1336	0	4	0	1728	440	0	4204
Heavy Trucks	0	0	0		20	0	8		8	64	0		0	88	8		196
Pedestrians		0				116				0				0			116
Bicycles	0	0	0		0	0	0		0	0	0		0	2	1		3
Railroad																	
Stopped Buses																	

Comments:

Report generated on 10/13/2014 12:08 AM

SOURCE: Quality Counts, LLC (http://www.qualitycounts.net) 1-877-580-2212

APPENDIX B: INTERSECTION LEVEL OF SERIVCE CALCULATIONS

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/23/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1316	177	0	1017	148	161	704	221	230	710	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.86			0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.97			0.98		1.00	1.00	0.80	1.00	0.98	
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.98			0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		6107			3397		1770	3539	1259	1770	3400	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		6107			3397		1770	3539	1259	1770	3400	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	1329	179	0	1027	149	163	711	223	232	717	128
RTOR Reduction (vph)	0	20	0	0	10	0	0	0	79	0	12	0
Lane Group Flow (vph)	0	1488	0	0	1166	0	163	711	144	232	833	0
Confl. Peds. (#/hr)	82		123	123		82	52		100	100		52
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		42.4			42.4		14.8	28.6	28.6	19.0	32.8	
Effective Green, g (s)		42.4			42.4		14.8	28.6	28.6	19.0	32.8	
Actuated g/C Ratio		0.40			0.40		0.14	0.27	0.27	0.18	0.31	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		2466			1371		249	963	342	320	1062	
v/s Ratio Prot		0.24			c0.34		0.09	0.20		c0.13	c0.24	
v/s Ratio Perm									0.11			
v/c Ratio		0.60			0.85		0.65	0.74	0.42	0.72	0.78	
Uniform Delay, d1		24.7			28.4		42.7	34.8	31.4	40.5	32.9	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.4			5.3		6.1	3.0	0.8	7.9	3.9	
Delay (s)		25.1			33.7		48.7	37.8	32.2	48.5	36.7	
Level of Service		C			C		D	D	C	D	D	
Approach Delay (s)		25.1			33.7			38.3			39.3	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	105.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1797	157	0	1026	164	294
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6245			3539	1770	1519
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6245			3539	1770	1519
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	1834	160	0	1047	167	300
RTOR Reduction (vph)	13	0	0	0	0	13
Lane Group Flow (vph)	1981	0	0	1047	167	287
Confl. Peds. (#/hr)		103	103		117	19
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	51.6			51.6	21.3	21.3
Effective Green, g (s)	51.6			51.6	21.3	21.3
Actuated g/C Ratio	0.62			0.62	0.26	0.26
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3887			2202	454	390
v/s Ratio Prot	c0.32			0.30	0.09	
v/s Ratio Perm						c0.19
v/c Ratio	0.51			0.48	0.37	0.73
Uniform Delay, d1	8.7			8.4	25.3	28.2
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.2	0.5	7.0
Delay (s)	8.8			8.6	25.8	35.2
Level of Service	A			A	C	D
Approach Delay (s)	8.8			8.6	31.9	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	11.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	82.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	57.5%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	2026	114	0	744	272	114	1161	217	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.86			0.95		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.95		1.00	1.00	0.74			
Flpb, ped/bikes		1.00			1.00		0.82	1.00	1.00			
Frt		0.99			0.96		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		6279			3232		1456	5085	1168			
Flt Permitted		0.93			1.00		0.95	1.00	1.00			
Satd. Flow (perm)		5850			3232		1456	5085	1168			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	3	2067	116	0	759	278	116	1185	221	0	0	0
RTOR Reduction (vph)	0	7	0	0	1	0	0	0	12	0	0	0
Lane Group Flow (vph)	0	2179	0	0	1036	0	116	1185	209	0	0	0
Confl. Peds. (#/hr)	84		107	107		84	86		124	124		86
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4						2		2			
Actuated Green, G (s)		64.3			64.3		35.5	35.5	35.5			
Effective Green, g (s)		64.3			64.3		35.5	35.5	35.5			
Actuated g/C Ratio		0.59			0.59		0.32	0.32	0.32			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		3425			1892		470	1644	377			
v/s Ratio Prot					0.32			c0.23				
v/s Ratio Perm		c0.37					0.08		0.18			
v/c Ratio		0.64			0.55		0.25	0.72	0.55			
Uniform Delay, d1		15.0			13.9		27.3	32.8	30.6			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		0.4			0.3		0.3	1.6	1.8			
Delay (s)		15.4			14.2		27.6	34.4	32.4			
Level of Service		B			B		C	C	C			
Approach Delay (s)		15.4			14.2			33.6			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	21.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	109.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	222	1849	2	53	1393	173	8	133	122	223	77	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.92		1.00	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.89	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5084		1770	5085	1454		3530	1583	1610	2881	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5084		1770	5085	1454		3530	1583	1610	2881	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	231	1926	2	55	1451	180	8	139	127	232	80	275
RTOR Reduction (vph)	0	0	0	0	0	98	0	0	0	0	228	0
Lane Group Flow (vph)	231	1928	0	55	1451	82	0	147	127	206	153	0
Confl. Peds. (#/hr)	27		31	31		27	19		50	50		19
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	24.0	71.9		7.4	55.3	55.3		16.5	16.5	24.1	24.1	
Effective Green, g (s)	24.0	71.9		7.4	55.3	55.3		16.5	16.5	24.1	24.1	
Actuated g/C Ratio	0.17	0.51		0.05	0.40	0.40		0.12	0.12	0.17	0.17	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	303	2612		93	2010	574		416	186	277	496	
v/s Ratio Prot	c0.13	c0.38		0.03	0.29			0.04	c0.08	c0.13	0.05	
v/s Ratio Perm						0.06						
v/c Ratio	0.76	0.74		0.59	0.72	0.14		0.35	0.68	0.74	0.31	
Uniform Delay, d1	55.2	26.6		64.8	35.8	27.1		56.8	59.2	55.0	50.6	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	10.8	1.1		9.7	1.3	0.1		0.5	9.9	10.3	0.4	
Delay (s)	66.0	27.7		74.5	37.1	27.2		57.3	69.1	65.3	51.0	
Level of Service	E	C		E	D	C		E	E	E	D	
Approach Delay (s)		31.8			37.3			62.8			56.0	
Approach LOS		C			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	38.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	139.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2152	39	0	1534	35	54
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5058			5085	1761	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5058			5085	1761	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	2196	40	0	1565	36	55
RTOR Reduction (vph)	2	0	0	0	0	24
Lane Group Flow (vph)	2234	0	0	1565	36	31
Confl. Peds. (#/hr)		51	51		3	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	64.2			64.2	7.6	7.6
Effective Green, g (s)	64.2			64.2	7.6	7.6
Actuated g/C Ratio	0.78			0.78	0.09	0.09
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3969			3990	163	147
v/s Ratio Prot	c0.44			0.31		
v/s Ratio Perm					c0.02	0.02
v/c Ratio	0.56			0.39	0.22	0.21
Uniform Delay, d1	3.4			2.7	34.4	34.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.1	0.7	0.7
Delay (s)	3.6			2.8	35.0	35.0
Level of Service	A			A	D	D
Approach Delay (s)	3.6			2.8	35.0	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	4.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.53		
Actuated Cycle Length (s)	81.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	54.2%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	80	1990	185	23	1370	74	74	59	47	67	85	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00			1.00	0.81		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.94	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1770	4928		1770	5032			1812	1288		1718	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.58	1.00		0.66	1.00
Satd. Flow (perm)	1770	4928		1770	5032			1080	1288		1167	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	85	2117	197	24	1457	79	79	63	50	71	90	117
RTOR Reduction (vph)	0	6	0	0	4	0	0	0	41	0	0	96
Lane Group Flow (vph)	85	2308	0	24	1532	0	0	142	9	0	161	21
Confl. Peds. (#/hr)	18		52	52		18			77	77		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	11.1	81.5		4.3	74.7			22.6	22.6		22.6	22.6
Effective Green, g (s)	11.1	81.5		4.3	74.7			22.6	22.6		22.6	22.6
Actuated g/C Ratio	0.09	0.66		0.03	0.61			0.18	0.18		0.18	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	159	3254		61	3046			197	235		213	289
v/s Ratio Prot	c0.05	c0.47		0.01	0.30							
v/s Ratio Perm								0.13	0.01		c0.14	0.01
v/c Ratio	0.53	0.71		0.39	0.50			0.72	0.04		0.76	0.07
Uniform Delay, d1	53.7	13.4		58.3	13.8			47.4	41.5		47.8	41.7
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	3.4	0.7		4.1	0.1			12.2	0.1		14.1	0.1
Delay (s)	57.1	14.1		62.4	13.9			59.6	41.5		61.9	41.8
Level of Service	E	B		E	B			E	D		E	D
Approach Delay (s)		15.6			14.7			54.9			53.5	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	19.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	123.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	342	1741	1544	389	262	225
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.94		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.79	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4636		1406	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4636		1406	2787
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	356	1814	1608	405	273	234
RTOR Reduction (vph)	0	0	26	0	0	0
Lane Group Flow (vph)	356	1814	1987	0	273	234
Confl. Peds. (#/hr)	111			111	78	
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	19.2	72.6	72.6		33.7	33.7
Effective Green, g (s)	19.2	72.6	72.6		33.7	33.7
Actuated g/C Ratio	0.14	0.52	0.52		0.24	0.24
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	469	2627	2395		337	668
v/s Ratio Prot	c0.10	0.36	c0.43			
v/s Ratio Perm					c0.19	0.08
v/c Ratio	0.76	0.69	0.83		0.81	0.35
Uniform Delay, d1	58.4	25.5	28.7		50.4	44.3
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	6.9	0.8	2.5		13.7	0.3
Delay (s)	65.4	26.3	31.2		64.1	44.6
Level of Service	E	C	C		E	D
Approach Delay (s)		32.7	31.2		55.1	
Approach LOS		C	C		E	

Intersection Summary			
HCM 2000 Control Delay	34.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	140.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/22/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	541	135	383	760	202	137	656	166	220	663	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91		1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.96		1.00	0.98		1.00	1.00	0.69	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.97		1.00	0.97		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		4727		1770	3375		1770	3539	1098	1770	3444	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		4727		1770	3375		1770	3539	1098	1770	3444	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	552	138	391	776	206	140	669	169	224	677	71
RTOR Reduction (vph)	0	31	0	0	17	0	0	0	129	0	5	0
Lane Group Flow (vph)	0	659	0	391	965	0	140	669	40	224	743	0
Confl. Peds. (#/hr)	26		84	84		26	52		127	127		52
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6		5	2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		25.2		32.1	62.3		15.0	30.3	30.3	20.0	35.3	
Effective Green, g (s)		25.2		32.1	62.3		15.0	30.3	30.3	20.0	35.3	
Actuated g/C Ratio		0.20		0.25	0.49		0.12	0.24	0.24	0.16	0.28	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		933		445	1647		208	840	260	277	952	
v/s Ratio Prot		c0.14		c0.22	0.29		0.08	0.19		c0.13	c0.22	
v/s Ratio Perm									0.04			
v/c Ratio		0.71		0.88	0.59		0.67	0.80	0.15	0.81	0.78	
Uniform Delay, d1		47.7		45.9	23.4		54.0	45.7	38.5	52.0	42.6	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.5		17.6	0.5		8.3	5.3	0.3	15.8	4.2	
Delay (s)		50.2		63.4	23.9		62.2	51.0	38.8	67.7	46.8	
Level of Service		D		E	C		E	D	D	E	D	
Approach Delay (s)		50.2			35.2			50.5			51.6	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	45.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	127.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	82.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	801	103	243	1095	143	208
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	0.97
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	4944			5020	1770	1542
Flt Permitted	1.00			0.68	0.95	1.00
Satd. Flow (perm)	4944			3437	1770	1542
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	871	112	264	1190	155	226
RTOR Reduction (vph)	19	0	0	0	0	129
Lane Group Flow (vph)	964	0	0	1454	155	97
Confl. Peds. (#/hr)		77	77		54	13
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	37.4			37.4	11.1	11.1
Effective Green, g (s)	37.4			37.4	11.1	11.1
Actuated g/C Ratio	0.64			0.64	0.19	0.19
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3160			2197	335	292
v/s Ratio Prot	0.19				c0.09	
v/s Ratio Perm				c0.42		0.06
v/c Ratio	0.30			0.66	0.46	0.33
Uniform Delay, d1	4.7			6.6	21.1	20.5
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.8	1.0	0.7
Delay (s)	4.8			7.4	22.1	21.2
Level of Service	A			A	C	C
Approach Delay (s)	4.8			7.4	21.5	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	8.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	58.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	66.8%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1119	73	73	1064	197	119	1135	203	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.91			0.91		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.99		1.00	1.00	0.89			
Flpb, ped/bikes		1.00			1.00		0.90	1.00	1.00			
Frt		0.99			0.98		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		4985			4908		1594	5085	1415			
Flt Permitted		1.00			0.78		0.95	1.00	1.00			
Satd. Flow (perm)		4985			3819		1594	5085	1415			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1142	74	74	1086	201	121	1158	207	0	0	0
RTOR Reduction (vph)	0	8	0	0	3	0	0	0	24	0	0	0
Lane Group Flow (vph)	0	1208	0	0	1358	0	121	1158	183	0	0	0
Confl. Peds. (#/hr)	33		112	112		33	66		64	64		66
Turn Type		NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases				8			2		2			
Actuated Green, G (s)		40.5			40.5		29.8	29.8	29.8			
Effective Green, g (s)		40.5			40.5		29.8	29.8	29.8			
Actuated g/C Ratio		0.50			0.50		0.37	0.37	0.37			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2514			1926		591	1887	525			
v/s Ratio Prot		0.24						c0.23				
v/s Ratio Perm					c0.36		0.08		0.13			
v/c Ratio		0.48			0.70		0.20	0.61	0.35			
Uniform Delay, d1		13.0			15.3		17.2	20.6	18.2			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		0.1			1.2		0.2	0.6	0.4			
Delay (s)		13.2			16.5		17.4	21.2	18.6			
Level of Service		B			B		B	C	B			
Approach Delay (s)		13.2			16.5			20.5			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	17.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	80.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	1492	8	52	1571	183	7	45	29	140	49	399
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00	1.00	1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5079		1770	5085	1557		3516	1583	1610	2850	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5079		1770	5085	1557		3516	1583	1610	2850	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	267	1554	8	54	1636	191	7	47	30	146	51	416
RTOR Reduction (vph)	0	0	0	0	0	85	0	0	0	0	361	0
Lane Group Flow (vph)	267	1562	0	54	1636	106	0	54	30	131	121	0
Confl. Peds. (#/hr)	2		34	34		2	11		63	63		11
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	25.4	76.0		7.9	58.5	58.5		8.1	8.1	17.1	17.1	
Effective Green, g (s)	25.4	76.0		7.9	58.5	58.5		8.1	8.1	17.1	17.1	
Actuated g/C Ratio	0.20	0.59		0.06	0.45	0.45		0.06	0.06	0.13	0.13	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	348	2989		108	2304	705		220	99	213	377	
v/s Ratio Prot	c0.15	0.31		0.03	c0.32			0.02	c0.02	c0.08	0.04	
v/s Ratio Perm						0.07						
v/c Ratio	0.77	0.52		0.50	0.71	0.15		0.25	0.30	0.62	0.32	
Uniform Delay, d1	49.1	15.8		58.7	28.5	20.7		57.6	57.8	52.9	50.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	9.7	0.2		3.6	1.1	0.1		0.6	1.7	5.2	0.5	
Delay (s)	58.8	15.9		62.3	29.5	20.8		58.2	59.5	58.1	51.2	
Level of Service	E	B		E	C	C		E	E	E	D	
Approach Delay (s)		22.2			29.6			58.7			52.7	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	129.1	Sum of lost time (s)	20.0
Intersection Capacity Utilization	74.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1637	35	0	1767	41	49
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5059			5085	1766	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5059			5085	1766	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	1670	36	0	1803	42	50
RTOR Reduction (vph)	2	0	0	0	0	44
Lane Group Flow (vph)	1704	0	0	1803	42	6
Confl. Peds. (#/hr)		46	46		2	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	38.0			38.0	7.0	7.0
Effective Green, g (s)	38.0			38.0	7.0	7.0
Actuated g/C Ratio	0.69			0.69	0.13	0.13
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3495			3513	224	201
v/s Ratio Prot	0.34			c0.35		
v/s Ratio Perm					c0.02	0.00
v/c Ratio	0.49			0.51	0.19	0.03
Uniform Delay, d1	4.0			4.1	21.5	21.0
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.1	0.4	0.1
Delay (s)	4.1			4.2	21.9	21.1
Level of Service	A			A	C	C
Approach Delay (s)	4.1			4.2	21.4	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	4.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.46		
Actuated Cycle Length (s)	55.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	45.8%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	119	1460	108	19	1492	68	82	55	22	61	34	177
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.86		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.94	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	1.00
Satd. Flow (prot)	1770	4976		1770	5035			1809	1366		1691	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.76	1.00		0.64	1.00
Satd. Flow (perm)	1770	4976		1770	5035			1415	1366		1118	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	125	1537	114	20	1571	72	86	58	23	64	36	186
RTOR Reduction (vph)	0	5	0	0	3	0	0	0	19	0	0	154
Lane Group Flow (vph)	125	1646	0	20	1640	0	0	144	4	0	100	32
Confl. Peds. (#/hr)	36		49	49		36			72	72		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	12.8	60.9		2.6	50.7			16.2	16.2		16.2	16.2
Effective Green, g (s)	12.8	60.9		2.6	50.7			16.2	16.2		16.2	16.2
Actuated g/C Ratio	0.14	0.64		0.03	0.54			0.17	0.17		0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	239	3199		48	2695			242	233		191	270
v/s Ratio Prot	c0.07	0.33		0.01	c0.33							
v/s Ratio Perm								c0.10	0.00		0.09	0.02
v/c Ratio	0.52	0.51		0.42	0.61			0.60	0.02		0.52	0.12
Uniform Delay, d1	38.1	9.0		45.3	15.2			36.2	32.6		35.7	33.2
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	2.1	0.1		5.8	0.4			3.9	0.0		2.6	0.2
Delay (s)	40.2	9.2		51.1	15.6			40.1	32.7		38.3	33.4
Level of Service	D	A		D	B			D	C		D	C
Approach Delay (s)		11.3			16.0			39.1			35.1	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	16.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	94.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	327	1264	1607	449	200	224
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4676		1770	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4676		1770	2787
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	337	1303	1657	463	206	231
RTOR Reduction (vph)	0	0	39	0	0	0
Lane Group Flow (vph)	337	1303	2081	0	206	231
Confl. Peds. (#/hr)	107			107		
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	15.4	81.1	60.7		17.8	17.8
Effective Green, g (s)	15.4	81.1	60.7		17.8	17.8
Actuated g/C Ratio	0.14	0.74	0.56		0.16	0.16
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	485	3786	2606		289	455
v/s Ratio Prot	c0.10	0.26	c0.45			
v/s Ratio Perm					c0.12	0.08
v/c Ratio	0.69	0.34	0.80		0.71	0.51
Uniform Delay, d1	44.5	4.8	19.2		43.1	41.6
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	4.3	0.1	1.8		8.1	0.9
Delay (s)	48.8	4.8	21.0		51.2	42.4
Level of Service	D	A	C		D	D
Approach Delay (s)		13.9	21.0		46.6	
Approach LOS		B	C		D	

Intersection Summary			
HCM 2000 Control Delay	20.9	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	108.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	75.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/31/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1316	197	0	1018	149	164	706	221	230	730	127
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.86			0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.97			0.98		1.00	1.00	0.79	1.00	0.98	
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.98			0.98		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		6077			3395		1770	3539	1256	1770	3403	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		6077			3395		1770	3539	1256	1770	3403	
Peak-hour factor, PHF	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99
Adj. Flow (vph)	0	1329	199	0	1028	151	166	713	223	232	737	128
RTOR Reduction (vph)	0	22	0	0	10	0	0	0	79	0	12	0
Lane Group Flow (vph)	0	1506	0	0	1169	0	166	713	144	232	853	0
Confl. Peds. (#/hr)	82		123	123		82	52		100	100		52
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		42.6			42.6		15.0	29.3	29.3	19.1	33.4	
Effective Green, g (s)		42.6			42.6		15.0	29.3	29.3	19.1	33.4	
Actuated g/C Ratio		0.40			0.40		0.14	0.28	0.28	0.18	0.32	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		2442			1364		250	978	347	318	1072	
v/s Ratio Prot		0.25			c0.34		0.09	0.20		c0.13	c0.25	
v/s Ratio Perm									0.11			
v/c Ratio		0.62			0.86		0.66	0.73	0.42	0.73	0.80	
Uniform Delay, d1		25.2			28.9		43.1	34.8	31.3	41.0	33.2	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		0.5			5.5		6.5	2.8	0.8	8.1	4.2	
Delay (s)		25.7			34.5		49.6	37.5	32.2	49.1	37.4	
Level of Service		C			C		D	D	C	D	D	
Approach Delay (s)		25.7			34.5			38.2			39.9	
Approach LOS		C			C			D			D	

Intersection Summary			
HCM 2000 Control Delay	33.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	106.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	80.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1797	157	0	1026	166	301
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	0.96
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6244			3539	1770	1518
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6244			3539	1770	1518
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	1834	160	0	1047	169	307
RTOR Reduction (vph)	13	0	0	0	0	13
Lane Group Flow (vph)	1981	0	0	1047	169	294
Confl. Peds. (#/hr)		103	103		117	19
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	51.8			51.8	21.8	21.8
Effective Green, g (s)	51.8			51.8	21.8	21.8
Actuated g/C Ratio	0.62			0.62	0.26	0.26
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3868			2192	461	395
v/s Ratio Prot	c0.32			0.30	0.10	
v/s Ratio Perm						c0.19
v/c Ratio	0.51			0.48	0.37	0.74
Uniform Delay, d1	8.9			8.6	25.3	28.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.2	0.5	7.4
Delay (s)	9.0			8.8	25.8	35.7
Level of Service	A			A	C	D
Approach Delay (s)	9.0			8.8	32.2	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	12.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	83.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.0%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	3	2033	114	0	744	272	114	1167	217	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.86			0.95		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.95		1.00	1.00	0.74			
Flpb, ped/bikes		1.00			1.00		0.82	1.00	1.00			
Frt		0.99			0.96		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		6280			3231		1456	5085	1167			
Flt Permitted		0.93			1.00		0.95	1.00	1.00			
Satd. Flow (perm)		5850			3231		1456	5085	1167			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	3	2074	116	0	759	278	116	1191	221	0	0	0
RTOR Reduction (vph)	0	7	0	0	1	0	0	0	12	0	0	0
Lane Group Flow (vph)	0	2186	0	0	1036	0	116	1191	209	0	0	0
Confl. Peds. (#/hr)	84		107	107		84	86		124	124		86
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4						2		2			
Actuated Green, G (s)		64.4			64.4		35.6	35.6	35.6			
Effective Green, g (s)		64.4			64.4		35.6	35.6	35.6			
Actuated g/C Ratio		0.59			0.59		0.32	0.32	0.32			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		3424			1891		471	1645	377			
v/s Ratio Prot					0.32			c0.23				
v/s Ratio Perm		c0.37					0.08		0.18			
v/c Ratio		0.64			0.55		0.25	0.72	0.55			
Uniform Delay, d1		15.1			13.9		27.3	32.9	30.7			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		0.4			0.3		0.3	1.6	1.8			
Delay (s)		15.5			14.2		27.6	34.5	32.4			
Level of Service		B			B		C	C	C			
Approach Delay (s)		15.5			14.2			33.7			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	21.1	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	110.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	64.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	222	1889	2	118	1389	186	8	133	122	295	77	264
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.92		1.00	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.90	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	0.99	
Satd. Flow (prot)	1770	5084		1770	5085	1449		3530	1583	1610	2917	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	0.99	
Satd. Flow (perm)	1770	5084		1770	5085	1449		3530	1583	1610	2917	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	231	1968	2	123	1447	194	8	139	127	307	80	275
RTOR Reduction (vph)	0	0	0	0	0	105	0	0	0	0	199	0
Lane Group Flow (vph)	231	1970	0	123	1447	89	0	147	127	230	233	0
Confl. Peds. (#/hr)	27		31	31		27	19		50	50		19
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	24.6	72.3		11.2	58.9	58.9		16.8	16.8	26.3	26.3	
Effective Green, g (s)	24.6	72.3		11.2	58.9	58.9		16.8	16.8	26.3	26.3	
Actuated g/C Ratio	0.17	0.49		0.08	0.40	0.40		0.11	0.11	0.18	0.18	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	297	2507		135	2043	582		404	181	288	523	
v/s Ratio Prot	c0.13	c0.39		0.07	0.28			0.04	c0.08	c0.14	0.08	
v/s Ratio Perm						0.06						
v/c Ratio	0.78	0.79		0.91	0.71	0.15		0.36	0.70	0.80	0.45	
Uniform Delay, d1	58.4	30.7		67.2	36.7	28.0		60.0	62.5	57.6	53.7	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.1	1.7		51.3	1.1	0.1		0.6	11.6	14.3	0.6	
Delay (s)	70.5	32.4		118.5	37.8	28.1		60.5	74.1	71.9	54.3	
Level of Service	E	C		F	D	C		E	E	E	D	
Approach Delay (s)		36.4			42.4			66.8			60.4	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	43.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	146.6	Sum of lost time (s)	20.0
Intersection Capacity Utilization	84.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2126	243	0	1582	71	95
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	0.99	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4910			5085	1759	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4910			5085	1759	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	2169	248	0	1614	72	97
RTOR Reduction (vph)	10	0	0	0	0	26
Lane Group Flow (vph)	2407	0	0	1614	72	71
Confl. Peds. (#/hr)		51	51		3	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	88.0			88.0	10.5	10.5
Effective Green, g (s)	88.0			88.0	10.5	10.5
Actuated g/C Ratio	0.81			0.81	0.10	0.10
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3982			4124	170	153
v/s Ratio Prot	c0.49			0.32		
v/s Ratio Perm					0.04	c0.04
v/c Ratio	0.60			0.39	0.42	0.46
Uniform Delay, d1	3.8			2.8	46.1	46.3
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.3			0.1	1.7	2.2
Delay (s)	4.1			2.9	47.8	48.5
Level of Service	A			A	D	D
Approach Delay (s)	4.1			2.9	48.2	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	5.4	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	108.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	61.1%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	93	2004	185	23	1414	74	74	59	47	67	85	114
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	1.00			1.00	0.81		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.94	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.98	1.00
Satd. Flow (prot)	1770	4928		1770	5034			1812	1287		1718	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.58	1.00		0.66	1.00
Satd. Flow (perm)	1770	4928		1770	5034			1077	1287		1163	1583
Peak-hour factor, PHF	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Adj. Flow (vph)	99	2132	197	24	1504	79	79	63	50	71	90	121
RTOR Reduction (vph)	0	5	0	0	4	0	0	0	41	0	0	99
Lane Group Flow (vph)	99	2324	0	24	1579	0	0	142	9	0	161	22
Confl. Peds. (#/hr)	18		52	52		18			77	77		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	11.8	82.0		4.3	74.5			22.6	22.6		22.6	22.6
Effective Green, g (s)	11.8	82.0		4.3	74.5			22.6	22.6		22.6	22.6
Actuated g/C Ratio	0.10	0.66		0.03	0.60			0.18	0.18		0.18	0.18
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	168	3261		61	3026			196	234		212	288
v/s Ratio Prot	c0.06	c0.47		0.01	0.31							
v/s Ratio Perm								0.13	0.01		c0.14	0.01
v/c Ratio	0.59	0.71		0.39	0.52			0.72	0.04		0.76	0.08
Uniform Delay, d1	53.7	13.4		58.5	14.4			47.7	41.7		48.1	42.0
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	5.2	0.8		4.1	0.2			12.5	0.1		14.4	0.1
Delay (s)	58.9	14.2		62.7	14.5			60.2	41.8		62.5	42.1
Level of Service	E	B		E	B			E	D		E	D
Approach Delay (s)		16.0			15.2			55.4			53.8	
Approach LOS		B			B			E			D	

Intersection Summary			
HCM 2000 Control Delay	19.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	123.9	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.8%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	350	1748	1584	389	262	229
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.94		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.79	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4644		1405	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4644		1405	2787
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	365	1821	1650	405	273	239
RTOR Reduction (vph)	0	0	24	0	0	0
Lane Group Flow (vph)	365	1821	2031	0	273	239
Confl. Peds. (#/hr)	111			111	78	
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	20.4	74.5	74.5		31.1	31.1
Effective Green, g (s)	20.4	74.5	74.5		31.1	31.1
Actuated g/C Ratio	0.14	0.53	0.53		0.22	0.22
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	496	2686	2453		309	614
v/s Ratio Prot	c0.11	0.36	c0.44			
v/s Ratio Perm					c0.19	0.09
v/c Ratio	0.74	0.68	0.83		0.88	0.39
Uniform Delay, d1	57.7	24.4	27.9		53.2	46.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.6	0.7	2.4		24.4	0.4
Delay (s)	63.3	25.1	30.3		77.6	47.3
Level of Service	E	C	C		E	D
Approach Delay (s)		31.5	30.3		63.4	
Approach LOS		C	C		E	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	141.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.5%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/31/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	541	146	394	763	205	144	662	166	220	674	70
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91		1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.95		1.00	0.98		1.00	1.00	0.69	1.00	0.99	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.97		1.00	0.97		1.00	1.00	0.85	1.00	0.99	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		4702		1770	3373		1770	3539	1096	1770	3445	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		4702		1770	3373		1770	3539	1096	1770	3445	
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	552	149	402	779	209	147	676	169	224	688	71
RTOR Reduction (vph)	0	35	0	0	17	0	0	0	129	0	5	0
Lane Group Flow (vph)	0	666	0	402	971	0	147	676	40	224	754	0
Confl. Peds. (#/hr)	26		84	84		26	52		127	127		52
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6		5	2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		25.5		33.3	63.8		15.4	30.6	30.6	20.0	35.2	
Effective Green, g (s)		25.5		33.3	63.8		15.4	30.6	30.6	20.0	35.2	
Actuated g/C Ratio		0.20		0.26	0.49		0.12	0.24	0.24	0.15	0.27	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		926		455	1663		210	836	259	273	937	
v/s Ratio Prot		c0.14		c0.23	0.29		0.08	0.19		c0.13	c0.22	
v/s Ratio Perm									0.04			
v/c Ratio		0.72		0.88	0.58		0.70	0.81	0.15	0.82	0.80	
Uniform Delay, d1		48.6		46.2	23.3		54.8	46.6	39.1	53.0	43.9	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.7		18.0	0.5		9.8	5.8	0.3	17.6	5.1	
Delay (s)		51.3		64.2	23.9		64.6	52.4	39.4	70.6	49.0	
Level of Service		D		E	C		E	D	D	E	D	
Approach Delay (s)		51.3			35.5			52.0			53.9	
Approach LOS		D			D			D			D	

Intersection Summary			
HCM 2000 Control Delay	46.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	129.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	83.9%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	801	103	243	1106	148	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	0.97
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	4943			5020	1770	1542
Flt Permitted	1.00			0.68	0.95	1.00
Satd. Flow (perm)	4943			3436	1770	1542
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	871	112	264	1202	161	246
RTOR Reduction (vph)	19	0	0	0	0	128
Lane Group Flow (vph)	964	0	0	1466	161	118
Confl. Peds. (#/hr)		77	77		54	13
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	38.4			38.4	11.5	11.5
Effective Green, g (s)	38.4			38.4	11.5	11.5
Actuated g/C Ratio	0.64			0.64	0.19	0.19
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3168			2202	339	296
v/s Ratio Prot	0.19				c0.09	
v/s Ratio Perm				c0.43		0.08
v/c Ratio	0.30			0.67	0.47	0.40
Uniform Delay, d1	4.8			6.7	21.5	21.2
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.8	1.1	0.9
Delay (s)	4.8			7.5	22.6	22.0
Level of Service	A			A	C	C
Approach Delay (s)	4.8			7.5	22.3	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	8.7	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	59.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	67.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1137	73	73	1075	197	119	1152	203	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.91			0.91		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.99		1.00	1.00	0.89			
Flpb, ped/bikes		1.00			1.00		0.90	1.00	1.00			
Frt		0.99			0.98		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		4985			4910		1591	5085	1413			
Flt Permitted		1.00			0.77		0.95	1.00	1.00			
Satd. Flow (perm)		4985			3802		1591	5085	1413			
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	1160	74	74	1097	201	121	1176	207	0	0	0
RTOR Reduction (vph)	0	8	0	0	3	0	0	0	23	0	0	0
Lane Group Flow (vph)	0	1226	0	0	1369	0	121	1176	184	0	0	0
Confl. Peds. (#/hr)	33		112	112		33	66		64	64		66
Turn Type		NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases				8			2		2			
Actuated Green, G (s)		41.2			41.2		30.3	30.3	30.3			
Effective Green, g (s)		41.2			41.2		30.3	30.3	30.3			
Actuated g/C Ratio		0.51			0.51		0.37	0.37	0.37			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2520			1921		591	1890	525			
v/s Ratio Prot		0.25						c0.23				
v/s Ratio Perm					c0.36		0.08		0.13			
v/c Ratio		0.49			0.71		0.20	0.62	0.35			
Uniform Delay, d1		13.2			15.6		17.4	20.9	18.5			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		0.1			1.3		0.2	0.6	0.4			
Delay (s)		13.4			16.8		17.6	21.6	18.9			
Level of Service		B			B		B	C	B			
Approach Delay (s)		13.4			16.8			20.9			0.0	
Approach LOS		B			B			C			A	

Intersection Summary			
HCM 2000 Control Delay	17.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	81.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	256	1513	8	87	1586	217	7	45	29	189	49	399
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00	1.00	1.00	0.97	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5079		1770	5085	1557		3516	1583	1610	2852	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5079		1770	5085	1557		3516	1583	1610	2852	
Peak-hour factor, PHF	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	267	1576	8	91	1652	226	7	47	30	197	51	416
RTOR Reduction (vph)	0	0	0	0	0	101	0	0	0	0	351	0
Lane Group Flow (vph)	267	1584	0	91	1652	125	0	54	30	177	136	0
Confl. Peds. (#/hr)	2		34	34		2	11		63	63		11
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	25.3	73.0		11.5	59.2	59.2		8.2	8.2	20.8	20.8	
Effective Green, g (s)	25.3	73.0		11.5	59.2	59.2		8.2	8.2	20.8	20.8	
Actuated g/C Ratio	0.19	0.55		0.09	0.44	0.44		0.06	0.06	0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	335	2777		152	2254	690		215	97	250	444	
v/s Ratio Prot	c0.15	0.31		0.05	c0.32			0.02	c0.02	c0.11	0.05	
v/s Ratio Perm						0.08						
v/c Ratio	0.80	0.57		0.60	0.73	0.18		0.25	0.31	0.71	0.31	
Uniform Delay, d1	51.6	19.9		58.8	30.6	22.5		59.7	59.9	53.5	50.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	12.4	0.3		6.2	1.3	0.1		0.6	1.8	8.8	0.4	
Delay (s)	64.0	20.2		65.0	31.9	22.6		60.3	61.8	62.3	50.3	
Level of Service	E	C		E	C	C		E	E	E	D	
Approach Delay (s)		26.5			32.4			60.8			53.5	
Approach LOS		C			C			E			D	

Intersection Summary			
HCM 2000 Control Delay	33.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.71		
Actuated Cycle Length (s)	133.5	Sum of lost time (s)	20.0
Intersection Capacity Utilization	75.7%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1617	160	0	1782	126	136
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4968			5085	1765	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4968			5085	1765	1583
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	1650	163	0	1818	129	139
RTOR Reduction (vph)	15	0	0	0	0	53
Lane Group Flow (vph)	1798	0	0	1818	129	86
Confl. Peds. (#/hr)		46	46		2	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	42.0			42.0	10.2	10.2
Effective Green, g (s)	42.0			42.0	10.2	10.2
Actuated g/C Ratio	0.68			0.68	0.16	0.16
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3354			3433	289	259
v/s Ratio Prot	c0.36			0.36		
v/s Ratio Perm					c0.07	0.05
v/c Ratio	0.54			0.53	0.45	0.33
Uniform Delay, d1	5.1			5.1	23.5	23.0
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.1	1.1	0.8
Delay (s)	5.3			5.3	24.6	23.8
Level of Service	A			A	C	C
Approach Delay (s)	5.3			5.3	24.1	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	6.6	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	62.2	Sum of lost time (s)	10.0
Intersection Capacity Utilization	51.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	152	1498	108	19	1505	68	82	55	22	61	34	179
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	1.00			1.00	0.86		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.94	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	1.00
Satd. Flow (prot)	1770	4977		1770	5035			1809	1359		1688	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.76	1.00		0.63	1.00
Satd. Flow (perm)	1770	4977		1770	5035			1415	1359		1099	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	160	1577	114	20	1584	72	86	58	23	64	36	188
RTOR Reduction (vph)	0	4	0	0	3	0	0	0	19	0	0	156
Lane Group Flow (vph)	160	1687	0	20	1653	0	0	144	4	0	100	32
Confl. Peds. (#/hr)	36		49	49		36			72	72		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	14.4	64.0		2.6	52.2			16.6	16.6		16.6	16.6
Effective Green, g (s)	14.4	64.0		2.6	52.2			16.6	16.6		16.6	16.6
Actuated g/C Ratio	0.15	0.65		0.03	0.53			0.17	0.17		0.17	0.17
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	259	3243		46	2676			239	229		185	267
v/s Ratio Prot	c0.09	0.34		0.01	c0.33							
v/s Ratio Perm								c0.10	0.00		0.09	0.02
v/c Ratio	0.62	0.52		0.43	0.62			0.60	0.02		0.54	0.12
Uniform Delay, d1	39.3	9.0		47.1	16.0			37.7	34.0		37.3	34.6
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	4.3	0.2		6.5	0.4			4.2	0.0		3.2	0.2
Delay (s)	43.7	9.2		53.5	16.5			42.0	34.0		40.5	34.8
Level of Service	D	A		D	B			D	C		D	C
Approach Delay (s)		12.1			16.9			40.9			36.8	
Approach LOS		B			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	17.1	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	98.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	67.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	347	1282	1618	449	200	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4677		1770	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4677		1770	2787
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	358	1322	1668	463	206	233
RTOR Reduction (vph)	0	0	39	0	0	0
Lane Group Flow (vph)	358	1322	2092	0	206	233
Confl. Peds. (#/hr)	107			107		
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	15.8	81.6	60.8		17.8	17.8
Effective Green, g (s)	15.8	81.6	60.8		17.8	17.8
Actuated g/C Ratio	0.14	0.75	0.56		0.16	0.16
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	495	3792	2599		287	453
v/s Ratio Prot	c0.10	0.26	c0.45			
v/s Ratio Perm					c0.12	0.08
v/c Ratio	0.72	0.35	0.80		0.72	0.51
Uniform Delay, d1	44.7	4.8	19.5		43.4	41.9
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	5.2	0.1	1.9		8.3	1.0
Delay (s)	49.9	4.8	21.4		51.7	42.8
Level of Service	D	A	C		D	D
Approach Delay (s)		14.4	21.4		47.0	
Approach LOS		B	C		D	

Intersection Summary			
HCM 2000 Control Delay	21.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	109.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	76.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/23/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1502	282	0	1167	299	305	826	275	346	1159	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.86			0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.96			0.96		1.00	1.00	0.77	1.00	0.98	
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.98			0.97		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		5976			3296		1770	3539	1215	1770	3381	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		5976			3296		1770	3539	1215	1770	3381	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1581	297	0	1228	315	321	869	289	364	1220	238
RTOR Reduction (vph)	0	28	0	0	19	0	0	0	79	0	14	0
Lane Group Flow (vph)	0	1850	0	0	1524	0	321	869	210	364	1445	0
Confl. Peds. (#/hr)	82		123	123		82	52		100	100		52
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		47.0			47.0		19.0	33.0	33.0	25.0	39.0	
Effective Green, g (s)		47.0			47.0		19.0	33.0	33.0	25.0	39.0	
Actuated g/C Ratio		0.39			0.39		0.16	0.28	0.28	0.21	0.32	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		2340			1290		280	973	334	368	1098	
v/s Ratio Prot		0.31			c0.46		c0.18	0.25		0.21	c0.43	
v/s Ratio Perm									0.17			
v/c Ratio		0.79			1.18		1.15	0.89	0.63	0.99	1.32	
Uniform Delay, d1		32.2			36.5		50.5	41.8	38.1	47.4	40.5	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		1.9			89.9		99.3	10.5	3.7	43.5	148.5	
Delay (s)		34.1			126.4		149.8	52.3	41.8	90.9	189.0	
Level of Service		C			F		F	D	D	F	F	
Approach Delay (s)		34.1			126.4			71.4			169.4	
Approach LOS		C			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	100.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.22		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	112.2%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2077	239	0	1201	291	448
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	0.95
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6160			3539	1770	1501
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6160			3539	1770	1501
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2186	252	0	1264	306	472
RTOR Reduction (vph)	18	0	0	0	0	6
Lane Group Flow (vph)	2420	0	0	1264	306	466
Confl. Peds. (#/hr)		103	103		117	19
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	74.7			74.7	29.2	29.2
Effective Green, g (s)	74.7			74.7	29.2	29.2
Actuated g/C Ratio	0.66			0.66	0.26	0.26
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4039			2321	453	384
v/s Ratio Prot	c0.39			0.36	0.17	
v/s Ratio Perm						c0.31
v/c Ratio	0.60			0.54	0.68	1.21
Uniform Delay, d1	11.1			10.5	38.1	42.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.3	4.0	117.9
Delay (s)	11.4			10.8	42.1	160.2
Level of Service	B			B	D	F
Approach Delay (s)	11.4			10.8	113.7	
Approach LOS	B			B	F	

Intersection Summary			
HCM 2000 Control Delay	29.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.77		
Actuated Cycle Length (s)	113.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	72.6%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	2401	133	0	900	281	129	1203	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.86			0.95		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.95		1.00	1.00	0.72			
Flpb, ped/bikes		1.00			1.00		0.81	1.00	1.00			
Frt		0.99			0.96		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		6272			3254		1431	5085	1136			
Flt Permitted		0.85			1.00		0.95	1.00	1.00			
Satd. Flow (perm)		5317			3254		1431	5085	1136			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	48	2527	140	0	947	296	136	1266	242	0	0	0
RTOR Reduction (vph)	0	6	0	0	1	0	0	0	12	0	0	0
Lane Group Flow (vph)	0	2709	0	0	1242	0	136	1266	230	0	0	0
Confl. Peds. (#/hr)	84		107	107		84	86		124	124		86
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4						2		2			
Actuated Green, G (s)		71.0			71.0		37.8	37.8	37.8			
Effective Green, g (s)		71.0			71.0		37.8	37.8	37.8			
Actuated g/C Ratio		0.60			0.60		0.32	0.32	0.32			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		3177			1944		455	1617	361			
v/s Ratio Prot					0.38			c0.25				
v/s Ratio Perm		c0.51					0.10		0.20			
v/c Ratio		0.85			0.64		0.30	0.78	0.64			
Uniform Delay, d1		19.6			15.6		30.5	36.8	34.6			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		2.4			0.7		0.4	2.6	3.7			
Delay (s)		22.0			16.3		30.9	39.3	38.3			
Level of Service		C			B		C	D	D			
Approach Delay (s)		22.0			16.3			38.5			0.0	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	25.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	118.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.0%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	306	1988	3	55	1542	395	9	138	126	282	80	432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.91		1.00	1.00	1.00	0.95	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5083		1770	5085	1442		3529	1583	1610	2818	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5083		1770	5085	1442		3529	1583	1610	2818	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	322	2093	3	58	1623	416	9	145	133	297	84	455
RTOR Reduction (vph)	0	0	0	0	0	210	0	0	0	0	369	0
Lane Group Flow (vph)	322	2096	0	58	1623	206	0	154	133	267	200	0
Confl. Peds. (#/hr)	27		31	31		27	19		50	50		19
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	31.0	80.9		8.0	57.9	57.9		17.6	17.6	29.5	29.5	
Effective Green, g (s)	31.0	80.9		8.0	57.9	57.9		17.6	17.6	29.5	29.5	
Actuated g/C Ratio	0.20	0.52		0.05	0.37	0.37		0.11	0.11	0.19	0.19	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	351	2635		90	1887	535		398	178	304	532	
v/s Ratio Prot	c0.18	0.41		0.03	c0.32			0.04	c0.08	c0.17	0.07	
v/s Ratio Perm						0.14						
v/c Ratio	0.92	0.80		0.64	0.86	0.38		0.39	0.75	0.88	0.38	
Uniform Delay, d1	61.2	30.8		72.6	45.3	36.0		64.2	67.0	61.5	55.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	27.9	1.7		14.7	4.3	0.5		0.6	15.7	23.6	0.4	
Delay (s)	89.1	32.5		87.3	49.6	36.4		64.8	82.7	85.1	55.7	
Level of Service	F	C		F	D	D		E	F	F	E	
Approach Delay (s)		40.0			48.0			73.1			65.1	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	48.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	156.0	Sum of lost time (s)	20.0
Intersection Capacity Utilization	92.2%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2352	41	0	1903	37	56
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	0.99	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5055			5085	1758	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5055			5085	1758	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2476	43	0	2003	39	59
RTOR Reduction (vph)	1	0	0	0	0	16
Lane Group Flow (vph)	2518	0	0	2003	39	43
Confl. Peds. (#/hr)		51	51		3	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	93.5			93.5	9.0	9.0
Effective Green, g (s)	93.5			93.5	9.0	9.0
Actuated g/C Ratio	0.83			0.83	0.08	0.08
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4201			4226	140	126
v/s Ratio Prot	c0.50			0.39		
v/s Ratio Perm					0.02	c0.03
v/c Ratio	0.60			0.47	0.28	0.34
Uniform Delay, d1	3.2			2.6	48.7	49.0
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.1	1.1	1.6
Delay (s)	3.4			2.7	49.8	50.6
Level of Service	A			A	D	D
Approach Delay (s)	3.4			2.7	50.3	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	4.1	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.58		
Actuated Cycle Length (s)	112.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	58.2%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	144	2125	191	24	1679	216	77	61	49	183	88	169
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.78		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.90	1.00
Frt	1.00	0.99		1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	1.00
Satd. Flow (prot)	1770	4915		1770	4963			1812	1229		1619	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.42	1.00		0.62	1.00
Satd. Flow (perm)	1770	4915		1770	4963			783	1229		1041	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	152	2237	201	25	1767	227	81	64	52	193	93	178
RTOR Reduction (vph)	0	6	0	0	11	0	0	0	39	0	0	109
Lane Group Flow (vph)	152	2432	0	25	1983	0	0	145	13	0	286	69
Confl. Peds. (#/hr)	18		52	52		18			77	77		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	13.1	91.5		5.0	83.4			38.3	38.3		38.3	38.3
Effective Green, g (s)	13.1	91.5		5.0	83.4			38.3	38.3		38.3	38.3
Actuated g/C Ratio	0.09	0.61		0.03	0.56			0.26	0.26		0.26	0.26
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	154	3002		59	2763			200	314		266	404
v/s Ratio Prot	c0.09	c0.49		0.01	0.40							
v/s Ratio Perm								0.19	0.01		c0.27	0.04
v/c Ratio	0.99	0.81		0.42	0.72			0.72	0.04		1.08	0.17
Uniform Delay, d1	68.3	22.5		71.0	24.5			50.9	42.0		55.8	43.4
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	68.0	1.7		4.8	0.9			12.3	0.1		76.6	0.2
Delay (s)	136.3	24.2		75.8	25.4			63.2	42.0		132.3	43.6
Level of Service	F	C		E	C			E	D		F	D
Approach Delay (s)		30.8			26.0			57.6			98.3	
Approach LOS		C			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	35.9	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.92		
Actuated Cycle Length (s)	149.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	85.8%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	373	1961	1980	419	276	250
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.79	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4687		1395	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4687		1395	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	393	2064	2084	441	291	263
RTOR Reduction (vph)	0	0	18	0	0	0
Lane Group Flow (vph)	393	2064	2507	0	291	263
Confl. Peds. (#/hr)	111			111	78	
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	21.7	77.1	77.1		31.0	31.0
Effective Green, g (s)	21.7	77.1	77.1		31.0	31.0
Actuated g/C Ratio	0.15	0.53	0.53		0.21	0.21
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	514	2707	2495		298	596
v/s Ratio Prot	c0.11	0.41	c0.53			
v/s Ratio Perm					c0.21	0.09
v/c Ratio	0.76	0.76	1.00		0.98	0.44
Uniform Delay, d1	59.1	26.6	33.9		56.5	49.4
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	6.7	1.3	19.2		45.3	0.5
Delay (s)	65.8	28.0	53.0		101.8	49.9
Level of Service	E	C	D		F	D
Approach Delay (s)		34.0	53.0		77.2	
Approach LOS		C	D		E	

Intersection Summary			
HCM 2000 Control Delay	47.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	144.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/22/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	704	239	497	902	355	281	776	219	336	1111	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91		1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.94		1.00	0.98		1.00	1.00	0.69	1.00	0.98	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.96		1.00	0.96		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		4599		1770	3311		1770	3539	1085	1770	3401	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		4599		1770	3311		1770	3539	1085	1770	3401	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	741	252	523	949	374	296	817	231	354	1169	177
RTOR Reduction (vph)	0	43	0	0	29	0	0	0	146	0	8	0
Lane Group Flow (vph)	0	950	0	523	1294	0	296	817	85	354	1338	0
Confl. Peds. (#/hr)	26		84	84		26	52		127	127		52
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6		5	2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		32.8		35.0	72.8		19.0	35.0	35.0	22.0	38.0	
Effective Green, g (s)		32.8		35.0	72.8		19.0	35.0	35.0	22.0	38.0	
Actuated g/C Ratio		0.23		0.24	0.50		0.13	0.24	0.24	0.15	0.26	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1041		427	1664		232	855	262	268	892	
v/s Ratio Prot		c0.21		c0.30	0.39		0.17	0.23		c0.20	c0.39	
v/s Ratio Perm									0.08			
v/c Ratio		0.91		1.22	0.78		1.28	0.96	0.32	1.32	1.50	
Uniform Delay, d1		54.6		54.9	29.4		62.9	54.1	45.2	61.4	53.4	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		11.9		120.5	2.4		153.2	20.5	0.7	168.1	230.8	
Delay (s)		66.5		175.4	31.8		216.1	74.7	45.9	229.5	284.2	
Level of Service		E		F	C		F	E	D	F	F	
Approach Delay (s)		66.5			72.4			100.9			272.9	
Approach LOS		E			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	135.8	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.27		
Actuated Cycle Length (s)	144.8	Sum of lost time (s)	20.0
Intersection Capacity Utilization	116.7%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1051	184	320	1374	270	360
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	0.97
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	4868			5021	1770	1530
Flt Permitted	1.00			0.64	0.95	1.00
Satd. Flow (perm)	4868			3237	1770	1530
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1106	194	337	1446	284	379
RTOR Reduction (vph)	28	0	0	0	0	78
Lane Group Flow (vph)	1272	0	0	1783	284	301
Confl. Peds. (#/hr)		77	77		54	13
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	60.2			60.2	20.3	20.3
Effective Green, g (s)	60.2			60.2	20.3	20.3
Actuated g/C Ratio	0.67			0.67	0.22	0.22
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3238			2153	397	343
v/s Ratio Prot	0.26				0.16	
v/s Ratio Perm				c0.55		c0.20
v/c Ratio	0.39			1.51dl	0.72	0.88
Uniform Delay, d1	6.9			11.3	32.4	33.9
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			2.8	6.0	21.6
Delay (s)	6.9			14.1	38.5	55.5
Level of Service	A			B	D	E
Approach Delay (s)	6.9			14.1	48.2	
Approach LOS	A			B	D	

Intersection Summary			
HCM 2000 Control Delay	17.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.84		
Actuated Cycle Length (s)	90.5	Sum of lost time (s)	10.0
Intersection Capacity Utilization	85.7%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	1466	91	85	1400	203	134	1176	216	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.91			0.91		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.99		1.00	1.00	0.87			
Flpb, ped/bikes		1.00			1.00		0.88	1.00	1.00			
Frt		0.99			0.98		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		4974			4938		1557	5085	1383			
Flt Permitted		0.79			0.69		0.95	1.00	1.00			
Satd. Flow (perm)		3956			3430		1557	5085	1383			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	1543	96	89	1474	214	141	1238	227	0	0	0
RTOR Reduction (vph)	0	7	0	0	2	0	0	0	14	0	0	0
Lane Group Flow (vph)	0	1676	0	0	1775	0	141	1238	213	0	0	0
Confl. Peds. (#/hr)	33		112	112		33	66		64	64		66
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4			8			2		2			
Actuated Green, G (s)		54.0			54.0		33.3	33.3	33.3			
Effective Green, g (s)		54.0			54.0		33.3	33.3	33.3			
Actuated g/C Ratio		0.55			0.55		0.34	0.34	0.34			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2195			1903		532	1740	473			
v/s Ratio Prot								c0.24				
v/s Ratio Perm		0.42			c0.52		0.09		0.15			
v/c Ratio		0.76			0.93		0.27	0.71	0.45			
Uniform Delay, d1		16.7			20.0		23.1	27.8	24.9			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		1.6			9.0		0.3	1.4	0.7			
Delay (s)		18.4			28.9		23.4	29.2	25.6			
Level of Service		B			C		C	C	C			
Approach Delay (s)		18.4			28.9			28.2			0.0	
Approach LOS		B			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	25.2	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	100.4%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	341	1620	9	54	1725	303	8	47	30	197	51	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5079		1770	5085	1556		3515	1583	1610	2828	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5079		1770	5085	1556		3515	1583	1610	2828	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	359	1705	9	57	1816	319	8	49	32	207	54	602
RTOR Reduction (vph)	0	0	0	0	0	126	0	0	0	0	408	0
Lane Group Flow (vph)	359	1714	0	57	1816	193	0	57	32	186	269	0
Confl. Peds. (#/hr)	2		34	34		2	11		63	63		11
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	25.1	81.5		8.3	64.7	64.7		8.4	8.4	22.2	22.2	
Effective Green, g (s)	25.1	81.5		8.3	64.7	64.7		8.4	8.4	22.2	22.2	
Actuated g/C Ratio	0.18	0.58		0.06	0.46	0.46		0.06	0.06	0.16	0.16	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	316	2948		104	2343	717		210	94	254	447	
v/s Ratio Prot	c0.20	0.34		0.03	c0.36			0.02	c0.02	c0.12	0.10	
v/s Ratio Perm						0.12						
v/c Ratio	1.14	0.58		0.55	0.78	0.27		0.27	0.34	0.73	0.95dr	
Uniform Delay, d1	57.7	18.6		64.2	31.7	23.3		63.1	63.3	56.3	55.0	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	92.7	0.3		5.8	1.7	0.2		0.7	2.2	10.4	2.3	
Delay (s)	150.3	18.9		70.0	33.4	23.5		63.8	65.5	66.7	57.3	
Level of Service	F	B		E	C	C		E	E	E	E	
Approach Delay (s)		41.7			32.9			64.4			59.3	
Approach LOS		D			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	41.3	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.81		
Actuated Cycle Length (s)	140.4	Sum of lost time (s)	20.0
Intersection Capacity Utilization	87.1%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1821	37	0	2041	43	51
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	1.00			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	1.00			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	5057			5085	1765	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	5057			5085	1765	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1917	39	0	2148	45	54
RTOR Reduction (vph)	2	0	0	0	0	36
Lane Group Flow (vph)	1954	0	0	2148	45	18
Confl. Peds. (#/hr)		46	46		2	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	57.6			57.6	7.7	7.7
Effective Green, g (s)	57.6			57.6	7.7	7.7
Actuated g/C Ratio	0.76			0.76	0.10	0.10
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3868			3889	180	161
v/s Ratio Prot	0.39			c0.42		
v/s Ratio Perm					c0.03	0.01
v/c Ratio	0.51			0.55	0.25	0.11
Uniform Delay, d1	3.4			3.6	31.1	30.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			0.2	0.7	0.3
Delay (s)	3.5			3.8	31.9	31.0
Level of Service	A			A	C	C
Approach Delay (s)	3.5			3.8	31.4	
Approach LOS	A			A	C	

Intersection Summary			
HCM 2000 Control Delay	4.3	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.52		
Actuated Cycle Length (s)	75.3	Sum of lost time (s)	10.0
Intersection Capacity Utilization	51.1%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	184	1579	112	20	1703	141	85	57	23	176	36	238
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.81		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.89	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.96	1.00
Satd. Flow (prot)	1770	4961		1770	4989			1809	1283		1599	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.48	1.00		0.57	1.00
Satd. Flow (perm)	1770	4961		1770	4989			900	1283		954	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	194	1662	118	21	1793	148	89	60	24	185	38	251
RTOR Reduction (vph)	0	5	0	0	7	0	0	0	18	0	0	182
Lane Group Flow (vph)	194	1775	0	21	1934	0	0	149	6	0	223	69
Confl. Peds. (#/hr)	36		49	49		36			72	72		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	17.9	83.3		4.6	70.0			31.3	31.3		31.3	31.3
Effective Green, g (s)	17.9	83.3		4.6	70.0			31.3	31.3		31.3	31.3
Actuated g/C Ratio	0.13	0.62		0.03	0.52			0.23	0.23		0.23	0.23
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	236	3079		60	2602			209	299		222	369
v/s Ratio Prot	c0.11	0.36		0.01	c0.39							
v/s Ratio Perm								0.17	0.00		c0.23	0.04
v/c Ratio	0.82	0.58		0.35	0.74			0.71	0.02		1.00	0.19
Uniform Delay, d1	56.6	15.0		63.3	25.1			47.3	39.6		51.4	41.3
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	20.1	0.3		3.5	1.2			10.9	0.0		61.6	0.2
Delay (s)	76.7	15.3		66.9	26.3			58.2	39.6		113.0	41.5
Level of Service	E	B		E	C			E	D		F	D
Approach Delay (s)		21.3			26.7			55.7			75.1	
Approach LOS		C			C			E			E	

Intersection Summary			
HCM 2000 Control Delay	30.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	134.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	77.3%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	357	1470	1874	472	213	249
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4699		1770	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4699		1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	376	1547	1973	497	224	262
RTOR Reduction (vph)	0	0	34	0	0	0
Lane Group Flow (vph)	376	1547	2436	0	224	262
Confl. Peds. (#/hr)	107			107		
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	16.2	84.5	63.3		18.9	18.9
Effective Green, g (s)	16.2	84.5	63.3		18.9	18.9
Actuated g/C Ratio	0.14	0.75	0.56		0.17	0.17
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	490	3789	2622		295	464
v/s Ratio Prot	c0.11	0.30	c0.52			
v/s Ratio Perm					c0.13	0.09
v/c Ratio	0.77	0.41	0.93		0.76	0.56
Uniform Delay, d1	46.8	5.3	23.0		45.1	43.5
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	7.1	0.1	6.5		10.7	1.6
Delay (s)	53.9	5.4	29.5		55.8	45.0
Level of Service	D	A	C		E	D
Approach Delay (s)		14.8	29.5		50.0	
Approach LOS		B	C		D	

Intersection Summary			
HCM 2000 Control Delay	25.8	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	113.4	Sum of lost time (s)	15.0
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/31/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	1502	302	0	1168	300	308	828	275	346	1179	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.86			0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.95			0.96		1.00	1.00	0.77	1.00	0.98	
Flpb, ped/bikes		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.97			0.97		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		5951			3295		1770	3539	1215	1770	3383	
Flt Permitted		1.00			1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		5951			3295		1770	3539	1215	1770	3383	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1581	318	0	1229	316	324	872	289	364	1241	238
RTOR Reduction (vph)	0	30	0	0	19	0	0	0	79	0	14	0
Lane Group Flow (vph)	0	1869	0	0	1526	0	324	872	210	364	1466	0
Confl. Peds. (#/hr)	82		123	123		82	52		100	100		52
Turn Type		NA			NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6			2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		47.0			47.0		19.0	33.0	33.0	25.0	39.0	
Effective Green, g (s)		47.0			47.0		19.0	33.0	33.0	25.0	39.0	
Actuated g/C Ratio		0.39			0.39		0.16	0.28	0.28	0.21	0.32	
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		2330			1290		280	973	334	368	1099	
v/s Ratio Prot		0.31			c0.46		c0.18	0.25		0.21	c0.43	
v/s Ratio Perm									0.17			
v/c Ratio		0.80			1.18		1.16	0.90	0.63	0.99	1.33	
Uniform Delay, d1		32.4			36.5		50.5	41.9	38.1	47.4	40.5	
Progression Factor		1.00			1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		2.1			90.6		103.2	10.7	3.7	43.5	156.4	
Delay (s)		34.5			127.1		153.7	52.6	41.8	90.9	196.9	
Level of Service		C			F		F	D	D	F	F	
Approach Delay (s)		34.5			127.1			72.5			175.9	
Approach LOS		C			F			E			F	

Intersection Summary			
HCM 2000 Control Delay	102.4	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.23		
Actuated Cycle Length (s)	120.0	Sum of lost time (s)	15.0
Intersection Capacity Utilization	113.0%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2077	239	0	1201	293	455
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.86			0.95	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	0.95
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	6160			3539	1770	1501
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	6160			3539	1770	1501
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2186	252	0	1264	308	479
RTOR Reduction (vph)	18	0	0	0	0	6
Lane Group Flow (vph)	2420	0	0	1264	308	473
Confl. Peds. (#/hr)		103	103		117	19
Turn Type	NA			NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases						2
Actuated Green, G (s)	74.7			74.7	29.2	29.2
Effective Green, g (s)	74.7			74.7	29.2	29.2
Actuated g/C Ratio	0.66			0.66	0.26	0.26
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4039			2321	453	384
v/s Ratio Prot	c0.39			0.36	0.17	
v/s Ratio Perm						c0.32
v/c Ratio	0.60			0.54	0.68	1.23
Uniform Delay, d1	11.1			10.5	38.1	42.4
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.3	4.0	125.1
Delay (s)	11.4			10.8	42.2	167.5
Level of Service	B			B	D	F
Approach Delay (s)	11.4			10.8	118.4	
Approach LOS	B			B	F	

Intersection Summary			
HCM 2000 Control Delay	30.0	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	113.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	73.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	46	2408	133	0	900	281	129	1209	230	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.86			0.95		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.95		1.00	1.00	0.72			
Flpb, ped/bikes		1.00			1.00		0.81	1.00	1.00			
Frt		0.99			0.96		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		6273			3254		1430	5085	1135			
Flt Permitted		0.85			1.00		0.95	1.00	1.00			
Satd. Flow (perm)		5317			3254		1430	5085	1135			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	48	2535	140	0	947	296	136	1273	242	0	0	0
RTOR Reduction (vph)	0	6	0	0	0	0	0	0	12	0	0	0
Lane Group Flow (vph)	0	2717	0	0	1243	0	136	1273	230	0	0	0
Confl. Peds. (#/hr)	84		107	107		84	86		124	124		86
Turn Type	Perm	NA			NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4						2		2			
Actuated Green, G (s)		71.0			71.0		37.9	37.9	37.9			
Effective Green, g (s)		71.0			71.0		37.9	37.9	37.9			
Actuated g/C Ratio		0.60			0.60		0.32	0.32	0.32			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		3174			1943		455	1620	361			
v/s Ratio Prot					0.38			c0.25				
v/s Ratio Perm		c0.51					0.10		0.20			
v/c Ratio		0.86			0.64		0.30	0.79	0.64			
Uniform Delay, d1		19.7			15.6		30.5	36.8	34.6			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		2.5			0.7		0.4	2.6	3.7			
Delay (s)		22.2			16.3		30.9	39.4	38.3			
Level of Service		C			B		C	D	D			
Approach Delay (s)		22.2			16.3			38.5			0.0	
Approach LOS		C			B			D			A	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	118.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.2%	ICU Level of Service	G
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	306	2028	3	120	1538	408	9	138	126	354	80	432
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.91		1.00	1.00	1.00	0.95	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.88	
Flt Protected	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5083		1770	5085	1440		3529	1583	1610	2831	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5083		1770	5085	1440		3529	1583	1610	2831	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	322	2135	3	126	1619	429	9	145	133	373	84	455
RTOR Reduction (vph)	0	0	0	0	0	219	0	0	0	0	366	0
Lane Group Flow (vph)	322	2138	0	126	1619	210	0	154	133	321	225	0
Confl. Peds. (#/hr)	27		31	31		27	19		50	50		19
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	31.8	76.9		13.0	58.1	58.1		17.8	17.8	31.0	31.0	
Effective Green, g (s)	31.8	76.9		13.0	58.1	58.1		17.8	17.8	31.0	31.0	
Actuated g/C Ratio	0.20	0.48		0.08	0.37	0.37		0.11	0.11	0.20	0.20	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	354	2463		144	1861	527		395	177	314	552	
v/s Ratio Prot	c0.18	c0.42		0.07	0.32			0.04	c0.08	c0.20	0.08	
v/s Ratio Perm						0.15						
v/c Ratio	0.91	0.87		0.88	0.87	0.40		0.39	0.75	1.02	0.41	
Uniform Delay, d1	62.0	36.4		72.0	46.8	37.3		65.4	68.3	63.8	55.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	26.2	3.5		40.4	4.7	0.5		0.6	16.4	56.6	0.5	
Delay (s)	88.2	39.9		112.4	51.4	37.8		66.0	84.7	120.5	56.3	
Level of Service	F	D		F	D	D		E	F	F	E	
Approach Delay (s)		46.2			52.3			74.7			78.9	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	55.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	158.7	Sum of lost time (s)	20.0
Intersection Capacity Utilization	93.5%	ICU Level of Service	F
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	2326	245	0	1951	73	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	0.99	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4897			5085	1755	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4897			5085	1755	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	2448	258	0	2054	77	102
RTOR Reduction (vph)	8	0	0	0	0	15
Lane Group Flow (vph)	2698	0	0	2054	77	87
Confl. Peds. (#/hr)		51	51		3	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	119.2			119.2	12.8	12.8
Effective Green, g (s)	119.2			119.2	12.8	12.8
Actuated g/C Ratio	0.84			0.84	0.09	0.09
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	4110			4268	158	142
v/s Ratio Prot	c0.55			0.40		
v/s Ratio Perm					0.04	c0.05
v/c Ratio	0.66			0.48	0.49	0.61
Uniform Delay, d1	4.1			3.1	61.5	62.2
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.4			0.1	2.4	7.2
Delay (s)	4.5			3.2	63.8	69.4
Level of Service	A			A	E	E
Approach Delay (s)	4.5			3.2	67.0	
Approach LOS	A			A	E	

Intersection Summary			
HCM 2000 Control Delay	6.2	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	142.0	Sum of lost time (s)	10.0
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	157	2139	191	24	1723	216	77	61	49	183	88	173
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.98		1.00	0.99			1.00	0.77		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.90	1.00
Frt	1.00	0.99		1.00	0.98			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.97	1.00
Satd. Flow (prot)	1770	4916		1770	4966			1812	1227		1618	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.42	1.00		0.62	1.00
Satd. Flow (perm)	1770	4916		1770	4966			775	1227		1038	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	165	2252	201	25	1814	227	81	64	52	193	93	182
RTOR Reduction (vph)	0	6	0	0	11	0	0	0	39	0	0	108
Lane Group Flow (vph)	165	2447	0	25	2030	0	0	145	13	0	286	74
Confl. Peds. (#/hr)	18		52	52		18			77	77		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	13.1	92.4		5.0	84.3			38.3	38.3		38.3	38.3
Effective Green, g (s)	13.1	92.4		5.0	84.3			38.3	38.3		38.3	38.3
Actuated g/C Ratio	0.09	0.61		0.03	0.56			0.25	0.25		0.25	0.25
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	153	3014		58	2777			196	311		263	402
v/s Ratio Prot	c0.09	c0.50		0.01	0.41							
v/s Ratio Perm								0.19	0.01		c0.28	0.05
v/c Ratio	1.08	0.81		0.43	0.73			0.74	0.04		1.09	0.18
Uniform Delay, d1	68.8	22.5		71.5	24.8			51.6	42.4		56.2	44.0
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	95.2	1.8		5.1	1.0			13.6	0.1		80.8	0.2
Delay (s)	164.0	24.2		76.5	25.8			65.2	42.4		137.0	44.2
Level of Service	F	C		E	C			E	D		F	D
Approach Delay (s)		33.0			26.4			59.2			100.9	
Approach LOS		C			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	37.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.93		
Actuated Cycle Length (s)	150.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	86.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	381	1968	2020	419	276	254
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		0.79	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4693		1394	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4693		1394	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	401	2072	2126	441	291	267
RTOR Reduction (vph)	0	0	18	0	0	0
Lane Group Flow (vph)	401	2072	2549	0	291	267
Confl. Peds. (#/hr)	111			111	78	
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	22.1	77.1	77.1		31.0	31.0
Effective Green, g (s)	22.1	77.1	77.1		31.0	31.0
Actuated g/C Ratio	0.15	0.53	0.53		0.21	0.21
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	522	2700	2491		297	595
v/s Ratio Prot	c0.12	0.41	c0.54			
v/s Ratio Perm					c0.21	0.10
v/c Ratio	0.77	0.77	1.02		0.98	0.45
Uniform Delay, d1	59.1	27.0	34.0		56.8	49.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	6.7	1.4	24.2		46.1	0.5
Delay (s)	65.8	28.3	58.3		102.9	50.2
Level of Service	E	C	E		F	D
Approach Delay (s)		34.4	58.3		77.7	
Approach LOS		C	E		E	

Intersection Summary			
HCM 2000 Control Delay	49.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	145.2	Sum of lost time (s)	15.0
Intersection Capacity Utilization	88.1%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis
1: Ward Ave & Kapiolani Blvd

10/31/2014

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	0	704	250	508	905	358	288	782	219	336	1122	168
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Lane Util. Factor		0.91		1.00	0.95		1.00	0.95	1.00	1.00	0.95	
Frpb, ped/bikes		0.94		1.00	0.98		1.00	1.00	0.69	1.00	0.98	
Flpb, ped/bikes		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Frt		0.96		1.00	0.96		1.00	1.00	0.85	1.00	0.98	
Flt Protected		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)		4584		1770	3311		1770	3539	1085	1770	3402	
Flt Permitted		1.00		0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)		4584		1770	3311		1770	3539	1085	1770	3402	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	741	263	535	953	377	303	823	231	354	1181	177
RTOR Reduction (vph)	0	44	0	0	29	0	0	0	146	0	8	0
Lane Group Flow (vph)	0	960	0	535	1301	0	303	823	85	354	1350	0
Confl. Peds. (#/hr)	26		84	84		26	52		127	127		52
Turn Type		NA		Prot	NA		Prot	NA	Perm	Prot	NA	
Protected Phases		6		5	2		7	4		3	8	
Permitted Phases									4			
Actuated Green, G (s)		32.9		35.0	72.9		19.0	35.0	35.0	22.0	38.0	
Effective Green, g (s)		32.9		35.0	72.9		19.0	35.0	35.0	22.0	38.0	
Actuated g/C Ratio		0.23		0.24	0.50		0.13	0.24	0.24	0.15	0.26	
Clearance Time (s)		5.0		5.0	5.0		5.0	5.0	5.0	5.0	5.0	
Vehicle Extension (s)		3.0		3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)		1040		427	1665		232	854	262	268	892	
v/s Ratio Prot		c0.21		c0.30	0.39		0.17	0.23		c0.20	c0.40	
v/s Ratio Perm									0.08			
v/c Ratio		0.92		1.25	0.78		1.31	0.96	0.33	1.32	1.51	
Uniform Delay, d1		54.8		55.0	29.5		63.0	54.3	45.2	61.5	53.5	
Progression Factor		1.00		1.00	1.00		1.00	1.00	1.00	1.00	1.00	
Incremental Delay, d2		13.1		131.8	2.5		165.3	22.2	0.7	168.1	236.8	
Delay (s)		67.9		186.8	31.9		228.3	76.5	46.0	229.6	290.2	
Level of Service		E		F	C		F	E	D	F	F	
Approach Delay (s)		67.9			76.4			105.2			277.7	
Approach LOS		E			E			F			F	

Intersection Summary			
HCM 2000 Control Delay	139.6	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.28		
Actuated Cycle Length (s)	144.9	Sum of lost time (s)	20.0
Intersection Capacity Utilization	118.3%	ICU Level of Service	H
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1051	184	320	1385	275	378
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.98			1.00	1.00	0.97
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.98			1.00	1.00	0.85
Flt Protected	1.00			0.99	0.95	1.00
Satd. Flow (prot)	4867			5021	1770	1530
Flt Permitted	1.00			0.64	0.95	1.00
Satd. Flow (perm)	4867			3238	1770	1530
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1106	194	337	1458	289	398
RTOR Reduction (vph)	28	0	0	0	0	78
Lane Group Flow (vph)	1272	0	0	1795	289	320
Confl. Peds. (#/hr)		77	77		54	13
Turn Type	NA		Perm	NA	Prot	Perm
Protected Phases	4			8	2	
Permitted Phases			8			2
Actuated Green, G (s)	60.6			60.6	20.3	20.3
Effective Green, g (s)	60.6			60.6	20.3	20.3
Actuated g/C Ratio	0.67			0.67	0.22	0.22
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3244			2158	395	341
v/s Ratio Prot	0.26				0.16	
v/s Ratio Perm				c0.55		c0.21
v/c Ratio	0.39			1.51dl	0.73	0.94
Uniform Delay, d1	6.8			11.3	32.8	34.7
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.1			2.9	6.8	32.9
Delay (s)	6.9			14.2	39.6	67.6
Level of Service	A			B	D	E
Approach Delay (s)	6.9			14.2	55.8	
Approach LOS	A			B	E	

Intersection Summary			
HCM 2000 Control Delay	19.3	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	90.9	Sum of lost time (s)	10.0
Intersection Capacity Utilization	86.2%	ICU Level of Service	E
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	42	1484	91	85	1411	203	134	1193	216	0	0	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		5.0			5.0		5.0	5.0	5.0			
Lane Util. Factor		0.91			0.91		1.00	0.91	1.00			
Frpb, ped/bikes		0.99			0.99		1.00	1.00	0.87			
Flpb, ped/bikes		1.00			1.00		0.88	1.00	1.00			
Frt		0.99			0.98		1.00	1.00	0.85			
Flt Protected		1.00			1.00		0.95	1.00	1.00			
Satd. Flow (prot)		4975			4939		1555	5085	1382			
Flt Permitted		0.79			0.69		0.95	1.00	1.00			
Satd. Flow (perm)		3951			3422		1555	5085	1382			
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	44	1562	96	89	1485	214	141	1256	227	0	0	0
RTOR Reduction (vph)	0	7	0	0	2	0	0	0	14	0	0	0
Lane Group Flow (vph)	0	1695	0	0	1786	0	141	1256	213	0	0	0
Confl. Peds. (#/hr)	33		112	112		33	66		64	64		66
Turn Type	Perm	NA		Perm	NA		Perm	NA	Perm			
Protected Phases		4			8			2				
Permitted Phases	4			8			2		2			
Actuated Green, G (s)		54.4			54.4		33.4	33.4	33.4			
Effective Green, g (s)		54.4			54.4		33.4	33.4	33.4			
Actuated g/C Ratio		0.56			0.56		0.34	0.34	0.34			
Clearance Time (s)		5.0			5.0		5.0	5.0	5.0			
Vehicle Extension (s)		3.0			3.0		3.0	3.0	3.0			
Lane Grp Cap (vph)		2197			1903		531	1736	471			
v/s Ratio Prot								c0.25				
v/s Ratio Perm		0.43			c0.52		0.09		0.15			
v/c Ratio		0.77			0.98dl		0.27	0.72	0.45			
Uniform Delay, d1		16.9			20.2		23.3	28.2	25.1			
Progression Factor		1.00			1.00		1.00	1.00	1.00			
Incremental Delay, d2		1.7			9.5		0.3	1.5	0.7			
Delay (s)		18.6			29.7		23.6	29.7	25.8			
Level of Service		B			C		C	C	C			
Approach Delay (s)		18.6			29.7			28.6			0.0	
Approach LOS		B			C			C			A	

Intersection Summary			
HCM 2000 Control Delay	25.7	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	97.8	Sum of lost time (s)	10.0
Intersection Capacity Utilization	101.3%	ICU Level of Service	G
Analysis Period (min)	15		

dl Defacto Left Lane. Recode with 1 though lane as a left lane.
c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	341	1641	9	89	1740	337	8	47	30	246	51	572
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Lane Util. Factor	1.00	0.91		1.00	0.91	1.00		0.95	1.00	0.91	0.91	
Frpb, ped/bikes	1.00	1.00		1.00	1.00	0.98		1.00	1.00	1.00	0.96	
Flpb, ped/bikes	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Frt	1.00	1.00		1.00	1.00	0.85		1.00	0.85	1.00	0.87	
Flt Protected	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (prot)	1770	5079		1770	5085	1556		3515	1583	1610	2830	
Flt Permitted	0.95	1.00		0.95	1.00	1.00		0.99	1.00	0.95	1.00	
Satd. Flow (perm)	1770	5079		1770	5085	1556		3515	1583	1610	2830	
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	359	1727	9	94	1832	355	8	49	32	259	54	602
RTOR Reduction (vph)	0	0	0	0	0	141	0	0	0	0	400	0
Lane Group Flow (vph)	359	1736	0	94	1832	214	0	57	32	233	282	0
Confl. Peds. (#/hr)	2		34	34		2	11		63	63		11
Turn Type	Prot	NA		Prot	NA	Perm	Split	NA	Prot	Split	NA	
Protected Phases	7	4		3	8		2	2	2	6	6	
Permitted Phases						8						
Actuated Green, G (s)	25.0	78.0		11.8	64.8	64.8		8.4	8.4	25.0	25.0	
Effective Green, g (s)	25.0	78.0		11.8	64.8	64.8		8.4	8.4	25.0	25.0	
Actuated g/C Ratio	0.17	0.54		0.08	0.45	0.45		0.06	0.06	0.17	0.17	
Clearance Time (s)	5.0	5.0		5.0	5.0	5.0		5.0	5.0	5.0	5.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0		3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	309	2766		145	2301	704		206	92	281	494	
v/s Ratio Prot	c0.20	0.34		0.05	c0.36			0.02	c0.02	c0.14	0.10	
v/s Ratio Perm						0.14						
v/c Ratio	1.16	0.63		0.65	0.80	0.30		0.28	0.35	0.83	0.92dr	
Uniform Delay, d1	59.1	22.5		63.7	33.5	24.9		64.5	64.8	57.0	54.2	
Progression Factor	1.00	1.00		1.00	1.00	1.00		1.00	1.00	1.00	1.00	
Incremental Delay, d2	102.5	0.5		9.6	2.0	0.2		0.7	2.3	17.9	1.6	
Delay (s)	161.6	23.0		73.3	35.5	25.1		65.2	67.0	75.0	55.8	
Level of Service	F	C		E	D	C		E	E	E	E	
Approach Delay (s)		46.8			35.5			65.9			60.7	
Approach LOS		D			D			E			E	

Intersection Summary			
HCM 2000 Control Delay	44.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	143.2	Sum of lost time (s)	20.0
Intersection Capacity Utilization	88.3%	ICU Level of Service	E
Analysis Period (min)	15		

dr Defacto Right Lane. Recode with 1 though lane as a right lane.

c Critical Lane Group

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (vph)	1801	162	0	2056	128	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0			5.0	5.0	5.0
Lane Util. Factor	0.91			0.91	1.00	1.00
Frpb, ped/bikes	0.99			1.00	1.00	1.00
Flpb, ped/bikes	1.00			1.00	1.00	1.00
Frt	0.99			1.00	1.00	0.85
Flt Protected	1.00			1.00	0.95	1.00
Satd. Flow (prot)	4964			5085	1764	1583
Flt Permitted	1.00			1.00	0.95	1.00
Satd. Flow (perm)	4964			5085	1764	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	1896	171	0	2164	135	145
RTOR Reduction (vph)	10	0	0	0	0	35
Lane Group Flow (vph)	2057	0	0	2164	135	110
Confl. Peds. (#/hr)		46	46		2	
Turn Type	NA			NA	Perm	Perm
Protected Phases	4			8		
Permitted Phases				8	2	2
Actuated Green, G (s)	62.7			62.7	11.9	11.9
Effective Green, g (s)	62.7			62.7	11.9	11.9
Actuated g/C Ratio	0.74			0.74	0.14	0.14
Clearance Time (s)	5.0			5.0	5.0	5.0
Vehicle Extension (s)	3.0			3.0	3.0	3.0
Lane Grp Cap (vph)	3678			3768	248	222
v/s Ratio Prot	0.41			c0.43		
v/s Ratio Perm					c0.08	0.07
v/c Ratio	0.56			0.57	0.54	0.49
Uniform Delay, d1	4.8			4.9	33.8	33.6
Progression Factor	1.00			1.00	1.00	1.00
Incremental Delay, d2	0.2			0.2	2.4	1.7
Delay (s)	5.0			5.1	36.3	35.3
Level of Service	A			A	D	D
Approach Delay (s)	5.0			5.1	35.8	
Approach LOS	A			A	D	

Intersection Summary			
HCM 2000 Control Delay	7.0	HCM 2000 Level of Service	A
HCM 2000 Volume to Capacity ratio	0.57		
Actuated Cycle Length (s)	84.6	Sum of lost time (s)	10.0
Intersection Capacity Utilization	55.6%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	217	1617	112	20	1716	141	85	57	23	176	36	240
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Lane Util. Factor	1.00	0.91		1.00	0.91			1.00	1.00		1.00	1.00
Frpb, ped/bikes	1.00	0.99		1.00	0.99			1.00	0.81		1.00	1.00
Flpb, ped/bikes	1.00	1.00		1.00	1.00			1.00	1.00		0.89	1.00
Frt	1.00	0.99		1.00	0.99			1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00			0.97	1.00		0.96	1.00
Satd. Flow (prot)	1770	4962		1770	4989			1809	1278		1597	1583
Flt Permitted	0.95	1.00		0.95	1.00			0.47	1.00		0.57	1.00
Satd. Flow (perm)	1770	4962		1770	4989			881	1278		944	1583
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	228	1702	118	21	1806	148	89	60	24	185	38	253
RTOR Reduction (vph)	0	4	0	0	7	0	0	0	19	0	0	182
Lane Group Flow (vph)	228	1816	0	21	1947	0	0	149	5	0	223	71
Confl. Peds. (#/hr)	36		49	49		36			72	72		
Turn Type	Prot	NA		Prot	NA		Perm	NA	Perm	Perm	NA	Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases		6					4		4	8		8
Actuated Green, G (s)	19.3	85.8		4.7	71.2			31.2	31.2		31.2	31.2
Effective Green, g (s)	19.3	85.8		4.7	71.2			31.2	31.2		31.2	31.2
Actuated g/C Ratio	0.14	0.63		0.03	0.52			0.23	0.23		0.23	0.23
Clearance Time (s)	5.0	5.0		5.0	5.0			5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	249	3114		60	2598			201	291		215	361
v/s Ratio Prot	c0.13	0.37		0.01	c0.39							
v/s Ratio Perm								0.17	0.00		c0.24	0.04
v/c Ratio	0.92	0.58		0.35	0.75			0.74	0.02		1.04	0.20
Uniform Delay, d1	57.9	14.9		64.5	25.7			49.0	40.9		52.7	42.6
Progression Factor	1.00	1.00		1.00	1.00			1.00	1.00		1.00	1.00
Incremental Delay, d2	35.0	0.3		3.5	1.2			13.7	0.0		71.4	0.3
Delay (s)	92.9	15.2		68.0	27.0			62.7	40.9		124.2	42.9
Level of Service	F	B		E	C			E	D		F	D
Approach Delay (s)		23.9			27.4			59.7			81.0	
Approach LOS		C			C			E			F	

Intersection Summary			
HCM 2000 Control Delay	32.5	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	136.7	Sum of lost time (s)	15.0
Intersection Capacity Utilization	79.4%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (vph)	377	1488	1885	472	213	251
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	5.0	5.0	5.0		5.0	5.0
Lane Util. Factor	0.97	0.91	0.91		1.00	0.88
Frpb, ped/bikes	1.00	1.00	0.95		1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.97		1.00	0.85
Flt Protected	0.95	1.00	1.00		0.95	1.00
Satd. Flow (prot)	3433	5085	4700		1770	2787
Flt Permitted	0.95	1.00	1.00		0.95	1.00
Satd. Flow (perm)	3433	5085	4700		1770	2787
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	397	1566	1984	497	224	264
RTOR Reduction (vph)	0	0	34	0	0	0
Lane Group Flow (vph)	397	1566	2447	0	224	264
Confl. Peds. (#/hr)	107			107		
Turn Type	Prot	NA	NA		Perm	Perm
Protected Phases	7	4	8			
Permitted Phases					6	6
Actuated Green, G (s)	16.7	84.9	63.2		18.9	18.9
Effective Green, g (s)	16.7	84.9	63.2		18.9	18.9
Actuated g/C Ratio	0.15	0.75	0.56		0.17	0.17
Clearance Time (s)	5.0	5.0	5.0		5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	503	3793	2610		293	462
v/s Ratio Prot	c0.12	0.31	c0.52			
v/s Ratio Perm					c0.13	0.09
v/c Ratio	0.79	0.41	0.94		0.76	0.57
Uniform Delay, d1	46.9	5.3	23.5		45.3	43.7
Progression Factor	1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	8.1	0.1	7.3		11.3	1.7
Delay (s)	54.9	5.4	30.8		56.6	45.4
Level of Service	D	A	C		E	D
Approach Delay (s)		15.4	30.8		50.5	
Approach LOS		B	C		D	

Intersection Summary			
HCM 2000 Control Delay	26.6	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.88		
Actuated Cycle Length (s)	113.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	83.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

APPENDIX D

PRE-ASSESSMENT CONSULTATION LETTERS

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NEIL ABERCROMBIE
GOVERNOR

JESSICA E. WOOLEY
DIRECTOR

STATE OF HAWAI'I
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
Department of Health
235 South Beretania Street, Suite 702
Honolulu, Hawai'i 96813
Telephone (808) 586-4185
Facsimile (808) 586-4186
Email: oeqchawaii@doh.hawaii.gov

October 6, 2014

Ms. Rachel Okoji, Principal
Environmental Risk Analysis LLC
P.O. Box 240606
Honolulu, Hawai'i 96824

SUBJECT: Draft Environmental Assessment: Pre-Consultation, Proposed Multi-Use Facility, Kewalo Basin, Honolulu, Hawai'i; and
Draft Environmental Assessment: Pre-Consultation, Proposed Restaurant with Outdoor Seating, Kewalo Basin, Honolulu, Hawai'i

Aloha Ms. Okoji,

The Office of Environmental Quality Control is in receipt of two pre-consultation letters, dated September 10, 2014, for the proposed Multi-Use Facility Draft Environmental Assessment and the proposed Restaurant with Outdoor Seating, both located at Kewalo Basin. Environmental Risk Analysis (ERA) LLC is conducting environmental assessment pre-consultation on behalf of Good Luck International Corporation and Hinamari Hawai'i, Inc., for a proposed Multi-Use Facility and also on behalf of Bellavita, Inc., for a proposed Restaurant with Outdoor Seating. After review of the proposed project, OEQC offers these comments:

1. Please review the Kewalo Basin Repairs Final Environmental Impact Statement published in The Environmental Notice on March 23, 2011 and the Final Supplemental Environmental Impact Statement for the Kaka'ako Makai Area Plan published on June 23, 1998.

   Chapter 343, Hawai'i Revised Statutes, allows the incorporation of relevant information from existing environmental studies by reference, for new proposed projects. Therefore, OEQC advises that you review and incorporate relevant information from existing Chapter 343, HRS studies for the proposed environmental assessments.

2. Your letters state that EAs are required for both projects because of the Special Management Area and identify the Department of Business, Economic Development & Tourism as the agency in charge. We advise that you coordinate

with the Office of Planning and the Hawai'i Community Development Authority to clarify which agency will make the Chapter 343, HRS determination for the two proposed projects.

3. Please evaluate the traffic circulation within the Kewalo Basin Area and pedestrian linkage to the proposed developments on the mauka side of Ala Moana Boulevard.
4. We recommend that you evaluate the sewage discharge and system capacity, and discuss the solid waste management for both projects.
5. The site is in the tsunami inundation zone. Please provide plans to address flooding from tsunami or storm surge.
6. The content requirements for an environmental assessment are listed in Section 11-200-10, Hawai'i Administrative Rules.
7. Thank you for the opportunity to comment on the proposals for a multi-use facility and a restaurant with outdoor seating at Kewalo Basin. Please feel free to contact me at (808) 586-4185 if you have further questions.

Sincerely,

Herman Tuiolosega
Senior Planner

DEPARTMENT OF PARKS & RECREATION

CITY AND COUNTY OF HONOLULU

1000 Uluohia Street, Suite 309, Kapolei, Hawaii 96707
Phone: (808) 768-3003 • Fax: (808) 768-3053
Website: www.honolulu.gov

KIRK CALDWELL
MAYOR

MICHELE K. NEKOTA
DIRECTOR

JEANNE C. ISHIKAWA
DEPUTY DIRECTOR

September 26, 2014

Environmental Risk Analysis
820 W. Hind Drive #240606
Honolulu, Hawaii 96824

Dear Sir:

SUBJECT: Pre-Consultation-Draft Environmental Assessment
Proposed Multi–Use Facility
Kewalo Basin, Honolulu, Hawaii

Thank you for the opportunity to review and comment at the pre-consultation stage of the Draft Environmental Assessment for the proposed multi-use project to be developed on the existing 2.1 acre surface parking lot between Kewalo Basin and Ala Moana Beach Park.

The Department of Parks and Recreation has no comment at this time and looks forward to our continued participation in the EIS process.

Should you have any questions, please contact Mr. John Reid, Planner at 768-3017.

Sincerely,

Michele K. Nekota
Director

MKN:jr
(581138)

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET · HONOLULU, HAWAII 96813
TELEPHONE: (808) 529-3111 · INTERNET: www.honolulupd.org

PETER B. CARLISLE
MAYOR

LOUIS M. KEALOHA
CHIEF

DAVE M. KAJIHIRO
MARIE A. McCAULEY
DEPUTY CHIEFS

OUR REFERENCE EO-WS

October 2, 2014

Ms. Rachel Okoji, Principal
Environmental Risk Analysis LLC
820 West Hind Drive, No. 240606
Honolulu, Hawaii 96821

Dear Ms. Okoji:

This is in response to your letter dated September 10, 2014, requesting comments on the Pre-Consultation, Draft Environmental Assessment, for the proposed multi-use facility project in Kewalo Basin.

The Honolulu Police Department (HPD) anticipates possible short-term impacts to traffic around the area during the construction phase of the project. We recommend scheduling construction vehicles and supply deliveries from Ala Moana Boulevard to Kewalo Basin during off-peak traffic hours. We also advise informing the public of any potential delays in and around the project area.

Once completed, the project would increase the vehicular and pedestrian traffic in and around the Kewalo Basin area. This increase may impact the operations of the HPD in the surrounding area.

If there are any questions, please contact Major Roy Sugimoto of District 1 (Central Honolulu) at 723-3327 or via e-mail at rsugimoto1@honolulu.gov.

Sincerely,

LOUIS M. KEALOHA
Chief of Police

By RANDAL K. MACADANGDANG
Assistant Chief
Support Services Bureau

Serving and Protecting With Aloha

NEIL ABERCROMBIE
GOVERNOR

FORD N. FUCHIGAMI
INTERIM DIRECTOR

Deputy Directors
RANDY GRUNE
AUDREY HIDANO
ROSS M. HIGASHI
JADINE URASAKI

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

STP 8.1676

September 30, 2014

Ms. Rachel Okoji
Principal
Environmental Risk Analysis LLC
820 West Hind Drive #240606
Honolulu, Hawaii 96824

Dear Ms. Okoji:

Subject: Proposed Kewalo Basin Multi-Use Facility
Pre- Consultation for Draft Environmental Assessment
TMK: (1) 2-1-058:128 (por.)

Our Department of Transportation's (DOT) comments on the subject project are as follows:

The Draft Environmental Assessment (DEA) should discuss and evaluate the project's contribution to the cumulative traffic impacts on State highways facilities in the area.

If there are any questions, please contact Mr. Norren Kato of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

FORD N. FUCHIGAMI
Interim Director of Transportation

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

October 6, 2014

KIRK CALDWELL, MAYOR

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ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

ELLEN E. KITAMURA, P.E.
Deputy Manager and Chief Engineer

Ms. Rachel Okoji, Principal
Environmental Risk Analysis LLC
820 West Hind Drive #240606
Honolulu, Hawaii 96824

Dear Ms. Okoji:

Subject: Your Letter Dated September 10, 2014 on the Draft Environmental Assessment: Pre-Consultation for the Proposed Multi-Use Facility at Kewalo Basin – Tax Map Key: 2-1-58: 128

Thank you for the opportunity to comment on the proposed multi-use facility.

The existing water system is adequate to accommodate the proposed development. However, please be advised that this information is based upon current data, and therefore, the Board of Water Supply (BWS) reserves the right to change any position or information stated herein up until the final approval of the building permit application. The final decision on the availability of water will be confirmed when the building permit application is submitted for approval.

When water is made available, the applicant will be required to pay our Water System Facilities Charges for resource development, transmission and daily storage.

The proposed project is subject to BWS Cross-Connection Control and Backflow Prevention requirements prior to the issuance of the Building Permit Applications.

The on-site fire protection requirements should be coordinated with the Fire Prevention Bureau of the Honolulu Fire Department.

If you have any questions, please contact Robert Chun, Project Review Branch of our Water Resources Division at 748-5443.

Very truly yours,

ERNEST Y. W. LAU, P.E.
Manager and Chief Engineer

OFFICE OF PLANNING
STATE OF HAWAII

NEIL ABERCROMBIE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-14516

September 23, 2014

Ms. Rachel Okoji, Principal
Environmental Risk Analysis LLC
820 W. Hind Drive #240606
Honolulu, Hawaii 96824

Dear Ms. Okoji:

Subject: Draft Environmental Assessment: Pre-Consultation Proposed Multi-Use Facility, Kewalo Basin, Honolulu, Hawaii

Thank you for the pre-consultation opportunity to provide comments on the Draft Environmental Assessment (EA) associated with the proposed multi-use facility in Kewalo Basin, Honolulu, Oahu, Hawaii.

According to the pre-consultation information you provided, the proposed facility, which consists of four two-level buildings, includes waterfront retail stores, small restaurants, cafes and bars, commercial office space, a live entertainment venue, and a observation deck and signature multipurpose venue. In addition, the proposed project includes a 250-stall, multi-level parking structure.

The Office of Planning (OP) has reviewed your pre-consultation request and has the following comments to offer.

1. The Draft EA should identify the triggers for the requirements of Hawaii Revised Statutes (HRS) Chapter 343 for the proposed action, pursuant to Hawaii Administrative Rules (HAR) Chapter 11-200.

2. We note there are several proposed projects around Kewalo Basin. The Draft EA should assess cumulative impact which may result from the incremental impact of the subject proposed action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

3. HRS Chapter 205A requires all State and County agencies to enforce the coastal zone management (CZM) objectives and policies. The Draft EA should include an assessment as to how the proposed action conforms to CZM objectives and its supporting policies set forth in HRS § 205A-2. The assessment on compliance with

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2014-TA-0442

OCT 0 9 2014

Ms. Rachel Okoji, Principle
Environmental Risk Analysis, LLC
820 West Hind Drive # 240606
Honolulu, Hawaii 96824

Subject: Technical Assistance for Proposed Multi-Use Facility in Kewalo Basin, Oahu

Dear Ms. Okoji:

The U.S. Fish and Wildlife Service (Service) received your letter, dated September 10, 2014, in which you requested our comments on the proposed multi-use facility in Kewalo Basin, Oahu, as a pre-consultation for the associated Draft Environmental Assessment (DEA). The proposed project involves building a two-story building that will house approximately 50,000 square (sq) feet (ft) of waterfront retail stores including small restaurants, cafes, bars, commercial office space, a live entertainment venue, and a large observation desk and signature multipurpose venue on the second floor. This multi-use facility will be built on what is now 2.1 acres of parking lot in Kewalo Basin. Additionally, a 250-stall multi-level parking structure will accompany the multi-use facility structure. This response is in accordance with sect 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*); the Fish and Wildlife Coordination Act of 1934 (16 U.S.C. 661 *et seq.*; 48 Stat. 401); and the Migratory Bird Treaty Act of 1918 (16 U.S.C. 703-712), as amended (MBTA).

We have reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity Mapping Program. There is no federally designated or proposed critical habitat, or National Wildlife Refuges, wilderness areas, or wildlife preserves in the vicinity of the proposed project. Species documented within the project vicinity include the federally endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*, ʻopeʻapeʻa). Additionally, Hawaiian seabirds (e.g., White fairy Terns (*Gygis alba*)), protected under the MBTA, may occur in the project area. We offer the following recommendations to assist you with your project.

The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet tall should not be disturbed, removed, or trimmed

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during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to Hawaiian hoary bats in the project area.

White fairy terns often nest in urban parks and residential areas from Hawaii Kai to Hickam Air Force Base. White fairy terns do not build nests, instead they lay a single egg directly on a ledge, tree branch, or other suitable location. The egg will hatch after approximately 35 days, after which it takes 45 days for the chick to be mature enough to leave the nest on its own. If tree trimming becomes part of your project, please examine all trees slated to be cut to determine if there are white fairy terns nesting in them. Similarly, we recommend examining any structures slated for demolition. Signs that white fairy terns are present include accumulation of white feathers or white droppings underneath the tree or structure.

In addition, we recommend that you include a Stormwater Pollution Prevention Plan to address stormwater runoff into your Environmental Assessment. In addition, due to the close proximity of the proposed structure to the ocean, grading and landscaping should be implemented to minimize runoff.

Because the proposed activities may cause soil erosion and sedimentation into the marine environment, we are attaching the Service's recommended Best Management Practices regarding sedimentation and erosion in aquatic environments. We encourage you to incorporate the relevant practices into your project design.

We appreciate your efforts to conserve endangered species. If you have any questions concerning these recommendations please contact Carrie Harrington, Fish and Wildlife Biologist (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

Aaron Nadig
Assistant Field Supervisor
Oahu, Kauai, NWHI, and American Samoa

Enclosure: Service BMPs for erosion and sediment control

U.S. Fish and Wildlife Service
Recommended Standard Best Management Practices

The U.S. Fish and Wildlife Service (USFWS) recommends the following measures to be incorporated into project planning to avoid or minimize impacts to fish and wildlife resources. Best Management Practices (BMPs) include the incorporation of procedures or materials that may be used to reduce either direct or indirect negative impacts to aquatic habitats that result from project construction-related activities. These BMPs are recommended in addition to, and do not over-ride any terms, conditions, or other recommendations prepared by the USFWS, other federal, state or local agencies. If you have questions concerning these BMPs, please contact the USFWS Aquatic Ecosystems Conservation Program at 808-792-9400.

1. Authorized dredging and filling-related activities that may result in the temporary or permanent loss of aquatic habitats should be designed to avoid indirect, negative impacts to aquatic habitats beyond the planned project area.

2. Dredging/filling in the marine environment should be scheduled to avoid coral spawning and recruitment periods, and sea turtle nesting and hatching periods. Because these periods are variable throughout the Pacific islands, we recommend contacting the relevant local, state, or federal fish and wildlife resource agency for site specific guidance.

3. Turbidity and siltation from project-related work should be minimized and contained within the project area by silt containment devices and curtailing work during flooding or adverse tidal and weather conditions. BMPs should be maintained for the life of the construction period until turbidity and siltation within the project area is stabilized. All project construction-related debris and sediment containment devices should be removed and disposed of at an approved site.

4. All project construction-related materials and equipment (dredges, vessels, backhoes, silt curtains, etc.) to be placed in an aquatic environment should be inspected for pollutants including, but not limited to; marine fouling organisms, grease, oil, etc., and cleaned to remove pollutants prior to use. Project related activities should not result in any debris disposal, non-native species introductions, or attraction of non-native pests to the affected or adjacent aquatic or terrestrial habitats. Implementing both a litter-control plan and a Hazard Analysis and Critical Control Point plan (HACCP – see *http://www.haccp-nrm.org/Wizard/default.asp*) can help to prevent attraction and introduction of non-native species.

5. Project construction-related materials (fill, revetment rock, pipe, etc.) should not be stockpiled in, or in close proximity to aquatic habitats and should be protected from erosion (*e.g.*, with filter fabric, etc.), to prevent materials from being carried into waters by wind, rain, or high surf.

6. Fueling of project-related vehicles and equipment should take place away from the aquatic environment and a contingency plan to control petroleum products accidentally spilled during the project should be developed. The plan should be retained on site with the person responsible for compliance with the plan. Absorbent pads and containment booms should be stored on-site to facilitate the clean-up of accidental petroleum releases.

7. All deliberately exposed soil or under-layer materials used in the project near water should be protected from erosion and stabilized as soon as possible with geotextile, filter fabric or native or non-invasive vegetation matting, hydro-seeding, etc.

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HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

October 9, 2014

Ms. Rachel Okoji, Principal
Environmental Risk Analysis LLC
P.O. Box 240606
Honolulu, Hawaii 96824

Dear Ms. Okoji:

Subject: Preconsultation for Draft Environmental Assessment
Proposed Multi-Use Facility
Kewalo Basin
Honolulu, Hawaii

In response to your letter dated September 10, 2014, regarding the above-mentioned subject, the Honolulu Fire Department (HFD) requires that the following be complied with:

1. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 feet from fire department access roads as measured by an approved route around the exterior of the building or facility. (National Fire Protection Association [NFPA] 1, Uniform Fire Code [UFC]™, 2006 Edition, Section 18.2.3.2.2.)

   A fire department access road shall extend to within 50 ft of at least one exterior door that can be opened from the outside and that provides access to the interior of the building. (NFPA 1, UFC™, 2006 Edition, Section 18.2.3.2.1.)

2. A water supply approved by the county, capable of supplying the required fire flow for fire protection, shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet from a water supply on a

fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ [Authority Having Jurisdiction]. (NFPA 1, UFC™, 2006 Edition, Section 18.3.1, as amended.)

3. The unobstructed width and unobstructed vertical clearance of a fire apparatus access road shall meet county requirements. (NFPA 1, UFC™, 2006 Edition, Section 18.2.3.4.1.1, as amended.)

4. Submit civil drawings to the HFD for review and approval.

Should you have questions, please contact Acting Battalion Chief Sheldon Yasso of our Fire Prevention Bureau at 723-7151 or syasso@honolulu.gov.

Sincerely,

Socrates D. Bratakos

SOCRATES D. BRATAKOS
Assistant Chief

SDB/SY:bh

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 7TH FLOOR • HONOLULU, HAWAII 96813
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DEPT. WEB SITE: www.honoluludpp.org • CITY WEB SITE: www.honolulu.gov

KIRK CALDWELL
MAYOR

GEORGE I. ATTA, FAICP
DIRECTOR

ARTHUR D. CHALLACOMBE
DEPUTY DIRECTOR

2014/ELOG-1773(rns4)

October 21, 2014

Ms. Rachel Okoji
Principal
Environmental Risk Analysis LLC
820 West Hind Drive, No. 240606
Honolulu, Hawaii 96824

Dear Ms. Okoji:

SUBJECT: Draft Environmental Assessment for
Proposed Multi-Use Facility,
Kewalo Basin, Tax Map Key: portion 2-1-058:128

Thank you for your letter dated September 10, 2014, regarding a request for comments in anticipation of preparation of a Draft Environmental Assessment (DEA) for the project listed above.

We have the following comments:

1. The DEA should include a discussion of the consistency of the project with the Oahu General Plan and the Primary Urban Center Development Plan.

2. The DEA should address drainage and storm water quality impacts.

3. The DEA should list all permits required from the City and County.

4. A connection to the City sewer system was approved under 2014/SCA-0595 and 2014/SCA-0622. An Industrial Wastewater Discharge Permit may be required.

5. The DEA should address how the project satisfies the urban design guidance of Hawaii Community Development Authority's Makai Area Plan (Section 4.0) and the guiding principles and objectives of the Draft Kakaako Community Development District Transit Oriented Development Overlay Plan (Chapter 2).

6. The DEA should include a discussion of how the risk of flooding due to sea level rise will be incorporated in the design of the project and proposed operations at the project site.

The Army Corps of Engineers (COE) has issued an Engineering Circular (EC 1165-2-212) which provides guidance on likely ranges of sea level rise through 2100 which they require to be used in evaluating projects in shoreline areas subject to COE review.

More recently they have provided online tools which can be used to adapt the circular's guidance to reflect historic sea level rise conditions measured at the closest local tidal gauge.

Using the circular as adapted to reflect the local sea level rise rate, the elevation above sea level at the project site, and the estimated life of the structures involved in the project, a determination can be made as to whether sea level rise is likely to increase the risk of flooding at the project site during the life of the project structures.

Such a determination should be made for the proposed restaurant, and if it is likely that sea level rise will increase the risk of flooding during the life of the structure, the DEA should discuss how the design and operation of the project will address that risk and provide resilience in recovering from any flooding.

A practical example of how the COE circular and the tidal gauge adjustments can be incorporated into a Honolulu area study is provided by the Army Corps of Engineers Ala Wai Canal Study.

For further details on how the Engineering Circular and local tidal gauge information could be used to assess sea level rise risk for a local project, contact Mr. Michael Wong, Chief, Engineering and Construction Technical Branch, Army Corps of Engineers, Honolulu District (808-835-4138).

Thank you for the opportunity to provide comments prior to preparation of your DEA. Should you have any questions, please contact Bob Stanfield of our staff, at 768-8051.

Very truly yours,

George I. Atta, FAICP
Director

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