BEFORE THE MAUI PLANNING COMMISSION

COUNTY OF MAUI

STATE OF HAWAII

In the Matter of the Applications of WILLIAM SPENCE OF WILLIAM SPENCE & ASSOCIATES on behalf of CHRISTOPHER AND CANDICE HAYES To Obtain a District Boundary Amendment from 'Agricultural' to 'Urban' and a Change of Zoning from 'Rural' to 'M-1 Light Industrial' for the Ohukai Light Industrial Park, to be Located on Approximately 14.626 Acres of Land at 454 Ohukai Road, Kihei, Maui, Hawaii, TMK(s): (2) 3-9-001:034 (por.).	DOCKET NO. ZPA2022-00002 William Spence of William Spence & Associates on behalf of Christopher and Candice Hayes (T. Furukawa)

DEPARTMENT OF PLANNING
REPORT AND RECOMMENDATION
JUNE 13, 2023 MEETING

DEPARTMENT OF PLANNING
COUNTY OF MAUI
2200 MAIN STREET, SUITE 619
WAILUKU, HAWAII 96793

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DESCRIPTION OF THE PROJECT

The Applicants, Christopher and Candice Hayes, are proposing to develop approximately 21 light industrial lots with related improvements on approximately 14.626 acres of land at 454 Ohukai Road, Kihei, Maui, Hawaii at TMK (2) 3-9-001:034. See location map, aerial photograph and Site Plan attached as **Exhibits 1-3**. The lots will be available for lease as storage baseyards to store and secure equipment and materials.

The light industrial lots will be subdivided out of a larger 28.7-acre property if/when the zoning approval is granted. The lots will vary in size. Twelve lots will be between approximately 0.440 and 0.505 acres, two lots will be approximately 0.723 and 0.746 acres, and seven lots will be between approximately 1.000 to 1.130 acres in size. Each lot will be fenced for security purposes. Each tenant will have the option to connect to utilities, as needed; however, no electrical, water or wastewater hookups are proposed at this time. Concrete pads will be required so liquids will be contained when equipment maintenance is conducted. No permanent structures will be allowed to be constructed within the subdivision. Shipping containers will be allowed to be temporarily placed onsite. Each lot will have a six-inch gravel layer, but will not be paved.

Each lot will have paved aprons off of a 35-foot wide central paved roadway. The road will remain privately owned and will not be dedicated to the County. To mitigate community concern on prospective traffic impacts and vehicle back-ups on to the road, and to ensure smooth ingress/egress into the project area, the Applicant will not gate the entryway to the project area.

The other improvements proposed include a private water system with an 8-inch waterline for fire protection and a double-check backflow preventer built to county standards. A smaller potable waterline will be installed for prospective tenant hook-ups. Also proposed is an 8-inch wastewater line to connect to the county system for future tenant hook-up, if desired.

Electrical hook-up will also be available. The Applicant plans to connect to overhead lines for security lighting that will be down-shielded.

The State Land Use District Boundary designation for the proposed project is 'Agricultural.' See **Exhibit 4**. In order to allow for the proposed use, the Applicants are proposing a change to the 'Urban' designation. See **Exhibit 5**. The Maui County zoning for the proposed light industrial subdivision is 'Rural.' See **Exhibit 6**. A change of zoning is proposed to 'M-1 Light Industrial' to allow for the proposed use. See **Exhibit 7**.

PROJECT NEED

Since many base yards are located in Central Maui, the proposed project would be a closer alternative to those residing in or conducting business in South Maui. Light industrial lease space is more expensive, and equipment parked on residential streets is subject to theft or vandalism. For neighbors, street parking is problematic because of the size of vehicles and parking space needed to accommodate the trucks and trailers.

Enabling small businesses to grow will contribute toward a healthier local economy. According to the Bureau of Labor Statistics website, wages paid by light industrial jobs tend to be higher than those for retail and other commercial jobs. While retail wages were reported as being between $14 and $15 per hour, light industrial jobs pay between $20 to $40 or more per hour.

The project will help to diversify Maui's economy. Policymakers have been concerned that Maui has been overly dependent on the visitor industry and wish to diversify the economy. The theme of economy diversification is in the Maui Island Plan and all the community plans.

DESCRIPTION OF THE PROPERTY

1. The project area is vacant with kiawe trees. The portion of the property that is not proposed for development consists of a farm house, garage and mango orchard.

2. **Land Use Designations**

State Land Use District	Agricultural
Maui Island Plan	Urban Growth Boundary/Outside Protected Areas
Kihei-Makena Community Plan	Light Industrial
County Zoning	Rural District
Other	Outside of the Special Management Area

3. **Surrounding Uses**

North	Ohukai Road/single-family residential subdivisions
East	Agricultural land/undeveloped land
South	Hawaiian Electric substation/undeveloped land
West	Kihei Commercial Plaza, Kihei Gateway and other commercial/light industrial business properties

4. The properties lie in Flood Zone 'X,' an area of minimal flooding, and does not require a Flood Development Permit. See **Exhibit 8**.

5. The property is located outside of the 3.2-foot scenario sea level rise exposure area, per the Pacific Islands Ocean Observing System. See **Exhibit 9**.

6. The property is located outside of the tsunami evacuation zone and extreme tsunami evacuation zone.

7. There are no open Requests for Service on the property.

8. There are no police reports for the subject property.

9. The subject application does not involve an action that triggers compliance with Chapter 343, Hawaii Revised Statutes, relating to Environmental Impact Statements.

PROCEDURAL MATTERS

1. On August 8, 2022, a Notice of Application was mailed to all owners and lessees of record within 500 feet of the parcel.

2. On April 10, 2023, the Department emailed the consultant about the scheduled public hearing.

3. On April 25, 2023, the Maui Planning Commission voted to conduct the public hearing, rather than delegating the responsibility to the South Maui Advisory Committee.

4. On May 8, 2023, a Notice of Public Hearing was mailed to all owners and lessees of record within 500 feet of the parcel.

5. On May 6, 13, 20, 2023, a Notice of Public Hearing on the Change of Zoning was published in the Maui News by the Applicant for the June 13, 2023 hearing.

6. On May 12, 2023, a Notice of Public Hearing on the Change of Zoning was published in the Maui News by the Department.

REVIEWING AGENCIES

County

Department of Environmental Management	**Exhibit 10**
Department of Fire & Public Safety	**Exhibit 11**
Department of Housing and Human Concerns	**Exhibit 12**
Department of Parks & Recreation	**Exhibit 13**

State

Department of Accounting and General Services	**Exhibit 14**
Department of Education-Maui (DOE)	**Exhibit 15**
DLNR-State Historic Preservation Division	**Exhibit 16**
Department of Transportation	**Exhibit 17**

ANALYSIS

LAND USE

1. The proposed land use entitlements are in conformance with the goals, objectives and policies of the Hawaii State Plan.

- A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.

- A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

- Physical, social, and economic well-being for individuals and families in Hawaii that nourishes a sense of community responsibility, of caring and of participation in community life.

Objectives and Policies of the Hawaii State Plan

The proposed reclassification is in conformance with the following objectives and policies of the Hawaii State Plan:

Chapter 226-5, HRS, Objectives and Policies for population.

(a) It shall be the objective in planning for the State's population to guide population growth to be consistent with the achievement of physical, economic, and social objectives contained in this chapter.

(b) To achieve the population objective, it shall be the policy of this State to:

(2) Encourage an increase in economic activities and employment opportunities on the Neighbor Islands consistent with community needs and desires.

(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

Chapter 226-6, HRS, 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 Hawaii's people.

(2) A steadily growing and diversified economic base that is not overly dependent on a few industries.

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

(16) Foster a business climate in Hawaii – 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.

Chapter 226-10, HRS, Objectives and Policies for the economy – potential growth activities.

(a) Planning for the State's economy with regard to potential growth activities shall be directed towards achievement of the objective of development and expansion of potential growth activities that serve to increase and diversify Hawaii's economic base.

(b) To achieve the potential growth activity objective, it shall be the policy of this State to:

(1) Facilitate investment and employment in economic activities that have the potential for growth such as diversified agriculture, aquaculture, apparel and textile manufacturing, film and television production, and energy and marine-related industries.

(6) Provide public incentives and encourage private initiative to attract new industries that best support Hawaii's social, economic, physical, and environmental objectives.

Chapter 226-13, HRS, Objectives and Policies for the physical environment – land, air and water quality.

(a) Planning for the State's physical environment with regard to land, air and water quality shall be directed towards achievement of the following objectives:

(1) Maintenance and pursuit of improved quality in Hawaii's land, air, and water resources.

(2) Greater public awareness and appreciation of Hawaii's environmental resources.

(b) To achieve the land, air, and water quality objectives, it shall be the policy of this State to:

(7) Encourage urban developments in close proximity to existing services and facilities.

The State Office of Planning and Sustainable Development did not have any comments on the proposed land use entitlements.

2. **State Land Use Designation.** The project requires a State Land Use District Boundary Amendment of the 14.6-acre area from the State 'Agricultural' to the 'Urban' District. Refer to **Exhibits 4-5**. The proposed use is consistent with the 'Urban' District. The proposed reclassification has been analyzed with respect to the following criteria, as discussed below.

Chapter 15-15-18, HAR

(1) It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses;

Comment: The project area is located contiguous with a busy, fully developed commercial and industrial area to the West. There are many single-family homes to the North. There is a small mango farm that is proposed to be subdivided out in the future.

2) It shall take into consideration the following specific factors:

(A) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;

Comment: The proposed project will be located in proximity to central Kihei, and it will generate a new center of trade and employment. The project area is located to the east of the Kihei Commercial Plaza, Kihei Gateway, other commercial and light industrial properties. In addition, the property is located approximately 1.5 miles away from the Piilani Shopping Center consisting of retail and medical office space and approximately 1.75 miles away from the Azeka Shopping Center.

(B) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and

Comment: The proposed project is a light industrial subdivision that will be connected to County water, wastewater and drainage systems for tenant tie-in. Various schools and parks are located along Piilani Highway approximately one to five miles away. In addition, police and fire protection service is located approximately 4.0 miles away. There will be private solid waste service that will dispose waste at the Central Maui Landfill.

(C) Sufficient reserve areas for foreseeable urban growth;

Comment: There are sufficient reserve areas for foreseeable urban growth mauka of the site that is designated 'Agricultural' and can be amended to 'Urban.' In addition, there is vacant designated 'Urban' land to the south of the property.

(3) It shall include lands with satisfactory topography, drainage, and reasonably free from the danger of any flood, tsunami, unstable soil condition, and other adverse environmental effects;

Comment: The property is free from the danger of flood, tsunami, unstable

condition and other adverse environmental effect. It is located in flood zone, 'X,' an area of minimal flooding. It is located outside of the tsunami evacuation area, approximately 1,500 feet away. Also, the topography is relatively flat, with a slope of 2.6 percent.

(4) Land contiguous with existing urban areas shall be given more consideration than non-contiguous land, particularly when indicated for future urban use on state or county general plans or county community plans or development plans;

Comment: The project area is contiguous to urban areas to the West and South. The property is designated for urban use by the Maui Island Plan and light industrial use by the Kihei-Makena Community Plan.

5) It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county general plans or county community plans or development plans;

Comment: As mentioned previously, the Maui Island Plan and the Kihei-Makena Community Plan designates the property for urban growth and light industrial use, respectively. The plans were subject to years of community and public review, as well as by the Maui Planning Department, the Maui Planning Commission and Maui County Council. The property is appropriately located for urban growth.

6) It may include lands which do not conform to the standards in paragraphs (1) to (5):

(A) When surrounded by or adjacent to existing urban development; and
(B) Only when those lands represent a minor portion of this district;

Comment: The property meets these criteria and is located adjacent to and is mostly surrounded by urban uses.

7) It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services; and

Comment: The property is located amidst land designated for urban use, so it would not be considered "scattered" or "spot" urban development. Project development will not necessitate unreasonable investment in public infrastructure or support services.

8) It may include lands with a gentle slope of twenty percent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.

Comment: The criteria is not applicable because the property slope is approximately 2.6 percent.

As previously mentioned, the State Office of Planning did not have any

comments on the proposed land use entitlement changes. In addition, the State Land Use Commission did not have any comments.

3. As stated in the Maui County Charter, as amended in 2002:

> "The General Plan shall indicate desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain the opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns, and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies, and implementing actions to be pursued with respect to population density, land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development."

The County of Maui 2030 General Plan Countywide Policy Plan, adopted by the Maui County Council on March 19, 2010, is the first component of the decennial General Plan update. The Countywide Policy Plan replaces the General Plan as adopted in 1990 and amended in 2002. The Countywide Policy Plan acts as an over-arching values statement and umbrella policy document for the Maui Island Plan and the nine Community Plans that provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future. The plan includes:

1. A vision statement and core values for the County to the year 2030
2. An explanation of the plan-making process
3. A description and background information regarding Maui County today
4. Identification of guiding principles
5. A list of countywide goals, objectives, policies, and implementing actions related to the following core themes:

A. Protect the Natural Environment

B. Preserve Local Cultures and Traditions

C. Improve Education

D. Strengthen Social and Healthcare Services

E. Expand Housing Opportunities for Residents

F. Strengthen the Local Economy

G. Improve Parks and Public Facilities

H. Diversify Transportation Options

I. Improve Physical Infrastructure

J. Promote Sustainable Land Use and Growth Management

K. Strive for Good Governance

The proposed DBA and COZ are is in keeping with the following Countywide Policy Plan goals, objectives and policies:

THEME: Strengthen the Local Economy

GOAL: Maui County's economy will be diverse, sustainable, and supportive of community values.

Objective: Promote an economic climate that will encourage diversification of the County's economic base and a sustainable rate of economic growth.

Policies:

a. *Support economic decisions that create long-term benefits.*

c. *Invest in infrastructure, facilities, and programs that foster economic diversification.*

l. Support public and private entities that assist entrepreneurs in establishing locally operated businesses.

THEME: Promote Sustainable Land Use and Growth Management

GOAL: Community character, lifestyles, economies, and natural assets will be preserved by managing growth and using land in a sustainable manner.

Objective: Improve land use management and implement a directed-growth strategy.

Policy:

b. *Direct urban and rural growth to designated areas.*

Objective: Improve and increase efficiency in land use planning and management.

Policy:

b. Ensure that new development projects requiring discretionary permits demonstrate a community need, show consistency with the General Plan, an provide an analysis of impacts.

The proposed DBA and COZ are consistent with the policies in the Countywide policy plan.

4. The Maui Island Plan (MIP) is applicable to the island of Maui only. The MIP provides more specific policy-based strategies for population, land use, transportation, public and community facilities, water and sewage, visitor destinations, urban design, and other matters related to future growth.

As provided by Chapter 2.80B, the MIP shall include the following components:

1. *An island-wide land use strategy, including a managed and directed growth plan*
2. *A water element assessing supply, demand and quality parameters*

3. *A nearshore ecosystem element assessing nearshore waters and requirements for preservation and restoration*
4. *An implementation program which addresses the County's 20-year capital improvement requirements, financial program for implementation, and action implementation schedule*
5. *Milestone indicators designed to measure implementation progress of the MIP*

The MIP addresses a number of planning categories with detailed policy analysis and recommendations which are framed in terms of goals, objectives, policies and implementing actions. These planning categories address the following areas:

1. *Population*
2. *Heritage Resources*
3. *Natural Hazards*
4. *Economic Development*
5. *Housing*
6. *Infrastructure and Public Facilities*
7. *Land Use*

Additionally, an essential element of the MIP is its directed growth plan which provides a management framework for future growth in a manner that is fiscally, environmentally, and culturally prudent. Among the directed growth management tools developed through the MIP process are maps delineating urban growth boundaries (UGB), small town boundaries (SRB) and rural growth boundaries (RGB). The respective boundaries identify areas appropriate for future growth and their corresponding intent with respect to development character.

According to the *Maui Island Plan* (MIP), the property lies within the 'Urban' Growth Boundary and 'Outside' Protected Areas.

The proposed action has been reviewed with respect to pertinent goals, objectives, policies and implementing actions of the MIP. A summary of the policy statement most applicable is provided below:

Goal 4.1 Maui will have a balanced economy composed of a variety of industries that offer employment opportunities and well-paying jobs and a business environment that is sensitive to resident needs and the island's unique natural and cultural resources.

Objective 4.1.2 Increase activities that support principles of sustainability.

Policy:
4.1.2.b Encourage and support local businesses.

5. According to the *Kihei-Makena Community Plan*, the parcel is designated 'Light Industrial.' The proposal is for light industrial lots and the proposed action is in keeping with the following *Kihei-Makena Community Plan* goals, objectives and policies:

Land Use

Goal: A well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infrastructural and community needs while preserving and enhancing the unique character of Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.

Objectives and Policies:

k. Provide for limited expansion of light industrial services in the area south of Ohukai and mauka of Piilani Highway, as well as limited marine-based industrial services in areas next to Maalaea Harbor. Provide for moderate expansion of light industrial use in the Central Maui Baseyard, along Mokulele Highway. These areas should limit retail business or commercial activities to the extent that they are accessory or provide service to the predominate light industrial use. These actions will place industrial use near existing and proposed transportation arteries for the efficient movement of goods.

The land use entitlements for the parcels are consistent with the *Kihei-Makena Community Plan* objectives and policies.

As previously mentioned, the parcel is zoned 'Rural.' The CIZ request will change the zoning to 'M-1, Light Industrial.' The zoning change is being sought so that it will be consistent with the community plan designation, which is also 'Light Industrial.'

Information about 'M-1, Light Industrial' zoning is as follows:

M-1 Light Industrial: Section §19.24.010, "Generally" reads as follows:

The M-1 light industrial district is designed to contain mostly warehousing and distribution types of activity, and permits most compounding, assembly, or treatment of articles or materials with the exception of heavy manufacturing and processing of raw materials. Residential uses are excluded except for dwelling units located in the same building as any non-dwelling permitted use.

19.24.020 Permitted uses.
Within light industrial districts, the following uses shall be permitted:

Uses
Any use permitted in a B-1, B-2, or B-3 business district except single family dwellings, duplexes, bungalow courts, short-term rental homes, and transient vacation rentals
Animal kennels
Dwelling units located in the same building as any non-dwelling permitted use
Assembly of electrical appliances, radios and phonographs including the manufacture of small parts such as coils, condensers crystal holders and the like
Carpet cleaning plants

Cold storage plants
Commercial laundries
Craft cabinet and furniture manufacturing
Education, specialized
Farm implement sales and service
General food, fruit and vegetable processing and manufacturing plants
Harbor facilities
Ice cream and milk producing, manufacturing and storage
Laboratories—experimental, photo or motion picture, film or testing
Light and heavy equipment and product display rooms, storage and service
Machine shop or other metal working shop
Manufacture, compounding or treatment of articles or merchandise from the following previously prepared materials: aluminum, bone, cellophane, canvas, cloth, cork, feathers, felt, fiber, fur, glass, hair, horn, leather, plastics, precious or semi-precious metals or stones, shell, tobacco and wood
Manufacture, compounding, processing, packing or treatment of such products as candy, cosmetics, drugs, perfumes, pharmaceutical, toiletries, and food products - Except the rendering or refining of fats and oils
Manufacture, dyeing and printing of cloth fabrics and wearing apparel
Manufacture of musical instruments, toys, novelties and rubber and metal stamps
Manufacture of pottery and figurines or other similar ceramic products
Milk bottling or central distribution stations
Mortuaries and morgues
Plumbing shops
Poultry or rabbit slaughter incidental to a retail business on the same premises
Production facility, multimedia
Radio transmitting and television stations; provided, that towers are of the self-sustaining type without guys
Replating shop
Retail lumber yard including mill and sash work - Mill and sash work shall be conducted within a completely enclosed building
Small boat building
Soda water and soft drink bottling and distribution plants
Tire repair operation including recapping and retreading
Utility facilities, minor, and substations up to, and including, 69 kv transmission
Warehouse, storage and loft buildings
Wearing apparel manufacturing
Wholesale business, storage buildings, nonexplosive goods and warehouses

Development Standards. The following development standards shall apply:

	M-1	*NOTES AND EXCEPTIONS*
Min. lot area (sf)	*7,500*	*Except for utility facilities minor, which shall have no min. lot area*
Min. lot width (in ft)	*65*	
Max. bldg ht (in ft) with 5 or more apartments or dwelling units on Maui and Lanai	*60*	*Except that vent pipes, fans, chimneys, antennae, and equipment used for small scale energy or communications systems on roofs shall not exceed 10 ft above the bldg roof*
Max. bldg ht (in ft) with 4 or fewer apartments or dwelling units on Maui and Lanai	*45*	*Except that vent pipes, fans, chimneys, antennae, and equipment used for small scale energy or communications systems on roofs shall not exceed 10 ft above the bldg roof*
Max. bldg ht (in ft) on Molokai	*40*	
Min. yard setback (in ft)		
Front	*0 or the same as the adjoining zoning category whichever is greater*	*Where the setback of the adjoining non-industrial zoned parcel is less than 10 ft, a min. setback of 10 ft shall be applied*
Side and rear	*0 or the same as the adjoining zoning category whichever is greater*	
Freestanding antenna or wind turbine structures height and setback	*Max. height of 75 ft and shall be setback 1 ft for every foot in ht from all property lines*	
Accessory structures allowed in setback	*Boundary walls, parking area, trash enclosures, and ground signs*	
Enclosure requirement	*All uses are to be conducted wholly within a completely enclosed building, or within an area enclosed on all sides except the front of the lot, by a solid fence or wall or cyclone fence at least 6 ft in ht*	

(Ord. No. 5126 , § 6, 2020; Ord. No. 3975, § 2, 2012)

ARCHAEOLOGICAL, HISTORIC AND CULTURAL RESOURCES

An archaeological Literature Review and Field Inspection (LRFI) was conducted by Scientific Consultant Services, Inc. in April, 2022. See **Exhibit 18**. Ground disturbance is necessary for grading, removing agricultural push piles and laying pavement for the roadway. There are habitation and agricultural sites of significance in the project vicinity. However, they are spread out, according to research of the archaeological work conducted in the area. As a result of a full pedestrian survey, no historic properties or cultural materials were identified. In the last 15 years, the project site has been used as a construction base yard and rock crusher site. Prior to that, the land was utilized as a cattle ranch. Therefore, no further archaeological work was recommended. The LRFI was submitted to SHPD for review. SHPD determined that no historic properties will be affected by the proposed project. Refer to **Exhibit 16**. SHPD said that should subsurface historic resources be identified during construction, the work shall cease, the find shall be protected and the Division should be contacted.

In October, 2020, a Cultural Impact Assessment was conducted by Honu Media, LLC. See **Exhibit 19**. The parcel is located in the Waiakoa Ahupuaa, which is now Kihei. Waiakoa is the northernmost of five ahupuaa in the Kula moku. There are two gulches, Waiakoa Gulch and the Kulanihakoi gulch. Kulanihakoi was a water source for farmers. No kuleana was claimed on the parcel. Lowland areas were not suitable for year-round cultivation and were primarily used for horse and cattle grazing and piggeries. No cultural features or historic objects more than 50 years old were found onsite. No rock alignments were observed.

No cultural or historic mentions were found in pre-Western contact primary or historical primary sources, or in cultural informant interviews. A notice for cultural information ran in the Maui News on June 9 and June 13, 2020. A press release was also issued to online and print outlets, Hawaiian churches, cultural associations, practitioners, educators and cultural descendants. Seven interviews were conducted. The property was formerly known as the Hashimoto Farm for tomato crops. The Hashimoto family purchased the farm in 1970 and had leased the land from the previous owner for about 30 years. The family grew mango trees and tomatoes. Tomato farming ceased in approximately 2009 and the property was leased by the Hashimoto family as a base yard. In 2018, the parcel was sold. The current owners use the property as an excavation business base yard.

The South Maui coast was a rich fishing area. Net fishing was conducted. There was traditional gathering of shellfish, growing of fish in salt ponds, trapping of fresh water shrimp and fish. Turtles were caught and eaten. Because the coastal area has long beaches and sandy soil, burials have been reported in a few places. Fifty burials were reported off of South Maui Road near Maui Lu. A search of historical records revealed that there were no battles or raids in Kihei during the 100 years before 1795. In 1752, the area was a landing site for Kalikuapuu. The only single burial was in the North Kihei area at the Villages, Phase 1. Another burial was unearthed during the construction of the Pakalana Street subdivision. No adverse impacts to archaeological or cultural resources are anticipated in association with the proposed project on the property.

INFRASTRUCTURE, PUBLIC FACILITIES, AND SERVICES

Water – The proposed land use entitlement should not have any adverse impact to existing water conditions. A Preliminary Engineering Report (PER) was conducted by CDF Engineering

LLC in March 2022. See **Exhibit 20**. The property has a 5/8-inch potable water meter. Potable water is drawn from a 2 million concrete water tank, located immediately mauka of the property at a base elevation of 220 feet mean sea level. A 16-inch waterline extends from the tank along Ohukai Road to Piilani Highway. A 36-inch concrete pipe feeds the water tank. The water source is the Wailuku/Waihee water system. There is a one-inch irrigation meter that also serves the site. The Department of Water Supply did not have any comments on the proposed project.

According to the Department of Fire & Public Safety, the fire flow requirement for this project is 2,000 gallons per minute, with a two-hour fire fight duration. Refer to **Exhibit 11**. For fire suppression, there is an 8-inch tap off of Ohukai Road. The tap will feed an eight-inch doublecheck detector assembly and all improvements will be to DWS standards. An 8-inch waterline will convey water from the DCDA to the project site. Fire hydrants will need to be installed every 250 feet.

Sewers – The proposed project will not involve a connection to the County wastewater system. Portable toilets will be placed on all lots. There is an 8-inch sewer line at the southwest corner of the property that can accommodate future tenant hook-ups. Refer to PER attached as **Exhibit 20**. The sewer line connects to the County's Wastewater Reclamation Division's collection system, which flows to the Kihei Wastewater Reclamation Facility. The Department of Environmental Management did not have any comment on the proposed land use entitlements. There should be no adverse impact to the County system associated with the proposed project.

Drainage – There should be no adverse impact to existing drainage conditions. The estimated post development 50-year, one-hour runoff is 62.3 cubic feet per second (cfs) with a runoff volume of 56,109 cubic feet. To accommodate the increase in runoff, a retention basin with a minimum of 23,160 cubic feet of storage will be installed at the southwest corner of the developed portion of the property. An additional retention basin, with a volume of 237 cubic yards, will also be installed adjacent to Ohukai Road to prevent stormwater from entering the County's right-of-way.

Currently, onsite surface runoff sheet flows across the southwest portion of the parcel from northeast to southwest. A 42-inch storm drain pipe is stubbed into the parcel for future tenant connection. The storm drain ties into the County of Maui and State of Hawaii stormwater conveyance system. The Department of Public Works did not have any comments on the proposed project.

Roadways, Curbs, Gutters, and Sidewalks – The project should not have any adverse impacts on roadways, curbs, gutters or sidewalks. The project will be accessible off of a 35-foot right-of-way that culminates in a cul-de-sac. The right-of-way connects with Ohukai Road, a two-lane County collector, that extends to Piilani Highway. Ohukai Road has a right-of-way of 60 feet. There are no sidewalks or driveway aprons that meet County standards. Piilani Highway is a four-lane undivided State Highway that extends north-south to Kihei and Wailea.

A Traffic Assessment Report (TAR) was prepared for the proposed project and existing traffic conditions were analyzed. See **Exhibit 21**. Future conditions without the project and with the project were also assessed. The Level of Service (LOS) comparison is included in the table below:

Approach	AM (7:15-8:15 a.m.)			PM (4:00 p.m.-5:00 p.m.)		
	Existing	Future Without Project	Future With Project	Existing	Future Without Project	Future With Project
Piilani Hwy & Ohukai Rd (Overall)	C	D	D	D	E	E
Piilani Highway (left-turn, northbound)	F	F	F	F	F	F
Piilani Highway (left-turn, southbound)	E	F	F	F	F	F
Ohukai Rd (left-turn, mauka bound)	E	E	E	F	F	F
Ohukai Rd (through, mauka bound)	E	E	E	F	F	F
Ohukai Rd (left-turn, makai bound)	E	F	F	F	F	F
Ohukai Rd (through traffic, makai bound)	D	D	D	F	F	F
Huku Lii Pl & Ohukai Rd	C	D	E	C	D	E
Wainohia St & Ohukai Rd	A	A	A	B	B	B

Without the project, the traffic engineer would recommend that the traffic signal phasing at the Piilani Highway and Ohukai Road intersection be simplified to provide a permissive phase in both directions on Ohukai Road. With the project, it is recommended that Ohukai Road be restriped/widened, as needed, to provide an exclusive left-turn lane and median refuge lane at Huku Lii Place. To accommodate the left-turn lane, it is recommended that on-street parking be prohibited on the south side of Ohukai Road, between Huku Lii Place and Kahakulani Place. The State Department of Transportation said after reviewing the Traffic Impact Analysis Report, it has determined that the project does not appear to significantly impact the state highway system. The DOT does not object to the District Boundary Amendment or Change of Zoning. The agency requested that a condition be added that if it is found that the project has an impact to State facilities, the Applicant shall mitigate them to the satisfaction of the Hawaii District Engineer, Highways Division at no cost to the State.

There is no County bus service in the vicinity due to the physical constraints along Hale Kai Street.

Electrical, Telephone, and Cable – The proposed project will involve electrical and telecom connections to overhead facilities located along Ohukai Road. Street lights will be installed along the access road at intervals recommended by the electrical engineer. Currently, there is an electrical easement granted by Hawaiian Electric for future transmission lines. There should be no adverse impact to electrical and telecom service associated with the proposed entitlements.

Parks – There should be no adverse impacts to existing public parks. Given that the proposed project involves the development of light industrial lots, recreational facilities are not relevant. There will be no changes in population that will impact the use of the facilities. There are a number of facilities in the area, including the Kihei Aquatic Center, Kihei Community Center, Kalepolepo Beach Park Kamaole Beach Parks, Mai Poina Beach Park, etc. The Department of Parks and Recreation did not have any comment on the proposed housing development. Refer to **Exhibit 13**.

Schools – The proposed development should not have any impacts on school service, as it is not a population generator. The area is served by the Kihei and Kamalii Elementary Schools for grades kindergarten through fifth grade, Lokelani Intermediate for grades six through eight and

Maui High School. The Kulanihakoi High School is proposed to open soon. There should be no adverse impacts associated with the proposed project.

Solid Waste – The proposed project area will have private solid waste service. Material recycling will be encouraged by lessees. There should be no adverse impact to solid waste as a result of the proposed land use entitlements. DEM did not have any comment with regard to the proposed entitlements.

Public Services – Police protection is provided by the Maui Police Department at the Kihei Police Station, approximately four miles away from the project site. There should be no adverse impact to police service as a result of the proposed land use entitlements. The Police Department did not have any comment on the proposed entitlements.

Fire prevention, suppression, and protection services for the region are provided by the Department of Fire and Public Safety's Kihei Fire Station, located approximately four miles away and the Wailea Fire Station located approximately five miles away from the project site. There should be no adverse impact to fire services as a result of the proposed land use entitlements. The Department of Fire and Public Safety commented and said that access roadways should have a 20-foot minimum clear width of an all-weather surface. Fire protection water supply should have at least 2,000 gallons per minute with a hydrant spacing no greater than 250 feet along all roadways. The Department said that formal comments will be submitted on the subdivision application.

Maui Memorial Medical Center, the only major medical facility on the island, is located approximately 11 miles away from the project area. Acute, general, and emergency care services are provided by this facility, which is licensed for approximately 231 beds. In addition, numerous privately-operated medical/dental clinics and offices are located in the area to serve the region's residents.

No adverse impact to public services will occur as a result of the proposed land use entitlements.

SOCIO-ECONOMIC IMPACT

The project area is located in Kihei, which had a population of 22,749, according to the 2020 United States (U.S.) Census. The Kihei economy is comprised primarily by retail sales, accommodations and the food service industries. The population for Maui County was 167,902, according to the 2020 U.S. Census.

In the short-term, the project will support construction and construction-related employment. In the long-term, the project will stimulate the local economy through the generation of business in the area. There should be no adverse impact to the population or economy associated with the proposed land use entitlement changes.

ENVIRONMENTAL IMPACTS

Topography – The property is relatively flat. There should be no adverse impact associated with property reclassification.

Soil Conditions – Waiakoa extremely stony silty claim loam, 3 to 25 percent slopes, eroded,

underlies the property, according to the United States Department of Agriculture Natural Resources Conservation Service (NRCS) website. The soil is located at elevations between 100 to 1,000 feet. The slope is 3 to 25 percent and the runoff class is high. The mean annual precipitation is 14 to 19 inches. The depth to restrictive feature is 31 to 35 inches to lithic bedrock and it is not prime farmland.

The State Department of Agriculture has established three categories of Agricultural Lands of Importance to the State of Hawaii (ALISH) with land rated as "Prime," "Unique," or "Other," based on their underlying soils. The property is "Not Prime Farmland," which means that it is not of Statewide or local agricultural importance.

According to the Hawaii Land Study Bureau, the majority of the land has a rating of Class "B," with productivity rated "A (the highest class) through "E" (the lowest class).

Sea Level Rise, Flood and Tsunami – According to the Hawaii Sea Level Rise Viewer, the project area is outside of the 3.2-foot sea level rise exposure area.

As previously mentioned, according to the Federal Emergency Management Agency's Flood Insurance Rate Map, the properties are located within Flood Zone X, an area of minimal flooding.

The property is located outside of the Tsunami Evacuation Zone and the Extreme Tsunami Evacuation Zone. No adverse impact to existing flood or tsunami conditions are anticipated in connection with the proposed zoning change.

Flora and Fauna – A Botanical and Fauna Survey was conducted by Robert Hobdy on May 2020. The property is undeveloped and consists of some dried grass and a few scattered Kiawe trees. Three native species, ilima, uhalo and koali kuahulu were found onsite and they are of least conservation concern. There are no known endangered or threatened species onsite. There should be no adverse impacts to flora.

The property did not consist of any native mammals, birds or insects. No endangered or threatened Native seabirds, such as the endangered Hawaiian petrel and the threatened Newells' shearwater are known to fly over the area. Outdoor lighting should be shielded to prevent seabird disorientation. No adverse impacts to fauna are anticipated.

Air Quality – There should be no adverse air quality impacts associated with the proposed project. Air quality in the vicinity is generally good and trade winds disperse contaminants. The project is located in close proximity to Piilani Highway, so vehicle emissions are the main source of air pollution. In addition, the project area is located downwind of parcels being farmed. There is occasionally windblown dust generated by ongoing farm operations.

During construction, there may be short-term impacts related to fugitive dust. A grading and grubbing permit will be sought prior to work onsite. BMPs will be utilized and dust fences will be erected. There should be no adverse impacts to air quality. The Kihei Community Association recommended a green buffer of trees at least 20 feet wide along Ohukai Road. The vegetation will help mitigate dust transmission.

Noise – Noise in the area can be largely attributed to vehicular traffic, air traffic, heating, ventilation and air conditioning equipment and nearby residences. The proposed project is not

anticipated to cause much change in existing noise conditions. There may be short-term noise impacts associated with construction; however, hours of use can be limited. Best Management Practices (BMPs) will be submitted when the applicant applies for grading and building permits. The Applicant will adhere to Department of Health Administrative Rules, Chapter 11-46, Community Noise Control. There should be no adverse impact to neighboring properties is anticipated as a result of the proposed land use entitlements.

Scenic and Open Space Resources – There are no significant views from Ohukai Road to the ocean. The property is bound to the west by an active commercial/light industrial uses and to the south by an electrical substation with 100-foot towers and high voltage transmission lines. There should be no adverse impacts to scenic and open space resources associated with the proposed entitlement actions.

Streams, Wetlands and Reservoirs – There are no wetlands or rivers on or in the vicinity of the properties.

TESTIMONY

As of May 24, 2023, the Department has received no letters of protest.

ALTERNATIVES

1. ***Deferral:*** The Commission may defer action to another meeting date in order to obtain additional information that will assist in their deliberation on the request.

2. ***Recommend Approval without Conditions:*** The Commission may take action to recommend that the Maui County Council approve the request without imposing any conditions.

3. ***Recommend Approval with Conditions:*** The Commission may take action recommend that the Maui County Council approve the request with conditions.

4. ***Recommend Denial:*** The Commission may take action to recommend that the Maui County Council deny the request.

CONCLUSIONS OF LAW

DBA

State Land Use Commission District Boundary Amendments are reviewed pursuant to Chapter §205-3.1 Hawaii Revised Statutes (HRS) and is stated accordingly:

§205-3.1 Amendments to district boundaries.

(a) District boundary amendments involving lands in the conservation district, land areas greater than fifteen acres, or lands delineated as important agricultural lands shall be processed by the land use commission pursuant to section 205-4.

(b) Any department or agency of the State, and department or agency of the county in which the land is situated, or any person with a property interest in the land sought to be reclassified may petition the appropriate county land use decision-making authority of the county in which the land is situated for a change in the boundary of a district involving lands less than fifteen acres presently in the rural and urban districts and lands less than fifteen acres in the agricultural district that are not designated as important agricultural lands.

(c) District boundary amendments involving land areas of fifteen acres or less, except as provided in subsection (b), shall be determined by the appropriate county land use decision-making authority [Maui County Council] *for the district and shall not require consideration by the land use commission pursuant to section 205-4; provided that such boundary amendments and approved uses are consistent with this chapter. The appropriate county land use decision-making authority may consolidate proceedings to amend state land use district boundaries pursuant to this subsection, with county proceedings to amend the general plan, development plan, zoning of the affected land, or such other proceedings. Appropriate ordinances and rules to allow consolidation of such proceedings may be developed by the county land use decision-making authority.*

Conclusion: The State Land Use Commission District Boundary Amendment will change the land use designation from 'Agricultural' to 'Urban.' The proposed action is consistent with and is supported by the above listed criteria of a DBA to 'Urban' pursuant to Chapter §205-3.1 HRS as stated in the accompanying Department Report.

Hawaii Administrative Rules (HAR)

There are eight 'Urban' district rules that must be met when reviewing a Land Use Commission District Boundary Amendment to 'Urban.' These standards are found under the Hawaii Administrative Rules (HAR) Title 15, Subtitle 3 State Land Use Commission, Chapter 15 Land Use Commission Rules, Subchapter 2, 15-15-18. These rules are:

1. *It shall include lands characterized by "city-like" concentrations of people, structures, streets, urban level of services and other related land uses;*

2. *It shall take into consideration the following specific factors:*

   (A) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;

   (B) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and

   (C) Sufficient reserve areas for foreseeable urban growth;

3. *It shall include lands with satisfactory topography, drainage and reasonably free from the danger of any flood, tsunami, unstable soil condition, and other adverse environmental effects;*

4. *Land contiguous with existing urban areas shall be given more consideration than*

non-contiguous land, and particularly when indicated for future urban use on state or county general plans;

5. *It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the state and county general plans;*

6. *It may include lands which do not conform to the standards in paragraphs (1) to (5):*

   (A) When surrounded by or adjacent to existing urban development; and

   (B) Only when those lands represent a minor portion of this district;

7. *It shall not include lands, the urbanization of which will contribute toward scattered spot urban development, necessitating unreasonable investment in public infrastructure or support services; and*

8. *It may include lands with a general slope of twenty percent or more if the commission finds that those lands are desirable and suitable for urban purposes and that the design and construction controls, as adopted by any federal, state, or county agency, are adequate to protect the public health, welfare and safety, and the public's interests in the aesthetic quality of the landscape.*

Conclusion: The Applicant's proposed action is consistent with and is supported by the above listed criteria of a DBA pursuant to Hawaii Administrative Rules (HAR) Title 15, Subtitle 3, State Land Use Commission, Chapter 15 Land Use Commission Rules, Subchapter 2, §15-15-18 as stated in the accompanying Department Report.

Maui Planning Commission and County Council

The DBA is also processed at the county level: At the county level, Maui County Code (MCC) Title 19 Zoning, Chapter 19.68, State Land Use District Boundaries, states: "*certain responsibilities for the administration of boundary amendments are delegated to the Maui Planning Commission;*" i.e. for example: enforcement of the DBA conditions, title changes, conducting the public hearing on the petition, making a recommendation to the council, and/or any other administrative-related duties necessary to process the petition according to Ch. 19.68.

Further, pursuant to Section 19.68.040 the county council prior to the enactment of an ordinance affecting any reclassification/boundary change, may impose conditions upon the applicant's use of the property, fulfillment of such conditions to be prerequisite to the adoption of such ordinance or applicable part thereof. Such conditions shall have already been performed prior to council action on the reclassification/change of boundary or be enforceable by the county after council action. Conditions shall be fulfilled within the time limitation established by the council, or, if no time limitations are established, within a reasonable time. Such conditions, if any, shall run with the land and be recorded in the bureau of conveyances or filed with the assistant registrar of the land court. Conditions shall be imposed only if the council finds such to be necessary to prevent adverse effects upon public health, safety and welfare, and shall be reasonably conceived to fulfill needs arising directly out of the proposed land use in the following respects:

1. *Protection of the public from the potentially deleterious effects of the proposed use; or*

2. *Fulfillment of the needs for public service demands created by the proposed use.*

Conclusion: The Department is not recommending any conditions for the DBA. The proposed action is consistent with the above listed criteria of a DBA, pursuant to Maui County Code (MCC) Title 19 Zoning, Chapter 19.68, State Land Use District Boundaries as stated in the accompanying Department Report.

COZ

A Change of Zoning is reviewed pursuant to: Maui County Code (MCC), Title, 19, Chapter 19.510, Section 19.510.040, Change of Zoning, by which the appropriate planning commission shall hold a public hearing on all applications for zoning changes and make a recommendation to the Maui County Council. The Council may grant a Change of Zoning if the following criteria are met:

1. *The proposed request meets the intent of the general plan and the objectives and policies of the community plans of the county;*

2. *The proposed request is consistent with the applicable community plan land use map of the county;*

3. *The proposed request meets the intent and purpose of the district being requested;*

4. *The application, if granted, would not adversely affect or interfere with public or private schools, parks, playgrounds, water systems, sewage and solid waste disposal, drainage, roadway and transportation systems, or other public requirements, conveniences, and improvements;*

5. *The application, if granted, would not adversely impact the social, cultural, economic, environmental, and ecological character and quality of the surrounding area; and,*

6. *If the application change in zoning involves the establishment of an agricultural district with a minimum lot size of two acres, agricultural feasibility study shall be required and reviewed by the Dept. of Agriculture and the US Soil and Conservation Service.*

Conclusion: The Title 19 Change of Zoning will change the zoning from "Rural" to "M-1, Light Industrial." The Applicant's proposed action is consistent with and is supported by the above listed criteria for a CIZ pursuant to Title 19, Chapter 19.510, Section 19.510.040, Change of Zoning, MCC.

RECOMMENDATION

DBA

The Planning Department recommends to the Maui Planning Commission that it recommend "approval" to the Maui County Council for the DBA from "Agricultural' to 'Urban.'

COZ

The Planning Department recommends to the Maui Planning Commission that it recommend "approval" to the Maui County Council for the CIZ from 'Rural' to 'M-1 Light Industrial.'

In consideration of the foregoing, the Planning Department recommends that the Maui Planning Commission recommend approval of the Change of Zoning request and adopt the Department of Planning's Report and Recommendation prepared for the June 13, 2023, meeting and authorize the Planning Director to transmit said Report and Recommendation statements to the Maui County Council.

APPROVED:

Kathleen Ross Aoki

KATHLEEN ROSS AOKI
Planning Director

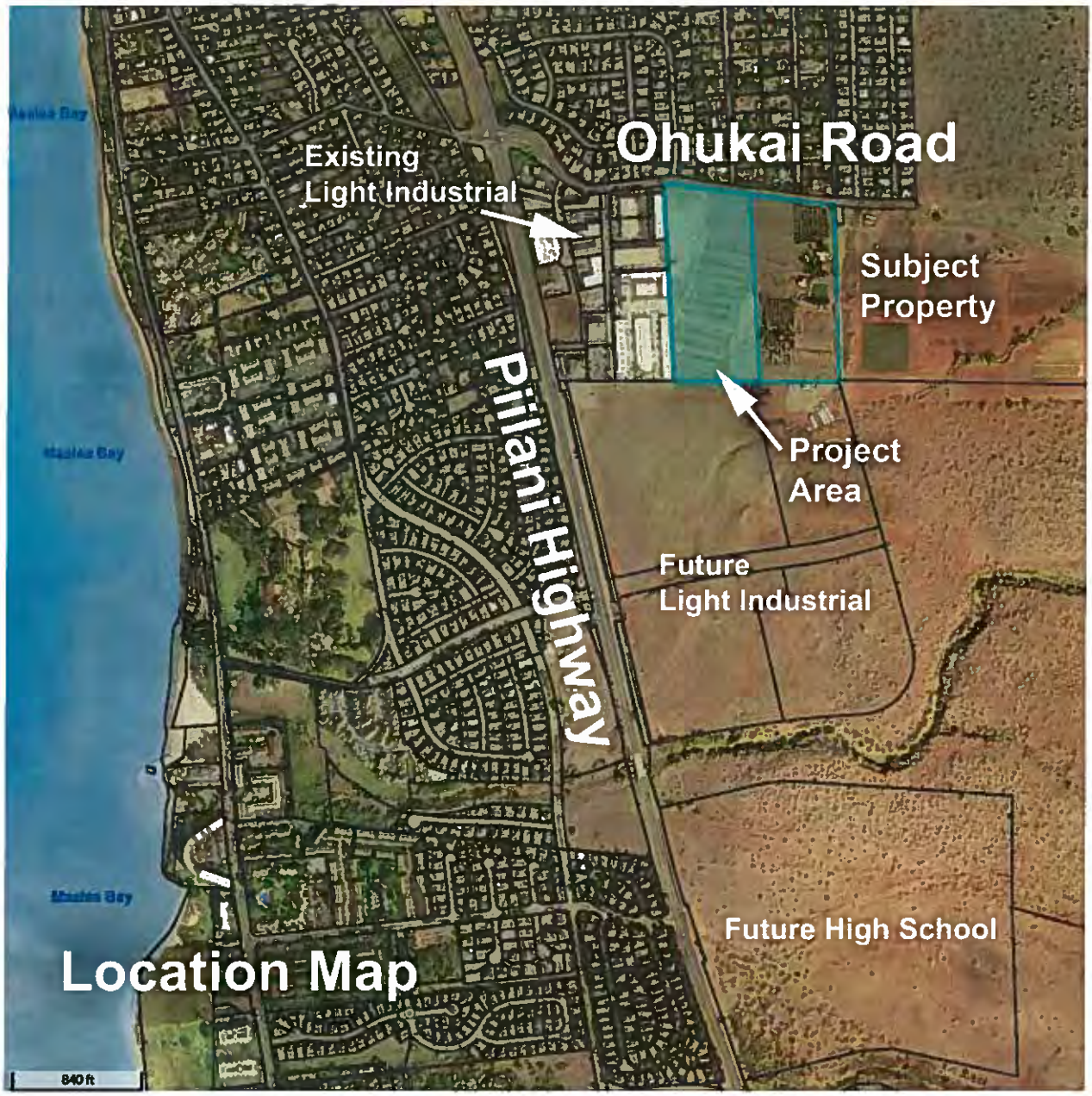


Figure 2, Location and Project Area Map IA

EXHIBIT I


CONNECTEXPLORER
Ohukai Road (HI 3190)
Noe Street
Huaka Street
Ohukai Road (HI 3190)
Huku Li Place
Manao Kala Street
Piilani Highway (HI 31)
Kaiola Place

EXHIBIT 2

- Figure 12, Drainage Plan and Basins IIIC

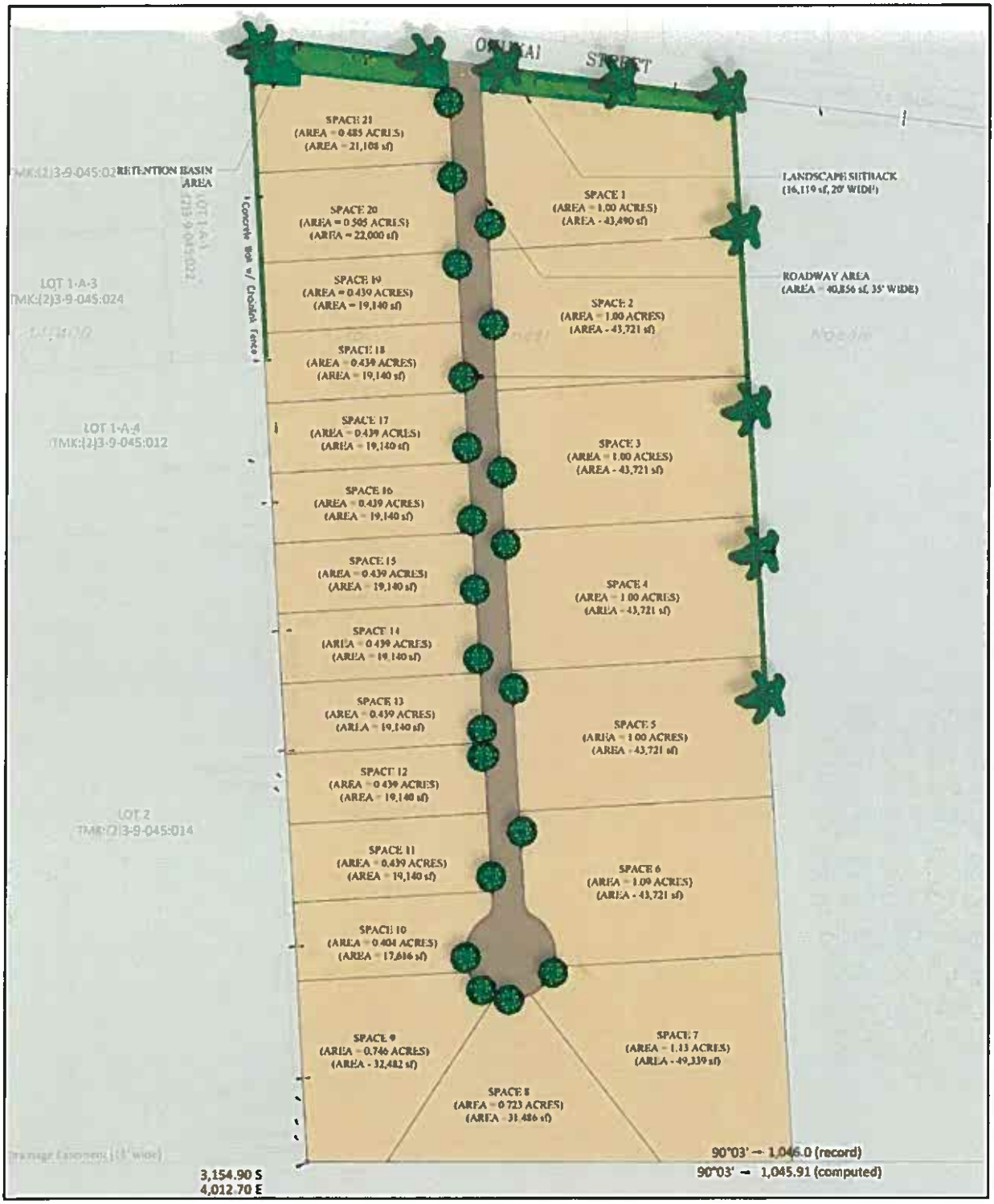


Figure 1, Site Plan IB 3

EXHIBIT 3

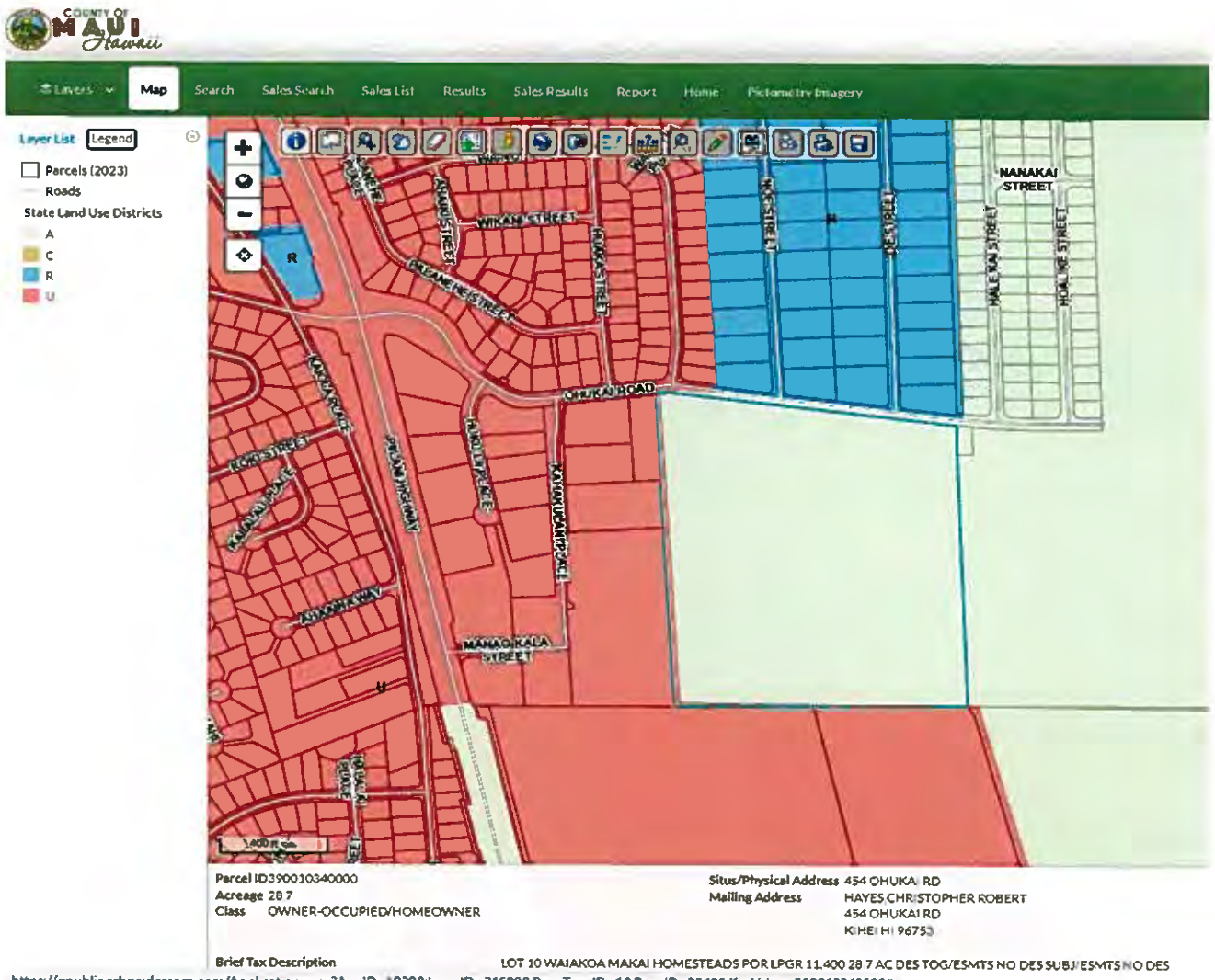
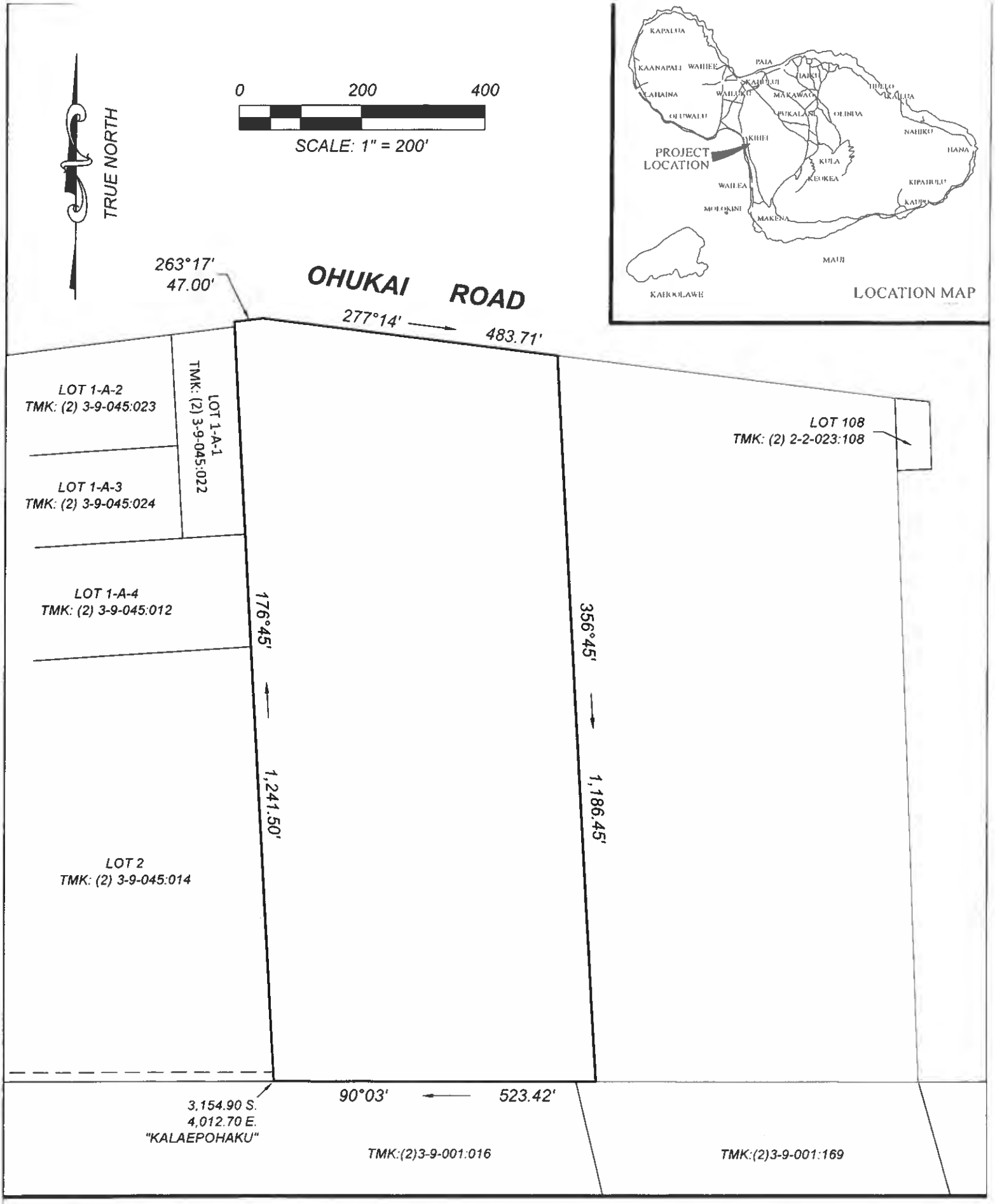

County of Maui Hawaii
Layers
Map
Search
Sales Search
Sales List
Results
Sales Results
Report
Home
Pictometry Imagery
Layer List
Legend
Parcels (2023)
Roads
State Land Use Districts
A
C
R
U
NANAKAI STREET
WIKANI STREET
OHUKAI ROAD
MANAOKALA STREET
Parcel ID 390010340000
Acreage 28 7
Class OWNER-OCCUPIED/HOMEOWNER
Situs/Physical Address 454 OHUKAI RD
Mailing Address HAYES CHRISTOPHER ROBERT
454 OHUKAI RD
KIHEI HI 96753
Brief Tax Description LOT 10 WAIAKOA MAKAI HOMESTEADS POR LPGR 11,400 28 7 AC DES TOG/ESMTS NO DES SUBJ/ESMTS NO DES
https://qpublic.schneidercorp.com/Application.aspx?AppID=1029&LayerID=21689&PageTypeID=1&PageID=9248&KeyValue=390010340000#

EXHIBIT 4



LAND USE DISTRICT BOUNDARY AMENDMENT MAP NO. _____

DISTRICT BOUNDARY AMENDMENT - WAIAKOA, KULA MAUI HAWAII

T.M.K.: (2) 3-9-001:034 (Por.) FROM AGRICULTURAL TO URBAN AREA: 14.626 AC.

EXHIBIT 5

COUNTY OF MAUI Hawaii

Layers | Map | Search | Sales Search | Sales List | Results | Sales Results | Report | Home | Pictometry Imagery

Layer List | Legend

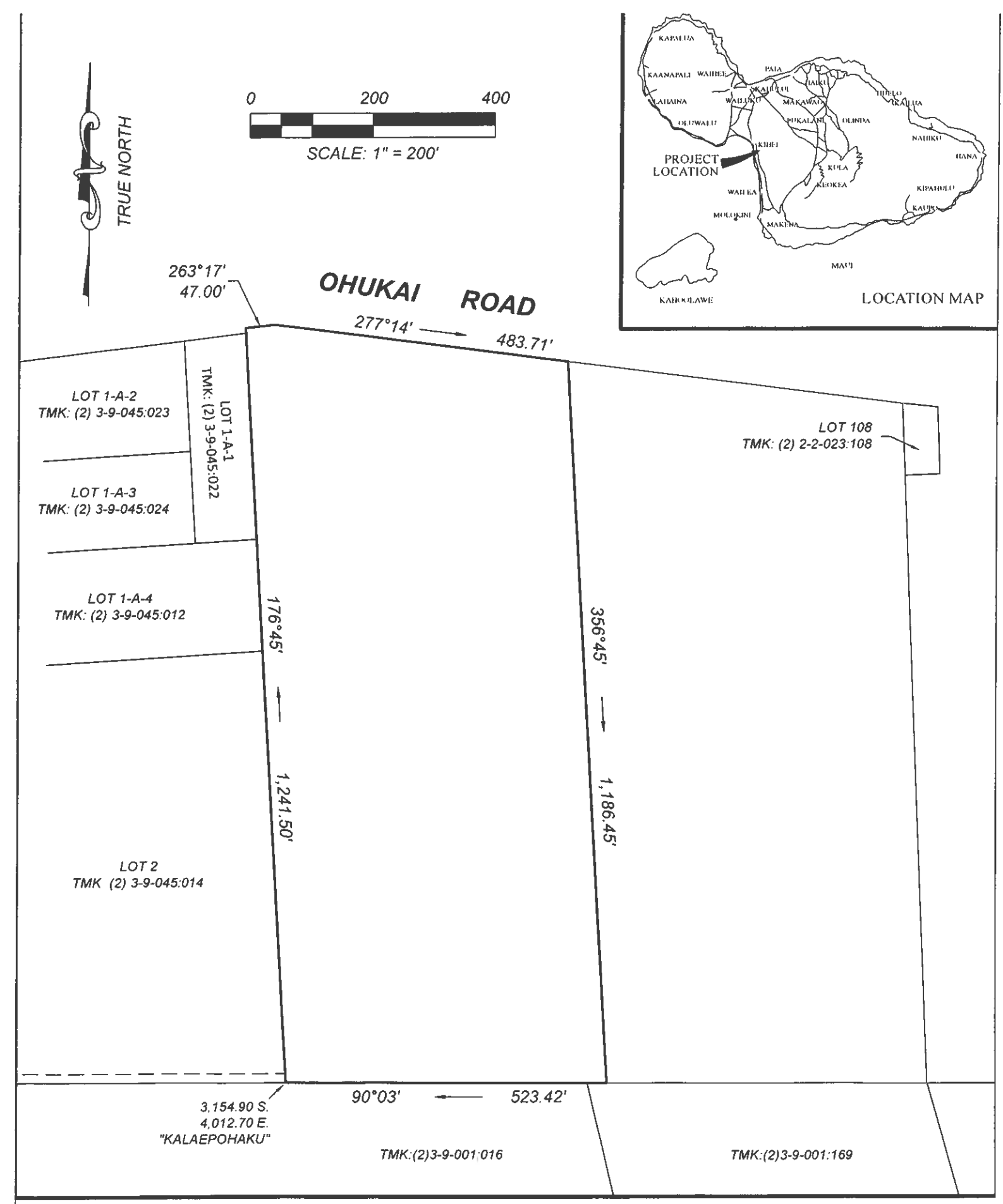
- Parcels (2023)
- Roads
- Zoning Districts
  - R-0 Residential
  - R-1 Residential
  - R-2 Residential
  - R-3 Residential
  - Residential - MRA
  - Multi Family - MRA
  - D-1 Duplex
  - D-2 Duplex
  - A-1 Apartment
  - A-2 Apartment
  - H Hotel
  - H-1 Hotel
  - HM Hotel
  - H-2 Hotel
  - B-1 Business-Neighborhood
  - B-2 Business-Community
  - B-3 Business-Central
  - BR Business-Resort
  - B-CT Business-Country Town
  - WCT Waikapu Country Town
  - Commercial Mixed Use - MRA
  - Business Multi Family - MRA
  - SBR Service Business Residential
  - M-1 Light Industrial
  - M-2 Heavy Industrial
  - M-3 Heavy Industrial
  - AP Airport
  - AG Agriculture
  - R Rural
  - RU-0.5 Rural 1/2 Acre
  - RU-1.0 Rural 1 Acre

Parcel ID 390010340000
Acreage 28.7
Class OWNER-OCCUPIED/HOMEOWNER

Situs/Physical Address 454 OHUKAI RD
Mailing Address HAYES,CHRISTOPHER ROBERT
454 OHUKAI RD
KIHEI HI 96753

Brief Tax Description LOT 10 WAIAKOA MAKAI HOMESTEADS POR LPGR 11,400 28 7 AC DES TOG/ESMTS NO DES
Note: Not to be used on legal documents!

EXHIBIT 6



TAX MAP KEY: (2) 3-9-001:034 (Por.)

LAND ZONING MAP L ___

AREA: 14.626 AC.

CHANGE OF ZONING - WAIAKOA, KULA MAUI HAWAII
FROM RURAL TO M-1 LIGHT INDUSTRIAL

EXHIBIT 1

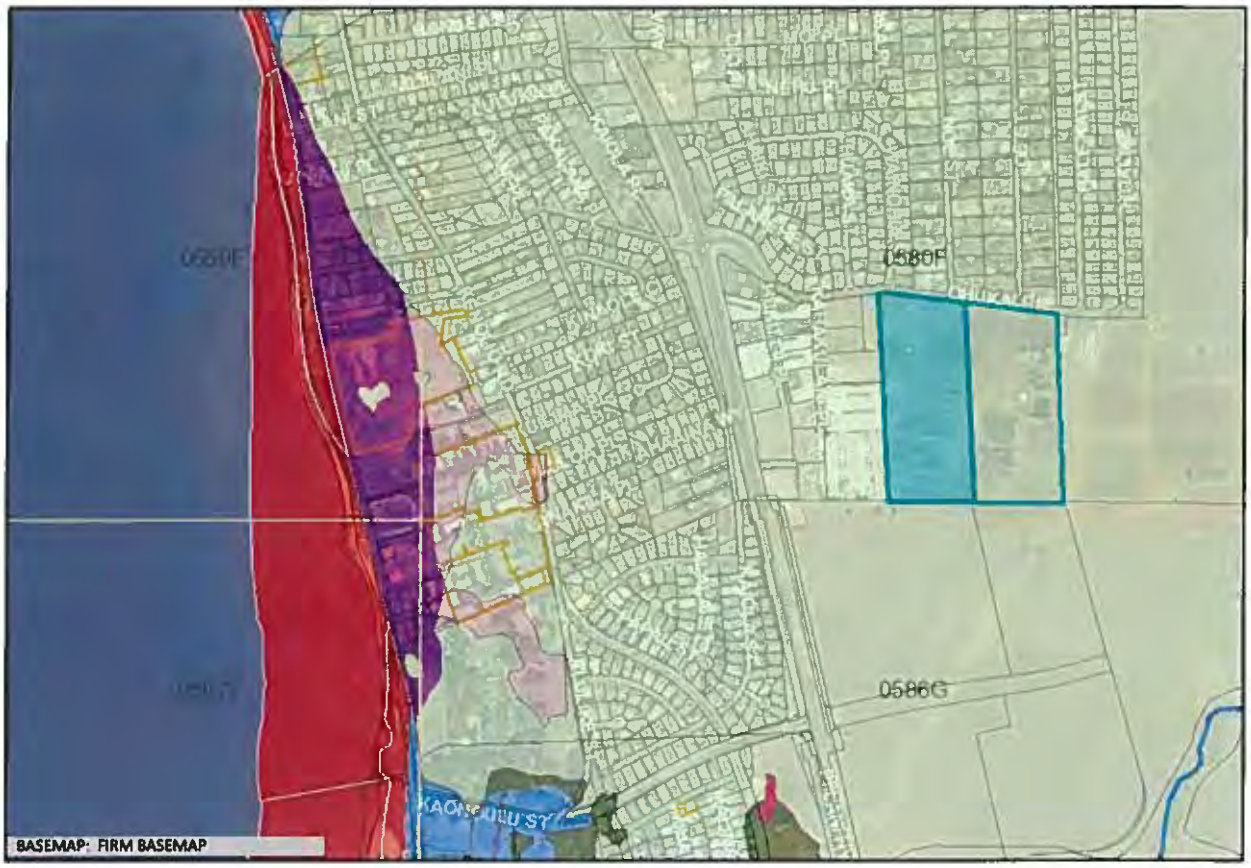


Figure 7, Flood Zones IIG

EXHIBIT 8

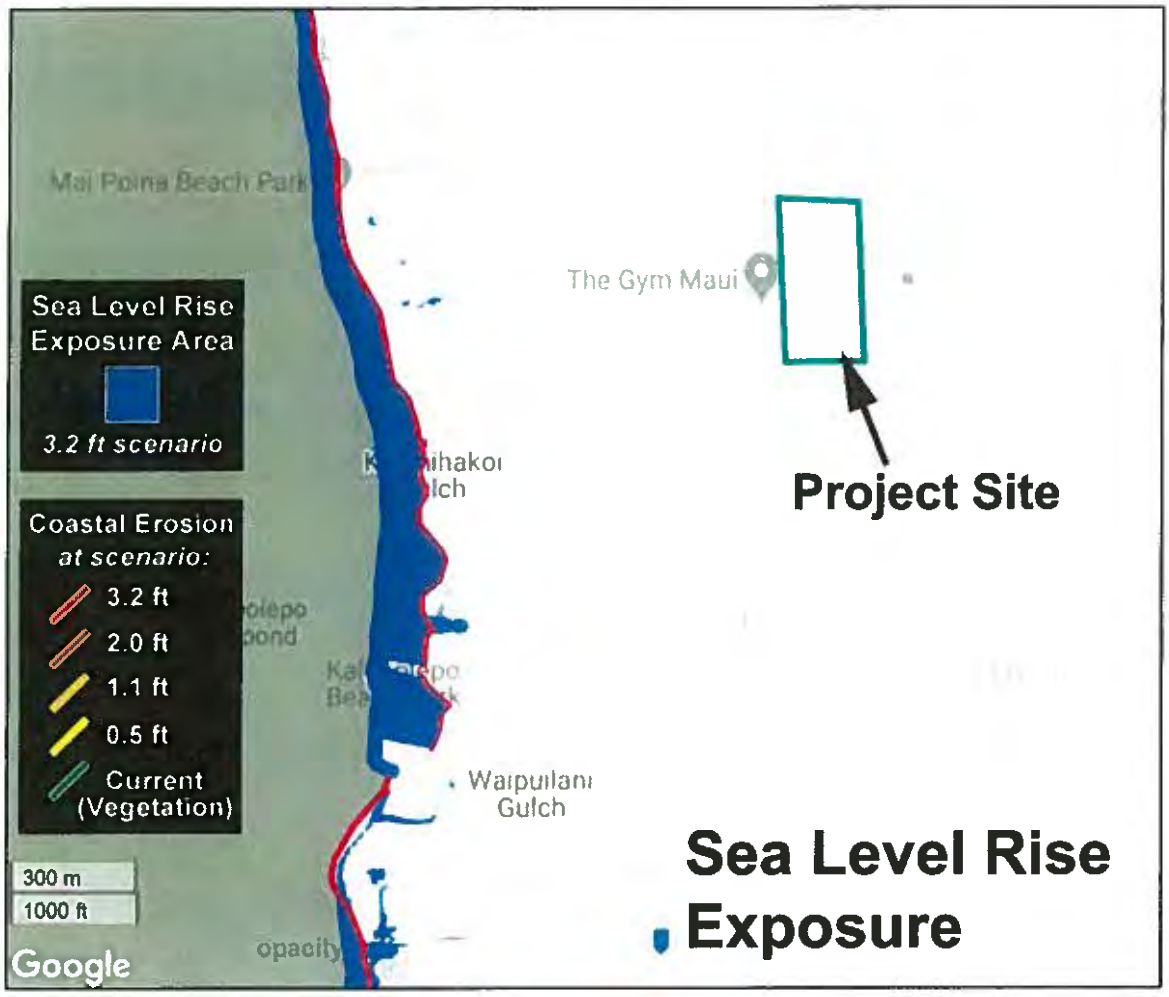


Figure 9, Sea Level Rise Exposure Area IIG

EXHIBIT 9

Item reviews

Name	User	Status	Assigned	Due	Complete
Dept of Environmental Management	Robert Schmidt	Approved w/Conditions	09/13/2022	10/13/2022	11/10/2022

We reviewed the subject application and have the following comments: 1. Solid Waste Division comments: a. No comments 2. Wastewater Reclamation Division comments: a. Preliminary engineering report indicates that portable toilets will be utilized in lieu of discharging the development's wastewater to the County sewer. Owner shall provide written approval from the State Department of Health that portable toilets are acceptable for the development.

EXHIBIT 10

MICHAEL P. VICTORINO
Mayor

BRADFORD K. VENTURA
Fire Chief

GAVIN L.M. FUJIOKA
Deputy Fire Chief

DEPARTMENT OF FIRE & PUBLIC SAFETY
FIRE PREVENTION BUREAU
COUNTY OF MAUI
313 MANEA PLACE
WAILUKU, HI 96793

November 22, 2022

SUBJECT: OHUKAI LIGHT INDUSTRIAL PARK
ZPA2022-00002

In regards to ZPA2022-00002 - Ohukai Light Industrial Park change in zoning Fire Prevention Bureau recommends meeting the subdivision land use requirements for water supply and access for all fronting and any prosed internal roads.

For light industrial land use the requirements are

1. FD access roadways shall have a 20ft minimum clear width of an all-weather surface a
2. Fire Protection water supply shall be at least 2000 gpm with a hydrant spacing no greater than 250ft along all road ways. (125 ft to any dead end)

Formal review comments will be provided in response to the subdivision application.

For any questions or comments, please feel free to contact us at (808) 876-4690 or by email at fire.prevention@mauicounty.gov.

Sincerely,

Plans Review - Fire Prevention Bureau

OV:jn

EXHIBIT 11

Tara Furukawa - 454 Ohukai Road, Kihei District Boundary Amendment and County Change in Zoning TMK (2) 3-9-001:034

From: Phillip Anderson
To: Tara Furukawa
Date: 11/14/2022 9:17 AM
Subject: 454 Ohukai Road, Kihei District Boundary Amendment and County Change in Zoning TMK (2) 3-9-001:034
Cc: LoriAnn Tsuhako; Almeida, Buddy; Jessica Crouse

Good morning Tara,

I am reaching out to let you know I received the subject review via MAPPS shortly after the application date and completed the review in MAPPS. I am seeing "Plan Status" Completed in my Workday Back office. This project does not trigger Chapter 2.96, M.M.C, and does not require a Residential Workforce Housing agreement. Please let me know if you have any questions.

Thank you,
Phil

Phillip R. Anderson
Development Project Coordinator
County of Maui-Housing Division
2065 Main Street, Suite 108
Wailuku, HI 96793
Phone: 808-270-5748

EXHIBIT 12

Tara Furukawa - Re: ZPA2022-00002

From: Karla Peters
To: Tara Furukawa
Date: 11/9/2022 4:52 PM
Subject: Re: ZPA2022-00002
Cc: Samual Marvel; Lisa Sakumoto

Aloha Tara,

Thank you for your email and our apologies for the delay. We have reviewed the project and have no comments.

Have a great rest of your week!
Karla

Karla H. Peters
Director
Parks & Recreation
County of Maui
700 Hali'a Nakoa St., Unit 2
Wailuku, Maui, Hawaii 96793
Office: (808) 270-7230
Fax: (808) 270-7934
karla.peters@co.maui.hi.us
Our Mission: "Provide safe, satisfying and cost effective recreational opportunities for the residents of and visitors to Maui County."

>>> Tara Furukawa 11/9/2022 11:36 AM >>>
Hi Karla, just checking in to see if Parks has any comments on the State District Boundary Amendment and the County Change in Zoning application for approximately 14.6 acres of TMK 3-9-001:034, at 454 Ohukai Road, Kihei. The State district is to be changed from Agriculture to Urban. The County zoning would be changed to match the community plan, from Rural to conditional Light Industrial.

We sent an agency transmittal on 9/13 and then another reminder on 10/14.

Please let me know if you have any comments. Thanks.

Tara Furukawa, Staff Planner
County of Maui Department of Planning
2200 Main St., Suite 619
Wailuku, HI 96793
(808) 270-7520
Email: tara.furukawa@co.maui.hi.us

EXHIBIT 13

DAVID Y. IGE
GOVERNOR

CURT T. OTAGURO
COMPTROLLER

AUDREY HIDANO
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P.O. BOX 119, HONOLULU, HAWAII 96810-0119

Response refer to:
Ma-183(22)

October 3, 2022

MEMORANDUM

TO: Michele Chouteau McLean, Director
Department of Planning, County of Maui

ATTN: Tara Furukawa, Staff Planner

FROM: Reid K. Siarot, State Land Surveyor
DAGS, Survey Division

SUBJECT: Ohukai Light Industrial Park
Applicant: William Spence & Associates
Permit No.: ZPA2022-00002
TMK: 3-9-01: 34

The subject proposal has been reviewed and confirmed that no Government Survey Triangulation Stations or Benchmarks are affected. Survey has no objections to the proposed project.

Should you have any questions, please call me at 586-0390.

EXHIBIT 14

Tara Furukawa - Fwd: Agency Review for - ZPA2022-00002 - Ohukai Light Industrial Park

From: Cori China <cori.china@k12.hi.us>
To: <tara.furukawa@co.maui.hi.us>
Date: 9/15/2022 10:09 AM
Subject: Fwd: Agency Review for - ZPA2022-00002 - Ohukai Light Industrial Park
Cc: Roy Ikeda <Roy.Ikeda@k12.hi.us>

Hi Tara,
Thank you for the opportunity to comment. The Hawaii Department of Education has no comment. The plan has no direct impact on school facilities.

Sincerely,
Cori China
Hawaii Department of Education
Office of Facilities and Operations
Facilities Development Branch, Planning Section
3633 Waialae Avenue, Room C209
Honolulu, HI 96816
Phone: (808) 784-5095

---------- Forwarded message ---------
From: <MAPPS@co.maui.hi.us>
Date: Tue, Sep 13, 2022 at 9:30 AM
Subject: Agency Review for - ZPA2022-00002 - Ohukai Light Industrial Park
To: <ci@hawaiianelectric.com>, <cori.china@k12.hi.us>, <dbedt.luc.web@hawaii.gov>, <dbedt.opsd.erp@hawaii.gov>, <diane.yogi@co.maui.hi.us>, <dlnr@dlnr.gov>, <dlnr1@test.com>, <DOT.ADMIN.STP_esign@hawaii.gov>, <DOT.HWYM.Permits@hawaii.gov>, <dws.reviews@mauicounty.gov>, <Fire.PlanReview@co.maui.hi.us>, <georgette.y.hill@co.maui.hi.us>, <gerald.gregory@usda.gov>, <hdoa.planning@hawaii.gov>, <ht-planreviews@hawaiiantel.com>, <jeanette.corden@co.maui.hi.us>, <jordan.k.molina@co.maui.hi.us>, <kathleen.aoki@co.maui.hi.us>, <lance.nakamura@co.maui.hi.us>, <landsurv...@hawaii.gov>, <OHACompliance@oha.org>, <pam.caton@co.maui.hi.us>, <patricia.kitkowski@doh.hawaii.gov>, <policechief@mpd.net>, <shayne.agaw...@co.maui.hi.us>, <tara.furukawa@co.maui.hi.us>, <zaed.cpReviews@mauicounty.gov>

Within 30 days of this notification please provide your agency's comments, clarifications or recommended conditions of approval on the referenced application(s). All County of Maui agencies, please provide your response within the County of Maui Automated Planning and Permitting System (MAPPS). Please upload a letter or memo response within MAPPS and be sure to change the "Update Item Review" Status to "Review Completed" after you have attached the file

EXHIBIT 15

STATE OF HAWAII | KA MOKU'ĀINA 'O HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
KAKUHIHEWA BUILDING
601 KAMOKILA BLVD, STE 555
KAPOLEI, HAWAII 96707

March 24, 2023

IN REPLY REFER TO:
Project No. 2019PR29804
Doc. No. 2303JG03
Archaeology

Kathleen Aoki, Director
Planning Department
County of Maui
2200 Main Street
One Main Plaza, Suite 315
Wailuku, HI 96793
c/o Tara Furukawa
Email tara.furukawa@co.maui.hi.us

Dear Kathleen Aoki:

SUBJECT: **Chapter 6E-42 Historic Preservation Review –**
County of Maui Permit Application ZPA2022-00002
Subdivision File No. 3.2397
Light Industrial Baseyard Project
Waiakoa Ahupua'a, Kula District, Island of Maui
TMK: (2) 3-9-001:034 por.

This letter provides the State Historic Preservation Division's (SHPD's) review of the subject County of Maui permit application associated with the development of a light industrial Baseyard within a 14.83-project area. The project will require grading and excavation for installation of the baseyard infrastructure. SHPD received the current submission on January 13, 2023, which included a HRS 6E Submittal Form, a Planning Application Report, a letter from the applicant, a copy of a previous SHPD correspondence associated with the subdivision (Log No. 2019.00543, Doc. No. 2003SL10), submittal documents related to the subdivision application, photographs and maps of the project area, construction plans, and an archaeological literature review and field inspection report (LRFI; Garcia and Dega, May 2022).

Scientific Consultant Services, Inc. (SCS) produced the LRFI report (Garcia and Dega May 2022) in support of the subject project. Garcia and Dega (May 2022) provide summaries of historic land use and previous archaeological investigations in the area, and the results of the field inspection. They indicate the project area has been previous disturbed by construction and stockpiling activities, and no historic properties were observed during the field inspection. Additionally, SHPD previously reviewed the subject subdivision application and commented that the department had no objections to the subdivision (Log No. 2019.00543, Doc. No. 2003LS10).

Based on the information provided, SHPD's determination is **No historic properties affected** for the proposed project. Pursuant to HAR §13-284-7(e), when the SHPD agrees that the action will not affect any significant historic properties, this is the SHPD's written concurrence and historic preservation review ends. The HRS 6E historic preservation review process is ended. The permit issuance process may proceed.

Although the field inspection does not fulfill the requirements of an archaeological inventory survey as specified in HAR §13-276-5, it serves to facilitate project planning and supports the historic preservation review process. Please submit two hard copies of the report, clearly labeled Library Copy, along with a text-searchable PDF copy of the report and a copy of this letter to the SHPD Kapolei office, Attn. Library. Also submit a text-searchable PDF copy of the report, labeled Library Copy, to lehua.k.soares@hawaii.gov.

EXHIBIT 16

Please annotate on the construction plans: In the unlikely event that subsurface historic resources, including human skeletal remains, structural remains, cultural deposits, artifacts, sand deposits, or sink holes are identified during the demolition and/or construction work, cease work in the immediate vicinity of the find, protect the find from additional disturbance, and contact the State Historic Preservation Division, at (808) 652-1510.

Please contact Andrew McCallister, Maui Archaeologist IV, at andrew.mccallister@hawaii.gov for any questions or concerns regarding this letter.

Aloha,
Susan A. Lebo
Signed For
Alan S. Downer, PhD
Administrator, State Historic Preservation Division
Deputy State Historic Preservation Officer

cc: County of Maui, planning@mauicounty.gov
Janet Six, County of Maui, janet.six@co.maui.hi.us
Mike Dega, SCS, mike@scshawaii.com
Will Spence, applicant, mauiwill@gmail.com

DAVID Y. IGE
GOVERNOR

JADE T. BUTAY
DIRECTOR

Deputy Directors
ROSS M. HIGASHI
EDUARDO P. MANGLALLAN
DAVID J. RODRIGUEZ
EDWIN H. SNIFFEN

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:

DIR 0871
HWY-PS 2.9940

October 21, 2022

VIA EMAIL: tara.furukawa@co.maui.hi.us

Ms. Michele Chouteau McLean
Director
Department of Planning
County of Maui
2200 Main Street, Suite 310
Wailuku, Hawaii 96793

Attention: Ms. Tara Furukawa

Dear Ms. Chouteau McLean:

Subject: Request for Comments for District Boundary Amendment and Change of Zoning Application (ZPA2022-00002)
Ohukai Light Industrial Park
454 Ohukai Road - Kihei, Maui, Hawaii
Tax Map Key No: (3) 3-9-001: 034

Thank you for your email dated September 13, 2022, requesting for our comments for the above-referenced application. The owner of the 28.7-acre property is proposing to subdivide 21 lots totaling 14.6 acres as baseyards. The lots will be available to be leased and utilized as storages for construction equipment or utilities.

The proposed work will include the construction of a paved road for access, appurtenances and utility installations for the project site. The project site is accessible from Piilani Highway (State Route 31), via Ohukai Road; a County Roadway.

The Hawaii Department of Transportation (HDOT) has the following comments:

1. The HDOT does not object to the proposed requests for the District Boundary Amendment or Change of Zoning.

2. Based on the Traffic Impact Analysis Report dated May 2022, the intersection at Piilani Highway and Ohukai Road is expected to increase by two percent and operate at the same level of service D and E during peak hours with or without the project. Therefore, we find that the project does not appear to significantly impact the state highway system.

EXHIBIT 17

3. If the application is approved, the HDOT recommends that the following condition be required: "In the event the project is found to have an impact to State facilities, the Applicant shall mitigate them satisfactorily to the Hawaii District Engineer, Highways, at no cost to the State."

If you have any questions, please contact Jeyan Thirugnanam, Systems Planning Engineer, Highways Division, Planning Branch at (808) 587-6336 or by email at jeyan.thirugnanam@hawaii.gov. Please reference file review number PS 2022-161.

Sincerely,

JADE T. BUTAY
Director of Transportation

SCS Project 2632 LRFI-1.3

AN ARCHAEOLOGICAL LITERATURE REVIEW AND FIELD INSPECTION FOR PROPOSED LIGHT INDUSTRIAL BASEYARD PROJECT IN KIHEI, WAIAKOA AHUPUA'A, MAKAWAO (KULA) DISTRICT, ISLAND OF MAUI [TMK: (2) 3-9-001:034]

Prepared by
Alondra Garcia, M.S.
and
Michael Dega, Ph.D.

May 2022

Prepared for
Chris and Candy Hayes

SCIENTIFIC CONSULTANT SERVICES, Inc.

1357 Kapiolani Blvd., Suite 850 Honolulu, Hawai'i 96814

EXHIBIT 18

ABSTRACT

Scientific Consultant Services, Inc. (SCS) has prepared this Archaeological Literature Review and Field Inspection (LRFI) for the proposed Light Industrial Baseyard project in Kihei, Maui. The parcel at 454 Ohukai Road [TMK: (2) 3-9-001:034] will be developed for baseyards where equipment can be stored. The proposed project includes ground disturbance of grading, removing agricultural push piles, and laying down pavement for a roadway.

A literature review of archaeological work in the vicinity indicates that while there are several habitation and agricultural sites of significance in the vicinity of the project area, they tend to be spread out on the surface. SCS archeologist Ian Bassford, B.A., conducted the field inspection under the direction of principal investigator Michael Dega, Ph.D., on April 13, 2022. No historic properties or cultural materials were identified during the surface pedestrian survey. If any surface historic properties were present in the project area, they would have been identified by the field inspection. For these reasons, no further archaeological work is recommended.

TABLE OF CONTENTS

LIST OF FIGURES

INTRODUCTION

At the request of the Chris and Candy Hayes, Scientific Consultant Services, Inc. (SCS) has prepared this Archaeological Literature Review and Field Inspection (LRFI) for the proposed Light Industrial Baseyard project in Kihei, Waiakoa Ahupua'a, in the traditional Kula District (modern Makawao District), Island of Maui [TMK: (2) 3-9-001:034] (Figures 1 through 3).

The project area consists of an agricultural lot that will be converted to a light industrial baseyard, while the adjacent lot will remain the same. The parcel is a total 28.7 acres of undeveloped land, 14.83 of which are proposed to be utilized for this project. The project area has been used for crop cultivation from the 1950s to 2015. Clearing the site for agriculture was extensive and involved pushing rocks and boulders into piles 100 to 500 feet long and up to 8 feet high. Further disturbance to the parcel included planting of windrows, installation of irrigation lines, and the previous cultivation which extended over a 65-year period.

A portion of the property is to be re-zoned to "Light Industrial" pursuant to 19.24 of the Maui County Code. The property will be developed into 19 individual lots and baseyards where equipment can be stored. Ground disturbance for the current project will be limited to grading, removing agricultural push-piles, trenching for utilities, and grading/pavement of an access roadway to and within the project area. No construction of warehouses or structures is planned for the phase of project, although this could change in time.

It is highly unlikely that any ground disturbance that takes place in the project area will adversely affect significant historic properties, as none have been identified on the surface during the current field inspection. SCS also assesses the likelihood of subterranean deposits or human burials as low based on a review of previous studies in the area, which only rarely found burials. SCS recommends no further archaeological work.

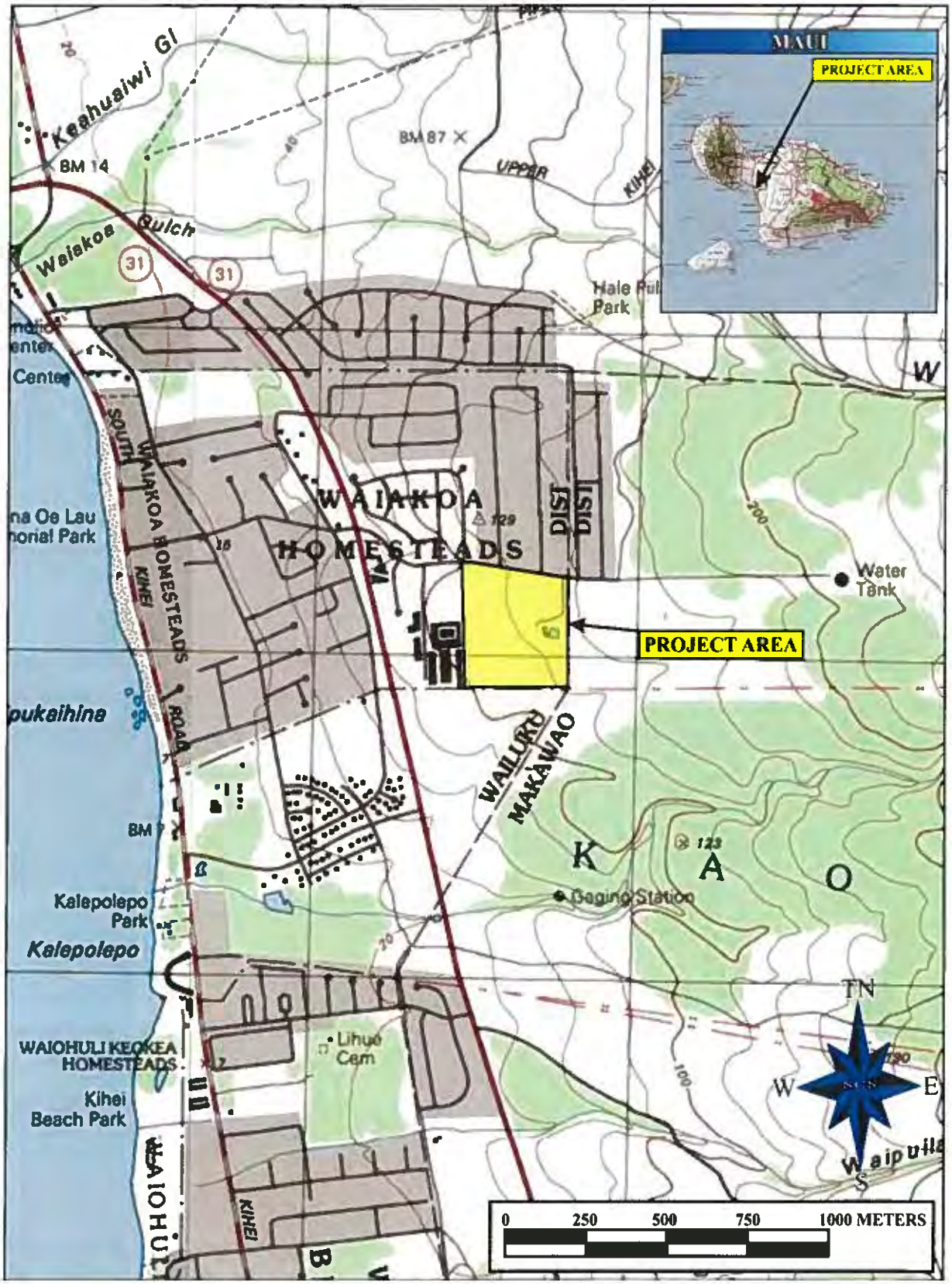


Figure 1: A composite USGS topographic map (Maalaea, 1996; Puu O Kali, 1992) showing the project area's location

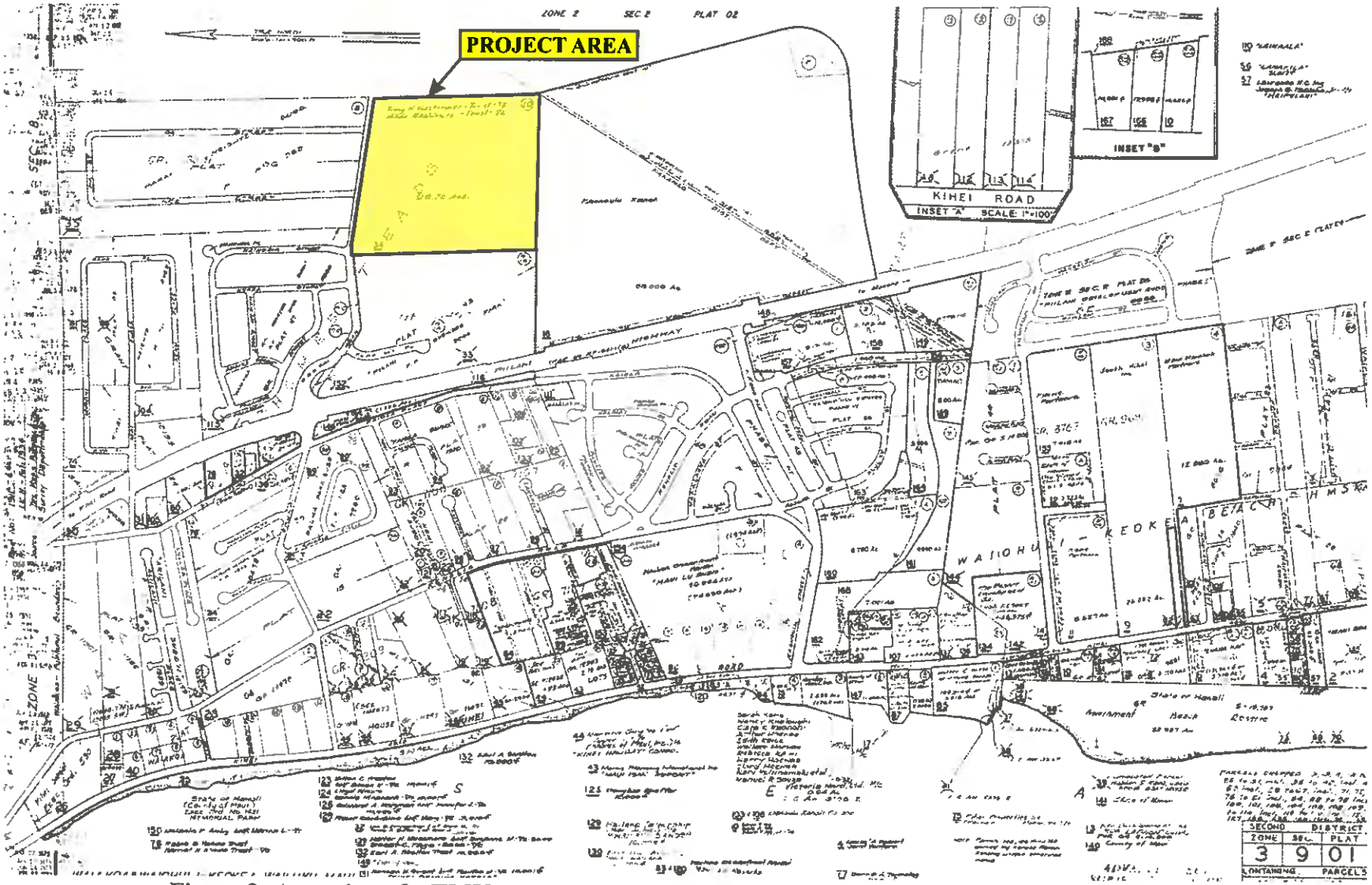


Figure 2: A portion of a TMK map showing the location of the project area in TMK: (2) 3-9-001

Figure 3: A Google Earth aerial photograph (imagery date: June 15, 2019) showing the location of the project area

ENVIRONMENTAL SETTING

With its 1,883 km^2 (727.2 square miles) Maui is the second largest among the Hawaiian Islands. It was formed by two volcanoes, the older and extinct Pu'u Kukui in the west and the younger dormant Haleakalā in the east, joined together by an isthmus of dry, open country. Pu'u Kukui ("candlenut peak"), rising to 1,764 m (5,788 ft) above mean sea level (amsl), is surrounded by large, heavily eroded amphitheater valleys that support permanent streams watering the fertile agricultural lands along the coasts. The deep valleys of the West Maui Mountains (Mauna Kahālāwai) and their coastal regions have been contested and coveted lands remarkable for their productivity. Haleakalā ("house of the Sun") is the larger of the two volcanoes, as it dominates the larger southeastern section of the island soaring 3,055 m (10,023 ft) amsl. Unlike the amphitheater valleys of West Maui, the flanks of Haleakalā are distinguished by their gentle slopes toward the isthmus. Since the permeable lavas of the Honomanū and Kula Volcanic Series prevent the formation of rain-fed perennial streams, the few perennial streams on the windward side of Haleakalā originate from springs located at lower elevations, while valleys and gulches on the leeward side were formed by intermittent water run-off. The lands in between the two orographically prominent features of Maui are formed by erosional deposits and are noticeably drier. The low isthmus connecting East and West Maui stretches from Mā'alaea Bay in the south to Kahului Bay in the north, and contains a large part of the island's population.

LOCATION

The project area is located in the *ahupua'a* of Waiakoa and the modern district of Makawao (the traditional Kula Moku). It is also located on the leeward (southwest) flank of the island, at base of the southwestern slope of Haleakalā, and in the urbanized area of Kīhei, Maui [TMK: (2) 3-9-001:034]. The project area is bounded by an agricultural field to the east, industrial buildings to the west, more undeveloped agricultural land to the south, and Ohukai Road and a residential subdivision to the north. The average elevation is 36 m amsl, ranging from 31 to 42 m amsl. The project is located 1,034 m (0.64 miles) away from the shoreline.

CLIMATE

The project area is located in one of the driest parts of the archipelago. Mean annual rainfall is 275.6 mm (10.85 in). Most of it occurs over the winter and spring months of November through March, while the summer months of June through October are relatively dry. Rainfall peaks in January at 66 mm (2.6 in), while July sees the least rain with an average of 1.5 mm (0.06 in) (Giambelluca et al. 2014).

Average annual air temperature at the project area is 26.64 °C (74.5 °F). August is the hottest month with an average of 25.6 °C (78.08 °F), while January is the coolest with an average at 21.6 °C (70.85 °F) (Giambelluca et al. 2014).

SOILS

According to Foote et al. (1972: Sheet 107), the surface in the project area is comprised of the Waiakoa soil series (Figure 4), characterized as well drained and developed from the decomposition of igneous rock (Foote et al. 1972:127). The specific soil phase in the project area is Waiakoa extremely stony silty clay loam, 3 to 25 percent slopes (WID2). These soils tend to be heavily eroded and exhibit medium runoff. A representative profile shows dark reddish brown silty clay loam both at the surface and in the substrate. Given the previous intensive agriculture on the parcel for 65 years, the soil has likely been tilled and cultivated quite a bit over time, disturbing natural sediments. Furthermore, given the history of agriculture, any rocks have likely been collected and removed, which has truncated the archaeological record both at the surface and below the surface.

HISTORICAL CONTEXT

Maui's lands were divided into districts (*moku*) and sub-districts by a *kahuna* (priest) named Kalaiha'ōhi'a, who lived during the reign of Kaka'alaneo (Beckwith 1970:383). Abraham Fornander places Kaka'alaneo at the end of the 15th or the beginning of the 16th century (Fornander 1916/1917, Vol. 6:248). Land was considered the property of the king, or the *ali'i 'ai moku* ("the chief eating the district"), which he held in trust for the gods. The title of *ali'i 'ai moku* ensured rights and responsibilities pertaining to the land but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him, and in turn distributed smaller parcels to lesser chiefs. The *maka'āinana* (commoners) worked individual plots of land collectively given to them.

The terms *moku*, *ahupua'a*, *'ili* or *'ili'āina*, and *mo'o* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua'a*) that incorporated the natural resources relevant to subsistence from the ocean to the mountains (Lyons 1875:111). These ancient divisions are still commonly used, even though land tenure has gone through radical changes (Sterling 1998:3). The *'ili* were smaller land divisions administered by the chief who controlled the corresponding *ahupua'a* (Lyons 1875:33; Lucas 1995:40). Finally, the *mo'o* were narrow strips of land within an *'ili*. The land holding of a tenant (*hoa 'āina*) was called a *kuleana* (right, privilege) (Lucas 1995:61).

PRE-CONTACT PERIOD

Archaeological data indicate that Polynesian settlers initially inhabited the windward shores of the Hawaiian Islands around the 10th century C.E. with populations extending into leeward areas at later periods (Kirch 2011:22). Accordingly, the 10th century would be the earliest date to which human presence could be expected in the project area and its vicinity. More likely, however, it would be traced to the early period of agricultural development, which on Maui began circa 1200-1400 C.E. (Kirch 1985:142). According to Edward Handy, there was continuous cultivation on the coastal region along the northwest coast of Maui. Of the leeward side, he wrote:

Figure 4: Google Earth aerial photograph showing the soil series in the project area and its vicinity (USDA-NRCSS 2017)

> On the south side of western Maui the flat coastal plain all the way from Kihei and Maalaea to Honokahua, in old Hawaiian times, must have supported many fishing settlements and isolated fishermen's houses, where sweet potatoes were grown in the sandy soil or red *lepo* [soil] near the shore. For fishing, this coast is the most favorable on Maui, and, although a considerable amount of taro was grown, I think it is reasonable to suppose that the large fishing population which presumably inhabited this leeward coast ate more sweet potatoes than taro with their fish. [1940:159].

The district of Kula was known for dryland agriculture. Dryland agricultural field systems were characterized by extensive stone and earthen embankments, reliance on rainfall, and regular rotation of crops (Kolb et al.1997:6). These systems were also noted for their arid conditions and lack of perennial streams. In fact, the word "*kula*" is also used to describe lands which were dry and inaccessible to water, except from rainfall (Malo 1951). Handy writes:

> Kula was always an arid region throughout its long, low seashore, vast stony *kula* lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala, a considerable population existed, fishing and raising occasional crops of potatoes along the coast, and cultivating large crops of potatoes inland, especially in the central and northeastern section including Keokea, Waiohuli, Koheo, Kaunoulu, and Waiakoa. [Handy 1940:161]

According to Kolb et al. (1997), the key component of Kula's economy was the dryland agriculture in and near the upland forests. *'Uala* (sweet potato, *Ipomoea batatas*) does not grow in very wet areas. Handy and Handy also noted its role for the traditional agriculture of Kula District calling it "the staple of life" in the district (Handy and Handy 1972:511). Handy and Handy also describe the planting methods in the drier sections of Kula:

> Where potatoes are planted in crumbling lava with humus, as on eastern Maui and in Kona, Hawaii, the soil is softened and heaped carelessly in little pockets and patches using favorable spots on slopes the crumbling porous lava gives ample aeration without much mounding. [Handy and Handy 1972:131]

There is little specific information pertaining directly to Kīhei (from Hawaiian, "cape, cloak"), today a six-mile section along the coast from the old town of Kīhei to Keawakapu (Clark 1989:49; Figure 5). The project area is located within what is referred to as a "barren zone," in which agriculture endeavors were almost non-existent and tool procurement materials, such as basalt rock and wood, were selected from other locales (Cordy 1977). Use of the area was primarily intermittent or transitory, but it was supported by trails extending between the two more profitable eco-zones of the coast and the higher slopes of Haleakalā. Handy confirms this: "Between Kihei and Makena there was probably very little settlement in former times. Today along this dry coast there are a few settlements and houses and a few gardens with sweet potatoes" (Handy 1940:161).

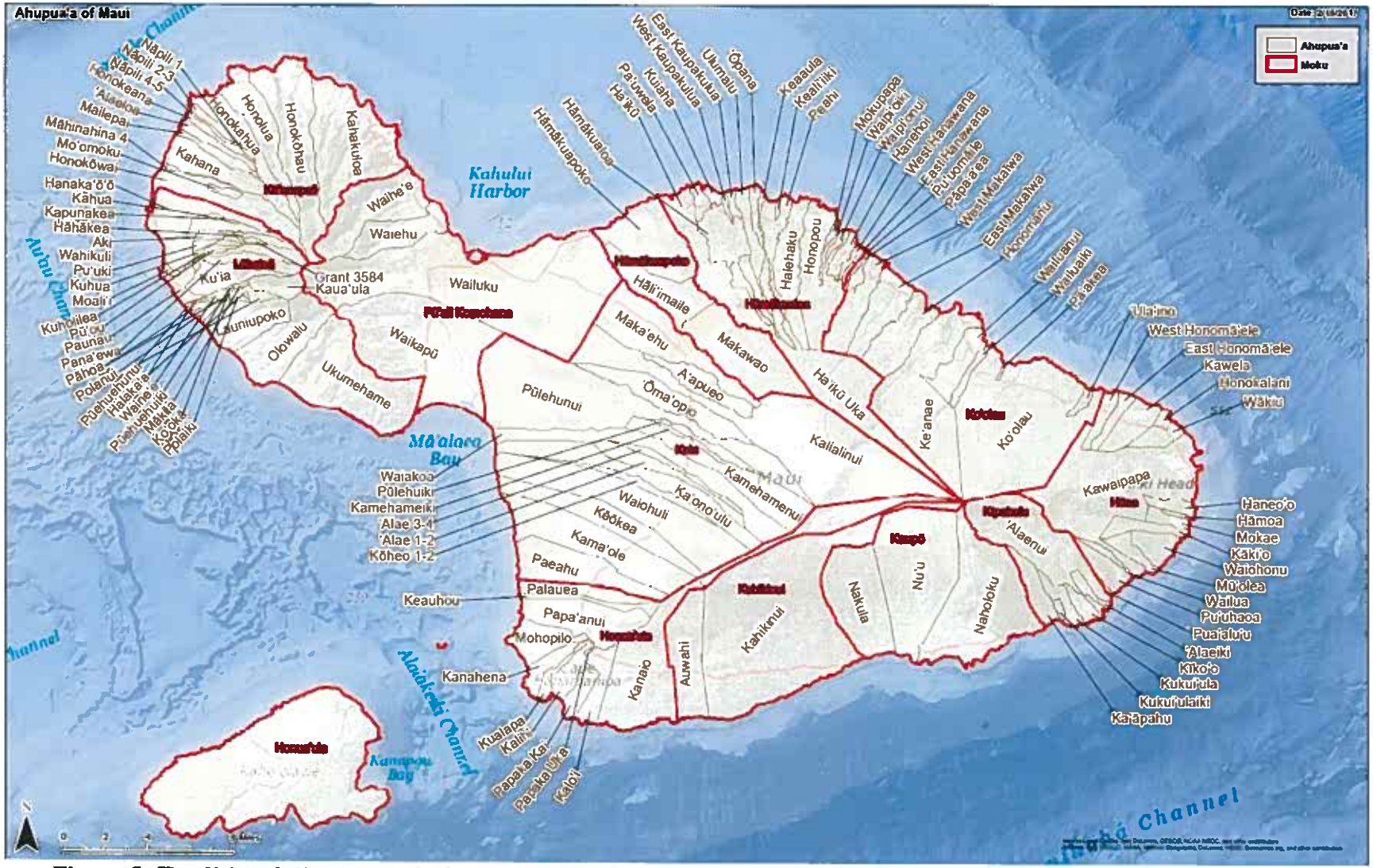


Figure 5: Traditional districts and *ahupua'a* of Maui (image courtesy of Department of Land and Natural Resources)

At drier, lower elevations, agriculture was a relatively minor component of the traditional subsistence economy. Early accounts and archaeological evidence suggest that the "barren zone" was a transitional area in which people moved resources between the coast and the uplands. Several trails connected the two. Built by Kiha-a-Pi'ilani, a trail known as "Ala Nui," or "King's trail," extended along the coast passing through major communities between Lāhainā and Mākena, including Kīhei. Another trail named "Kekuawaha'ula'ula," or the "red-mouthed god," extended from Kīhei inland to Kēōkea. The Kalepolepo trail began at Kalepolepo Fishpond and continued to upland Waiohuli. These trails were not only used during the Pre-Contact Period but were expanded to accommodate wagons bringing produce to the coast in the 1850s (Kolb et al. 1997:61).

Scattered amongst the few habitation sites along the coast were places of cultural significance to the *kama'āina* (natives, *lit.* "children of the land") of the district including at least two *heiau* (traditional Hawaiian religion temples). During the Pre-Contact Period, a small village at Kalepolepo was established specifically to utilize marine resources. The oral tradition recounts how Kalepolepo earned its name during the construction of the three fishponds in the 16th century. The *konohiki* (manager) of Kula ordered all people of Maui to repair the walls of the fishponds. A man named Kikau protested that the repairs could not be done without the assistance of the *menehune*, a mythical race of master builders (Wilcox 1921:66-67). The *konohiki* was furious and told Kikau that he would be put to death when the repairs were completed. Kēōkea-Kai was the first pond to be repaired. The *konohiki* rode proudly on top of the capstone as it was carried on a litter to be placed in the northeast corner of the pond. Upon completion of Waiohuli-Kai, the *konohiki* again rode the capstone to its resting place. As the last pond, Ka'ono'ulu Kai, was completed, the *konohiki* once again rode the capstone. Before the capstone could be placed into position, the litter on which it was carried broke, throwing both the rock and the *konohiki* into the dirt (*lepo*). The workers reportedly said, "Ua konohiki Kalepolepo, ua eku i ka lepo," or "the manager of Kalepolepo, one who roots in the dirt" (Wilcox 1921:66). That night a fierce storm destroyed the walls of the fishponds. Recognizing his mistake, the *konohiki* implored Kikau to help him repair the damage. Kikau called the *menehune*, who then rebuilt the walls in one night. 'Umi-a-Līloa, the ruler of Hawai'i Island, sent for Kikau and made him a resident of the court at Waipi'o Valley (Wilcox 1921:67). Ka'ono'ulu Kai Fishpond then became known as Kalepolepo.

The fishpond was rebuilt at least three times (Cordy 2000), the first of which by Maui chief Kekaulike (c. 1700–1736). Afterward, the pond supplied *'ama'ama* (mullet) to Kahekili II (1737–1794). The fishpond was restored again by Kamehameha I (r. 1782–1819) when he conquered Maui; it was also at Kalepolepo where he reportedly beached his victorious canoes after subduing the Maui chiefs. Finally, Kauikeaouli (r. 1825–1854) organized prisoners from Kaho'olawe penal colony to repair the complex in the 1840s using stones from Waiohuli-Kai (Wilcox 1921:67).

EARLY POST-CONTACT PERIOD

The Post-Contact Period on Maui began on November 26, 1778, with British Explorer Captain James Cook's passing by the island on his way back from the extreme Northern Pacific (Daws 1974:8). Cook's visit occurred during a war between Hawai'i chief Kalani'ōpu'u and Maui chief Kahekili II (a descendant of Pi'ilani), the latest in a series of conflicts between the islands (Speakman, Jr. 1978:26). Maui reached the height of its political influence under Kahekili II (c. 1737–1794) in 1783, just five years after Cook's visit (Kolb et al., 1997:3). Kahekili II was able to bring O'ahu, Lāna'i, and Moloka'i under his rule in addition to his native Maui, although the human cost of the wars was high.

Early descriptions of this portion of the Maui coast are infrequent and brief. Captain King, Second Lieutenant on *Revolution* during Cook's third voyage, briefly described what he saw from a vantage point of "eight or ten leagues" (approximately 44 to 56 kilometers) out to sea as his ship departed the islands in 1779 (Beaglehole 1967). King mentions Pu'u Ōla'i south of Kīhei, describing the animals observed, and noting the thriving groves of breadfruit, the excellence of the taro, and the unusual height of the sugarcane. In the ensuing years, LaPérouse (1786) and Nathaniel Portlock and George Dixon (also in 1786) sailed along the western coast of Maui but added little to our direct knowledge of Kīhei.

During Vancouver's second visit in 1793, the expedition was becalmed at Mā'alaea Bay. Vancouver reported:

> The appearance of this side of Mowee was scarcely less forbidding than that of its southern parts, which we had passed the preceding day. The shores, however, were not so steep and rocky, and were mostly composed of a sandy beach; the land did not rise so very abruptly from the sea towards the mountains, nor was its surface so much broken with hills and deep chasms; yet the soil had little appearance of fertility, and no cultivation was to be seen. A few habitations were promiscuously scattered near the waterside, and the inhabitants who came off to us, like those seen the day before, had little to dispose of. [Vancouver 1984:852]

Archibald Menzies, a naturalist accompanying Vancouver stated, "we had some canoes off from the latter island [Maui], but they brought no refreshments. Indeed, this part of the island appeared to be very barren and thinly inhabited" (Menzies 1920:102). According to Vancouver, the poverty he witnessed in the area was explained to him by various *ali'i* (chiefs) as the result of continuous warfare that had devastated lands "which had formerly been considered as fruitful and populous" and left them "over-run with weeds, and exhausted of their inhabitants" (Vancouver 1984:856).

After the death of Kahekili II at Waikīkī in 1794, his large but unstable realm soon succumbed to fratricidal conflicts. It was Hawai'i chief Kamehameha I (c. 1737–1819), however, who succeeded in unifying the islands. Kolb et al. suggest that Kahekili II may have anticipated and even endorsed that development:

> During a lull in Kamehameha's first bid to conquer the islands, shortly before he had to return to Hawai'i Island to supress a rebellion, he sent a messenger to Kahekili to arrange the time and place of battle. Kahekili was holding court at Waikīkī on O'ahu and was obviously contemplating the future. At this time he sent a personal message to Kamehameha stating: "Watch, and when I am covered with black tapa and a hog is placed at the mouth, remember and take the lands." [in Kolb et al. 1997:3]

In February of 1795, Kamehameha established his presence on Maui with an invasion of Lāhainā when his large fleet of war canoes covered the coast from Launiupoko to Mala (Kamakau 1961:171). In the following years, the descendants of Pi'ilani and the chiefly Maui families were for the most part dispossessed of their lands unless they surrendered to Kamehameha's conquest (Fornander 1919–20, Vol. 6:310). In 1810, Kamehameha I completed his unification of the islands when Kaua'i chief Kaumuali'i agreed to become his subordinate after negotiation (Daws 1974:43).

Kamehameha I won his wars with the aid of gunpowder and weapons gained by trade with passing American and European ships, although he guarded access to foreign trade jealously. Over the first half of the 19th century Hawai'i's previous subsistence based economy was slowly changing to a market based one. The buying and selling of produce to provision sailing ships, initially mostly passing by on trade routes between North America and Asia, had been strictly regulated under Kamehameha I, who held trade as a royal monopoly (Daws 1974:44). His successors, however, quickly gave into the pressure from the lesser chiefs, who wanted a share of the bounty, especially exotic merchandise brought in by foreign merchants, and opened the Hawaiian Kingdom to greater Western influence. During the reign of Liholiho (Kamehameha II, r. 1819–1824), chiefs imported foreign goods on credit, promising payment in sandalwood cut from the mountains. This practice caused famine as workers levied for the task were taken away from subsistence agriculture. On top of that, the supply of sandalwood trees (*'iliahi*, *Santalum* spp.) was exhausted within a few decades (Greene and Rhodes 1993). By the reign of Kauikeaouli, free enterprise dominated commerce in the islands, and suppling the booming whaling industry had become the main non-subsistence economic activity. Since the roadstead off Lāhainā was more convenient to whaling ships, much of the economic activity was centered on Maui, and the capital moved to the town after the death of Kamehameha I in 1819.

THE MĀHELE

Traditional land tenure shifted drastically with the introduction of private land ownership based on Western legal practices. The transition from communal land use to private ownership is commonly called the "Māhele" (division) and set the stage for consequential changes to property possession. Kame'eleihiwa (1992:209) states that Makawao District was the first area to experiment with land sales. In January 1846, land was made available for ownership to *maka'āinana* (commoners) with lots ranging from five to ten acres. The Māhele divided Hawaiian lands between the king, the chiefs, and the government, while instituting private land ownership. The subsequently awarded parcels were called Land Commission Awards (LCA). Once lands were made available and private ownership was instituted, the *maka'āinana* were able to claim the plots of land on which they had been living and that they had been cultivating through the Kuleana Act of 1850. These claims did not include any previously cultivated but presently fallow land, stream fisheries, or many other resources (Kame'eleihiwa 1992:295). They also demanded understanding of the Western-introduced procedures that was rare among Hawaiians. Foreigners in Hawai'i could acquire land through the Alien Landownership Act of 1850, although they often were simply given lands by the *ali'i*. If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent (RP), after which they could take legal possession of the property (Chinen 1958:16).

According to the Office of Hawaiian Affairs' Kipuka Database (n.d.), no LCAs overlap with the project area. Prior to the Māhele, the owner of Kula District was Kekau'onohi (Kame'eleihiwa 1992:52). During the Māhele Kamehameha III retained ownership of portions of Kula, including Waiakoa and other *ahupua'a* as part of "government lands." Importantly, no *kuleana* land claims occur within or near the present project area.

LATE POST-CONTACT PERIOD TO PRESENT

As Western influence grew, Kalepolepo became an important provisioning area. Westerners were living or frequently visiting the coast (Kolb et al. 1997:68-69). One Mr. John Joseph Halstead moved from the U.S. East Coast and established a residence and store in Kalepolepo on land given to him by Kamehameha III (Kolb et al. 1997). Known as the Koa House, the Pennsylvania Dutch-style house was constructed of *koa* (*Acacia koa*) logs brought from the uplands (Figure 6). Because of the demand for Irish potatoes and the growth of the whaling industry, the store flourished and provided an accessible port for exported produce. A landing was also built at Kīhei around 1890 (Clark 1989:49). Wilcox, giving a glimpse of the surroundings stated, "Kalepolepo was not so barren looking a place. Coconut trees grew beside pools of clear warm water along the banks of which grew taro and 'ape [*Alocasia macrorrhizos*]" (1921:67).

Figure 6: John Joseph Halstead's Koa House (adapted from Charles Wilcox, "Kalepolepo" in *Paradise of the Pacific*, 1921)

By 1887, however, the winds of fortune had begun to change. Wilcox writes:

> The Kula mountains had become denuded of their forests, torrential winter rains were washing down earth from the uplands, filling with silt the ponds at Kalepolepo…ruins of grass huts [were] partly covered by drifting sand, and a few weather-beaten houses perched on the broad top of the old fish pond wall at the edge of the sea, with the Halstead house looming over them dim and shadowy in the daily swirl of dust and flying sand. [Wilcox 1921:67]

Cultivation of Irish potatoes in the Kula District began shortly before 1840, after which time Kula became known as "the potato district" because of its great success in their cultivation. The resulting deforestation adversely affected the amount of rainfall in the district, and periods of drought became more common (Kolb et al. 1997). The *Sunday Star-Bulletin and Advertiser* describes the changes:

> Before 1850 Kula was supplied with moisture naturally through the existence of a large forest. That forest was cut down when land was cleared in Kula to open farm plots in 1850. This was in answer to the demand for food in California during the gold rush… [and] by ranchers clearing for pasture. A secondary result of clearing forests was destruction of existing fresh water ponds in Kihei on the Maalaea Bay coast below Kula. When forest was cleared, water was free to rush down the mountains carrying soil from Kula and filling with mud the ponds for which Kihei was once famous. [*Sunday Star-Bulletin and Advertiser* 1962:A15]

Although ranching was present prior to the 1840s, the industry took off at the end of the 19th century because of deforestation. The semiarid climate and paucity of inhabitants allowed for little else. By the 1880s, the lower *kula* lands, including the project area, consisted primarily of pastureland for ranching, and large sections of Crown Lands were leased for grazing cattle. Established in 1888, the Haleakalā Ranch Company included 33,817 acres and up to 500 acres set aside for corn cultivation. The ranch utilized coastal areas of Maui, including the land in and around the project area. Large portions of Ka'ono'ulu Ahupua'a were also used for cattle by the Ka'ono'ulu Ranch Co. Ltd and by Ulupalakua Ranch, Inc.

The Kīhei coast witnessed a significant World War II military presence along Mā'alaea Bay (Allen 1950). The beaches were "fortified to resemble enemy beachheads" (Clark 1989:45) and were assaulted in amphibious assault landing training exercises, as Army camps and hospitals were built inland. Immediately after the war, in 1946, the century-old and long-abandoned Koa House was "declared a menace to public safety, … condemned and burned to the ground" (Clark 1989:48). In 1948, the Department of the Navy built a monitoring facility for the nuclear tests conducted in the Pacific; this building now houses the Pacific Whale Foundation at Mā'alaea Bay (Medeiros et al. 2012:25).

In the 1970s, Mā'alaea Bay, Kīhei, and the neighboring coastal areas underwent rapid development of residential and commercial projects, many of which were in service of the burgeoning tourism industry. Significant efforts have been made since the 1980s to diversify the economy; as a result, the Maui Tech Park and a Monsanto plant research facility were built at the end of the 20th century.

PREVIOUS ARCHAEOLOGY

The earliest archaeological endeavors on Maui were undertaken by Thomas G. Thrum (1909), John F.G. Stokes (1909–16), and Winslow Walker (1930) with the sponsorship of Bernice Pauahi Bishop Museum. These studies identified a number of *heiau* and other religious features, many of which along the coastline and in Upper Kula. Much of the archaeological research near the project area, however, is more recent, taking place after archaeological regulations in advance of construction were instituted. The majority of the development of coastal Kīhei took place in the 1960s and 1970s, prior to the implementation of SHPD requirements in the late 1980s, making it likely that unmonitored development has already destroyed many culturally significant features.

COX (1976), CORDY (1977)

Kula has been divided into three environmental zones – inland, coastal, and transitional or "barren." The most population is expected to be highest in the inland zone, followed by the coastal one, and, lastly, the "barren zone." The latter is viewed as relatively inhospitable to permanent habitation because of its dryness, rocky soils, and dearth of natural resources (Cordy 1977). Previous studies failed to find evidence of traditional Hawaiian activities in that zone. For example, David Cox surveyed the then proposed Pi'ilani Highway in 1976 and found only small, temporary habitation features, an *ahu* (from Hawaiian, "pile"), and two Post-Contact houses (Cox 1976). Closest to the project area, Cordy identified a "collapsed frame house of very recent construction" which he designated as State Inventory of Historic Places (SIHP) Site 50-50-10-01703. No sites were documented in Waiakoa Ahupua'a itself as "nearly all of this corridor area has been cleared in connection with recent housing, roads, and orchards" (Cordy 1977:31).

KENNEDY (1986), MONAHAN (2003)

In 1986, Joseph Kennedy confirmed that the settlement pattern of avoiding the so-called "barren zone" probably continued from ancient times through the Early Post-Contact period, as LCAs were issued for land situated in the far upland reaches (Kennedy 1986). In 2003, SCS conducted an archaeological inventory survey, including subsurface testing, of a 28.737-acre portion of the Maui Research and Technology Park within the area investigated by Kennedy (1986). Other than a small arrangement of stacked boulders interpreted as a push pile, this survey yielded no significant evidence of Pre- or Post-Contact activity (Monahan 2003).

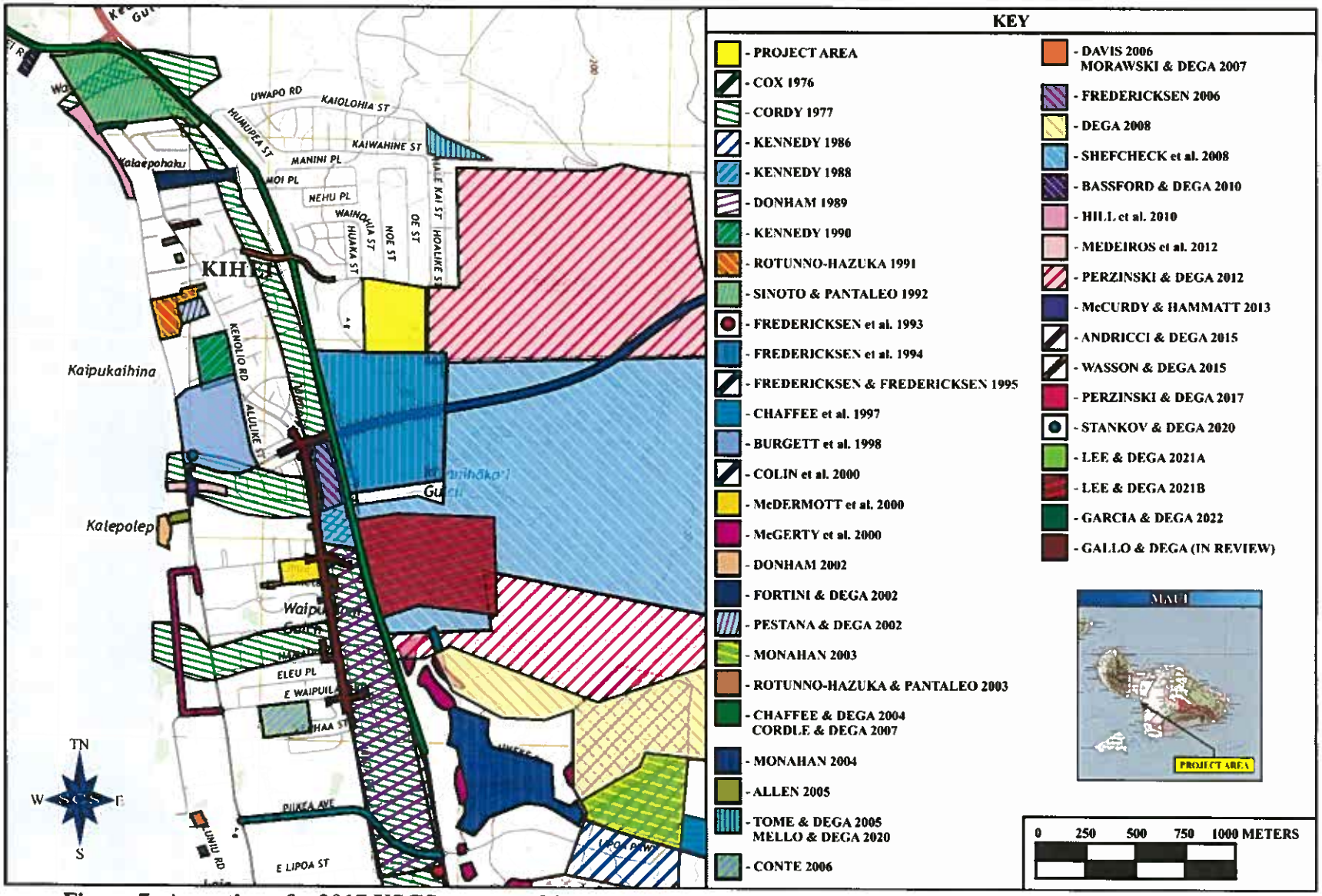


Figure 7: A portion of a 2017 USGS topographic map showing previous archaeology in the vicinity of the project area

KENNEDY (1988), DONHAM (1989), FREDERICKSEN (2006)

In 1988, Archaeological Consultants of Hawai'i (ACH) conducted a reconnaissance survey in the Ka'ono'ulu Ahupua'a. No surface features were found (Kennedy 1988). Donham conducted the first phase of an archaeological inventory survey of Pi'ilani Residential Community along the border of the "barren zone" and including the entirety of Kennedy's 1988 project area. The survey identified two Ranching Era structures and a Pre-Contact agricultural terrace designated as SIHP Site 50-50-10-02475 (Donham 1989). In 2006, Xamanek Researches (XRL) conducted an archaeological field inspection of 8.274 acres of land [TMK: (2) 3-9-001:157 and 158] in land surveyed by previous archaeological studies (Kennedy 1988 and Donham 1989). Because of the extensive ground disturbance, no historic properties were identified (Fredericksen 2006).

KENNEDY (1990), BURGETT et al. (1998), STANKOV AND DEGA (2020)

ACH surveyed a parcel [TMK (2) 3-9-001:64, 99] in 1990. There was no surface indication of any cultural artifacts (Kennedy 1990). SCS led a survey on land just south and slightly overlapping with Kennedy's study area in 1998. Occupied by the former Maui Lu Resort for the proposed Maui Bay Villas, 16 stratigraphic trenches were excavated, yielding only layers of soil or sand fill. No historic properties were identified (Burgett et al. 1998). SCS returned to the Maui Bay Villas in 2020 and recovered cultural materials north of Kalepolepo. Twelve Pre-Contact features were recovered, including a fishpond wall, a burned post, a hearth, a living floor, an L-shaped wall, post molds, canine remains, and a porcine jaw. Ten fragmented human remains belonging to two individuals were recovered, though there were no pit or subsurface burial features (Stankov and Dega 2020).

ROTUNNO-HAZUKA (1991)

Lisa Rotunno-Hazuka conducted an archaeological inventory survey for the Kai Makani project located north of Kīhei Road. The survey and subsurface testing, including backhoe trenching, identified no historic properties or subsurface deposits in the extensively disturbed project area (Rotunno-Hazuka 1991).

SINOTO AND PANTALEO (1992)

In 1992 Akihiko Sinoto Consulting conducted an archaeological inventory survey of the proposed location for the Gateway Complex which led to the identification of SIHP Site 50-50-09-00031, a remnant of a concrete bridge crossing Waiakoa Stream. It was suggested that the bridge was probably related to a narrow-gauge cane railroad that operated through the area and may have serviced Kīhei Camp 1 (Sinoto and Pantaleo 1992).

FREDERICKSEN et al. (1993)

In 1993, XRL conducted an archaeological inventory survey and data recovery (Fredericksen et al. 1993) on the grounds of Lokelani Intermediate School. A rock shelter, designated as SIHP Site 50-50-10-03193, was excavated. Recovered were midden and artifacts, including over 100 pieces of volcanic glass that were mostly waste by-products of knapping, in addition to worked bone, and coral abraders. Charcoal from one of three excavated hearths yielded a radiocarbon dating result of 1560-1800 C.E. (Fredericksen et al. 1993).

FREDERICKSEN et al. (1994)

In 1994, XRL (Fredericksen et al. 1994) conducted an archeological survey on an 88-acre former portion of Ka'ono'ulu Ranch located *mauka* (mountainward) of Pi'ilani Highway [TMK: (2) 3-9-01-16 and 2-22-02: por. 15). This project took place just south of the current project area. A total of 21 features were discovered, among which are five stone piles possibly indicating Pre-Contact agricultural activity, five surface scatters suggesting Pre-Contact temporary habitation, and a petroglyph that was subsequently designated as SIHP Site -03746 (Fredericksen et al. 1994).

FREDERICKSEN AND FREDERICKSEN (1995)

In 1994, XRL conducted an AIS (Fredericksen and Fredericksen 1995) along the approximately 150 ft. (45.7 m) wide corridor of a proposed collector road that would connect South Kīhei Road with Pi'ilani Highway [TMK: (2) 2-2-002:066, 067 por.; (2) 3-9-002:109]. SIHP Site 50-50-10-03529, a Pre-Contact rock shelter, was the only cultural property in the project area. Excavation yielded midden and artifacts, but the charcoal flecking found was insufficient for radiocarbon analysis. Site -03529 was recommended for data recovery work (Fredericksen and Fredericksen 1995).

CHAFFEE et al. (1997)

In 1997, SCS conducted an archaeological inventory survey that included subsurface testing (excavation) in a portion of Maui Research and Technology Park (Chaffee et al. 1997). Three sites consisting of ten archaeological features were identified. The features included remnant terraces, stone alignments, a mound, and a modified outcrop. All of the sites were interpreted as agricultural in function with the exception of a rock mound that may have functioned as a religious feature (Chaffee et al. 1997).

McDERMOTT et al. (2000)

CSH conducted an archaeological inventory survey of a 7.4-acre area of the Kiawe Mauka parcel development located along Kūlanihāko'i Road in Waiohuli Ahupua'a. During this 2000 survey, one historic property – a pond situated in the southwest portion of the project area – was identified and subsequently designated SIHP Site 50-50-09-04981 (McDermott et al. 2000).

McGERTY et al. (2000)

In 2000, SCS (McGerty et al. 2000) surveyed 15 areas within the Elleair Maui Golf Club, and identified five archaeological sites containing a total of seven surface features. The surface features were interpreted as agricultural terraces, perhaps dating from the Pre-Contact Period, and C-shaped rock formations (fighting positions) built during World War II training. The ten excavation units placed within these features yielded no cultural material (McGerty et al. 2000).

COLIN et al. (2000)

In 2000, CSH conducted an archaeological inventory survey for the then proposed Kīhei-Upcountry Maui highway (Colin et al. 2000). A total of 126 features comprising 17 Pre- and Post-Contact sites were identified. The functions of the Pre-Contact sites included temporary habitation, agriculture, and petroglyphs; the latter were recommended for preservation. The Post-Contact sites were remnants of agricultural activity, animal husbandry, and military training. (Colin et al. 2000).

TOME AND DEGA (2002)

In 2002, SCS conducted an archaeological inventory survey along the northeastern flank of Elleair Maui Golf Club (Tome and Dega 2002). Two Post-Contact features were identified (a ranching corral and a short agricultural wall) and collectively designated as SIHP Site 50-50-10-05233. No other structures or subsurface deposits were identified, and no traditional Hawaiian sites or features were encountered (Tome and Dega 2002).

FORTINI AND DEGA (2002)

In 2002, SCS conducted an archaeological inventory survey on two parcels totaling 15.6 acres in Kīhei [TMK:3-9-35:1 and 3-9-35:2] (Fortini and Dega 2002). Based on a pedestrian survey, it was concluded that both parcels had been subject to natural erosion and mechanical surface disturbance. Two Post-Contact features were identified. Feature 1, a cobble and boulder-faced wall, was interpreted as a foundation for a fuel or water tank. Feature 2 was a low wall alignment associated with a previous shop. Both features were dated to Late Post-Contact to Modern times and were not deemed historically significant. No subsurface cultural deposits were identified during representative testing of the parcel. Based on survey results and representative subsurface trenching of this area in the so-called "barren zone," it was assessed that the project area does not contain significant cultural features or deposits (Fortini and Dega 2002).

DONHAM (2002)

In 2002, Akahele Archaeology (Donham 2002) conducted an underwater archaeological inventory survey of Kō'ie'ie Fishpond (SIHP Site 50-50-09-01288). The survey of the 7.5-acre area, which included the fishpond and surrounding area outside the fishpond wall, identified boulders, suggesting Kō'ie'ie Fishpond may once have been larger than it now is (Donham 2002).

PESTANA AND DEGA (2002)

Also, in 2002, SCS conducted an archaeological inventory survey on a 2.5-acre parcel [TMK (2) 3-9-041:027] in previous marshlands (Pestana and Dega 2002). The nine stratigraphic trenches did not yield evidence of significant cultural features or deposits (Pestana and Dega 2002).

ROTUNNO-HAZUKA AND PANTALEO (2003)

In 2003, seven confirmed burial sites were inadvertently discovered by the landowner during initial ground altering activities for a construction project at 296 Kenolio Road near the intersection of Kenolio Road and Ohukai Road [TMK: 3-9-006:040]. The burial pits originated in the portion of the parcel located in Dune Land deposits. The burials were designated as SIHP Site 50-50-09-05560. An archaeological monitoring plan for the Hamada-Tanaka Subdivision on the property was accepted by the SHPD with a letter dated December 24, 2003 (Log No: 2003.2660; Doc No: 0312MK17; Rotunno-Hazuka and Pantaleo 2003). A search of SHPD records yielded no other archaeological reports for this parcel.

CHAFFEE AND DEGA (2004), CORDLE AND DEGA (2007)

In 2003, SCS (Chaffee and Dega 2004) monitored construction work for a residential home on a 0.462-acre parcel [TMK: (2) 3-9-008:008]. A second round of construction work on the parcel in 2006 was also subject to monitoring (Cordle and Dega 2007). In both cases, monitoring yielded negative results for any cultural properties, but since the project area was situated in dune lands that were often favored for Native Hawaiian burials, monitoring continued to be recommended for any future ground disturbing work (Chaffee and Dega 2004; Cordle and Dega 2007).

MONAHAN (2004)

In 2004, SCS conducted an archaeological inventory survey on two lots totaling 56.647 acres near Elleair Golf Course in Waiohuli and Kēōkea Ahupua'a, [TMK: 2-2-24:12 and 13]. Pedestrian survey and subsurface testing were performed, and four surface features consisting of stacked basalt stones were located and assigned SIHP numbers. Test excavations yielded buried cultural material consistent with Pre-Contact activities at three of the four sites (SIHP Sites 50-50-10-05506, -05507, and -05509). Excavation at the fourth site (-05508), a C-shaped rock pile likely a World War II training feature, did not yield any subsurface evidence. The discovery of three traditional sites in this area is significant, as previous studies have generally failed to document such activity. One of these sites (-05509) yielded a modern radiocarbon date (0±50 BP), but its context is questionable and it may not refer to the (probably older) buried artifacts. Two other sites (-05506 and -05507) failed to yield datable material, although both contained buried traditional artifacts and midden. No additional archaeological work was recommended (Monahan 2004).

ALLEN (2005)

International Archaeological Research Institute investigated a 0.457-hectare parcel near the historic Kalepolepo Fishpond in 2005. The excavation of 21 trenches into the existing dune system on the *makai* (seaward) side of South Kīhei Road identified two subsurface features – a cobble paving and a firepit "associated with a thin cultural layer." Both of these features were assessed as being from the late 1800s/early 1900s. Charcoal was identified in several of the trenches but was classified as secondary deposition from inland sources. Most of the excavated dune areas represented recent (approximately 70 years old) sand deposits, common in similar wind-swept regions where aeolian deposits are common (Allen 2005).

TOME AND DEGA (2005), MELLO AND DEGA (2019)

In 2005, Scientific Consultant Services, Inc. conducted an archaeological inventory survey with limited subsurface testing 0.4 miles northeast of the current project area [TMK: (2) 3-8-004:028] (Tome and Dega 2005). The survey revealed two archaeological sites comprising of four structural features. SIHP Site 50-50-09-05802 was interpreted as related to World War II, while SIHP Site 50-50-09-05802 was dated to the Pre-Contact Period. Fourteen years later, SCS monitored the Kaiwahine Village Affordable Housing project (Mello and Dega 2019). Monitoring was conducted because of the potential for the inadvertent discovery of Pre- and Post-Contact cultural materials, traditional habitation, and burial sites. No Pre- or Post-Contact cultural materials or deposits were identified.

DAVIS (2006), MORAWSKI AND DEGA (2007)

In 2003, SCS conducted an archaeological inventory survey (Davis 2006) of a 1.074-acre parcel [TMK: (2) 3-9- 008:018] in Waiohuli Ahupua'a. No historic properties were identified, but monitoring for any future subterranean construction was recommended because of the possibility of burials. The report was published as an AA (Davis 2006). In 2006, SCS (Morawski and Dega 2007) conducted an archaeological inventory survey of 3.16 acres [TMK: 3-9- 008:013 and 018] for the Hale O Uluniu Condominium development. The project area overlapped with that of Davis (2006). No historic properties were identified during the pedestrian survey and excavation of four stratigraphic trenches (Morawski and Dega 2007).

CONTE (2006)

CRM Solutions Hawai'i conducted an archaeological inventory survey on 7.217 acres in Waiohuli Ahupua'a [TMK: (2) 3-9-046:013]. No archaeological sites were identified (Conte 2006).

SHEFCHECK et al. (2008)

SCS conducted archeological inventory survey of a 516-acre parcel southeast of the project area, also *mauka* of Pi'ilani Highway (Shefcheck et al. 2008). A number of features were identified, including previously undocumented Pre-Contact habitation sites and rock shelters along Kulanihako'i Gulch. The survey also recorded two Post-Contact roads (SIHP Sites -06387 and -06401) and eight features associated with military activity during WWII (Shefcheck et al. 2008).

DEGA (2008)

In 2008, SCS conducted an archaeological inventory survey on 338 acres of undeveloped land primarily owned by the Maui Research and Technology Park (Dega 2008). The survey reports good ground visibility and some contemporary landscape, and resulted in the identification of SIHP Sites 50-50-10-06239, -06240, -06241, -06587, and -06588. Three of the five sites have been interpreted as related to WWII training exercises, one as a boundary wall meant to prevent cattle from approaching the slope of Waipulani Gulch, and another as a Pre-Contact location and direction marker. The survey recommended the informal preservation only of the boundary wall but no further archeological monitoring. No traditional structures, surface architecture or midden/artifact scatters, deposits, or areas thought to potentially yield cultural materials were identified (Dega 2008).

HILL et al. (2010)

In 2010, Cultural Surveys Hawai'i completed an archaeological mitigation program of the beach in Sand Dune deposits [TMK (2)-3-9001:25 and (2)-3-8-004:007]. No traditional cultural deposits were found (Hill et al. 2010).

MEDEIROS et al. (2012), McCURDY AND HAMMATT (2013)

CSH conducted a literature review and field inspection in 2012 for the Kūlanihāko'i Bridge Replacement Project, identifying no other historic features (Medeiros et al. 2012). Following their report, McCurdy and Hammatt did not recommend the preservation of the century old bridge (SIHP Site -07606) (McCurdy and Hammatt 2013).

PERZINSKI AND DEGA (2012)

Perzinski and Dega (2012) conducted archeological inventory survey on a total 427 acres directly *mauka* of the project area [TMK: (2) 2-2-02:16 and 54 por.]. Fifteen archeological sites were documented, among them being five (SIHP Sites -06784, -06785, -06786, -06792 and -07051) associated with Pre-Contact activities. Of these, Site-06792 was dated to c. 1480-1660 C.E., and Site -06786 is a *heiau* dated to c. 1450-1650 C.E. Three sites were recommended for preservation: Sites -06786, -06792 (Pre-Contact workshop) and -07051 (rock art) (Perzinski and Dega 2012).

WASSON AND DEGA (2015)

In 2015, SCS (Wasson and Dega 2015) monitored the highway improvements at the intersection of Ohukai Road and Pi'ilani Highway, including the widening of the intersection, the installation of two short drainage runs, and the installation of traffic signal and street lighting conduits and conductors. No human remains or other historic properties were identified.

PERZINSKI AND DEGA (2017)

In 2017, SCS (Perzinski and Dega 2017) conducted archaeological monitoring during the installation of a waterline lateral, electrical conduit, and building footing at 265 Kenolio Road in Kīhei [TMK: 3-9-015:020 por.]. Monitoring of subsurface excavation yielded negative results: no cultural deposits, human burials or Post-Contact trash deposits were encountered.

LEE AND DEGA (2021)

From August 2018 through January 2019, SCS monitored Lot 1 (previously parcel 105) at Kīhei High School in Kīhei, Maui [TMK: (2) 2-2-002:081] (Lee and Dega 2021). Ground altering activities consisted of clearing the project area through grubbing of rock, soil, and grass debris, as well as crushing and moving the bedrock. No significant cultural materials were newly discovered, although the previously documented SIHP Site 50-50-10-06393 (a mound complex) was predicted to be adversely impacted. Its eight features have been thoroughly documented with photographs, scale plan view maps, and written descriptions, and three of them were manually tested for additional information. Per Shefcheck et al. (2008), no further work is recommended. Although designated eligible under Criterion D for the National Register of Historic Places (NRHP), it is believed that the features have been adequately documented and additional research on the site would not contribute to knowledge of the area or Hawaiian history. In accordance with SHPD accepted archaeological inventory survey report (Perzinski and Dega 2010), Site -06393 has been documented, and no further mitigation is recommended (Lee and Dega 2021).

GARCIA AND DEGA (2022)

In February 2022, SCS conducted a field inspection at Uwapo Road for the Safety Improvements at Various Locations, County of Maui Project [TMK: (2) 3-8-077: 009] (Garcia and Dega 2022). The field inspection consisted of 100% pedestrian survey and did not identify any traditional or historic cultural materials on the surface (Garcia and Dega 2022).

GALLO AND DEGA (IN REVIEW)

Most recently, SCS conducted a literature review and field inspection over a 14.6-acre area along Līloa Drive (Gallo and Dega, in review). No cultural properties were observed, but further monitoring was recommended for future excavations in the vicinity of SIHP Sites 50-50-10-02474 and -02473 identified by Donham (1989) (Gallo and Dega, in review).

METHODS AND RESULTS

FIELD METHODOLOGY

The archaeological field inspection was conducted on April 13, 2022 by SCS archaeologist Ian Bassford, B.A., under the supervision of Michael F. Dega, Ph.D. Field methods consisted of pedestrian surveys of the project area accompanied by digital photographs taken at multiple locations within the project area. Archival research was also conducted at State Historic Preservation Division library in Kapolei to identify historic properties and previous archaeological research in the vicinity of the project area.

LABORATORY METHODOLOGY AND CURATION

As no culturally significant sites or artifacts were identified during this project, laboratory work consisted of cataloging field notes and photographs. All field notes and digital photographs have been curated at the SCS laboratory in Honolulu. All measurements were recorded in the metric system, and true north compass orientation was employed.

RESULTS OF THE FIELD INSPECTION

Full pedestrian survey of the project area did not lead to the identification of any historic properties. In the last 15 years the project area has been used as a construction baseyard and rock crusher site, and thus it contains numerous machines and construction materials stockpiled throughout. Before it was transformed into a baseyard, the land was utilized as a cattle ranch. It is evident that the project area has been subjected to numerous grubbing events as the landscape is fairly level and partially covered by low buffel grass (*Cenchrus ciliaris*) and few *koa haole* (*Leucaena leucocephala*) and *kiawe* trees (American carob, *Prosopis pallida*). Based on the past archaeological work done in the immediately surrounding areas, it is highly unlikely that any subsurface resources are present. Photographs of the project area are included in the Discussion and Summary section below.

DISCUSSION AND SUMMARY

While previous archeological work suggests that agricultural activity and accompanying habitation and settlement occurred both in Pre- and Post-Contact times in the vicinity of the project area, no sign of habitation or Pre-Contact agriculture was found within the project area. It is unlikely that planned ground disturbance on this parcel will adversely affect any historic properties, as none have been identified on the property in the current field inspection or in previous archaeological work in the vicinity. The spread-out nature of settlement in the region does not make it likely that this portion of land contained any permanent habitation. Accordingly, SCS recommends no further archaeological work.

Figure 8: Overview of property from Ohukai road entrance, view to Southwest

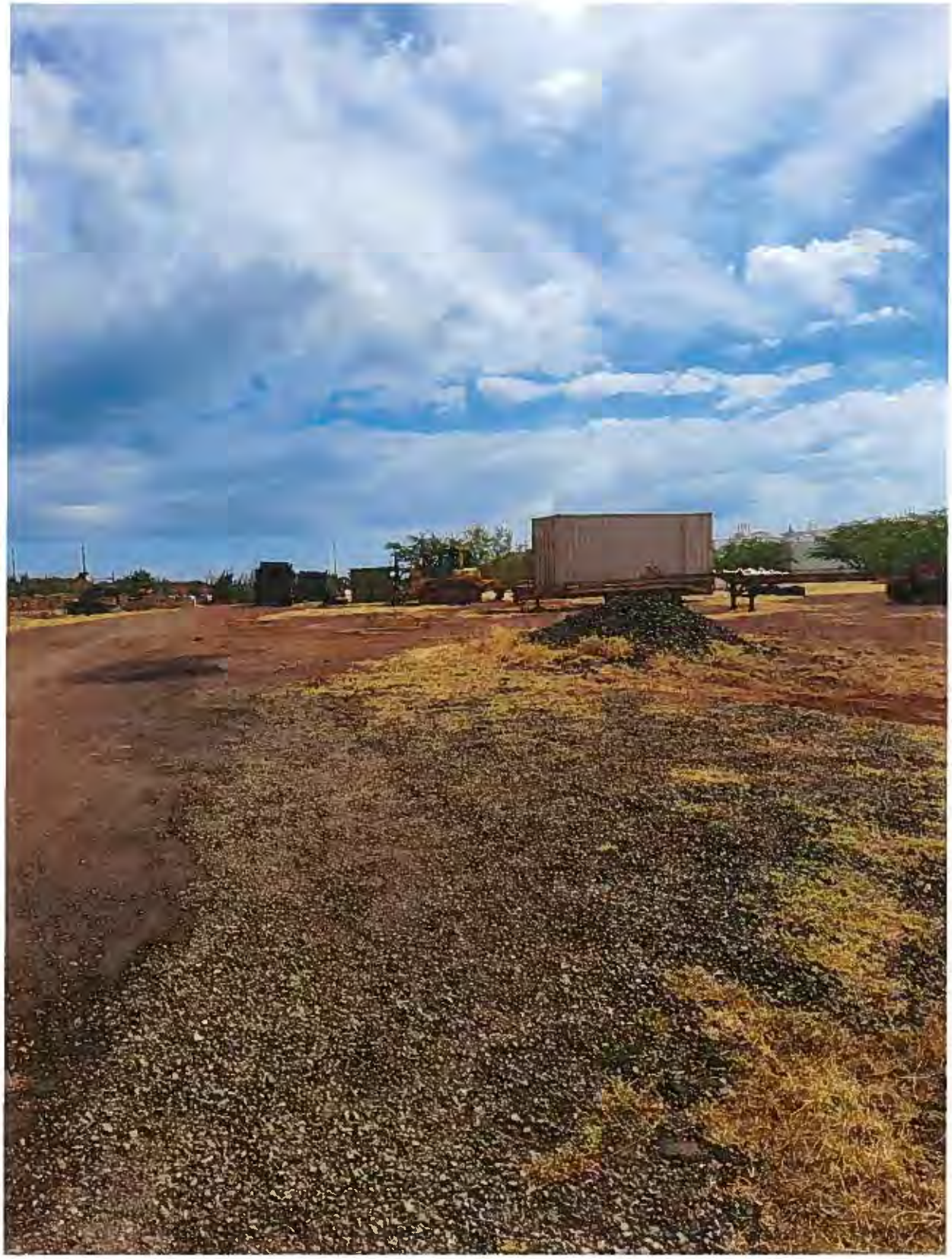


Figure 9: Overview, view to South

Figure 10: Property overview from Ohukai entrance, view to Southeast

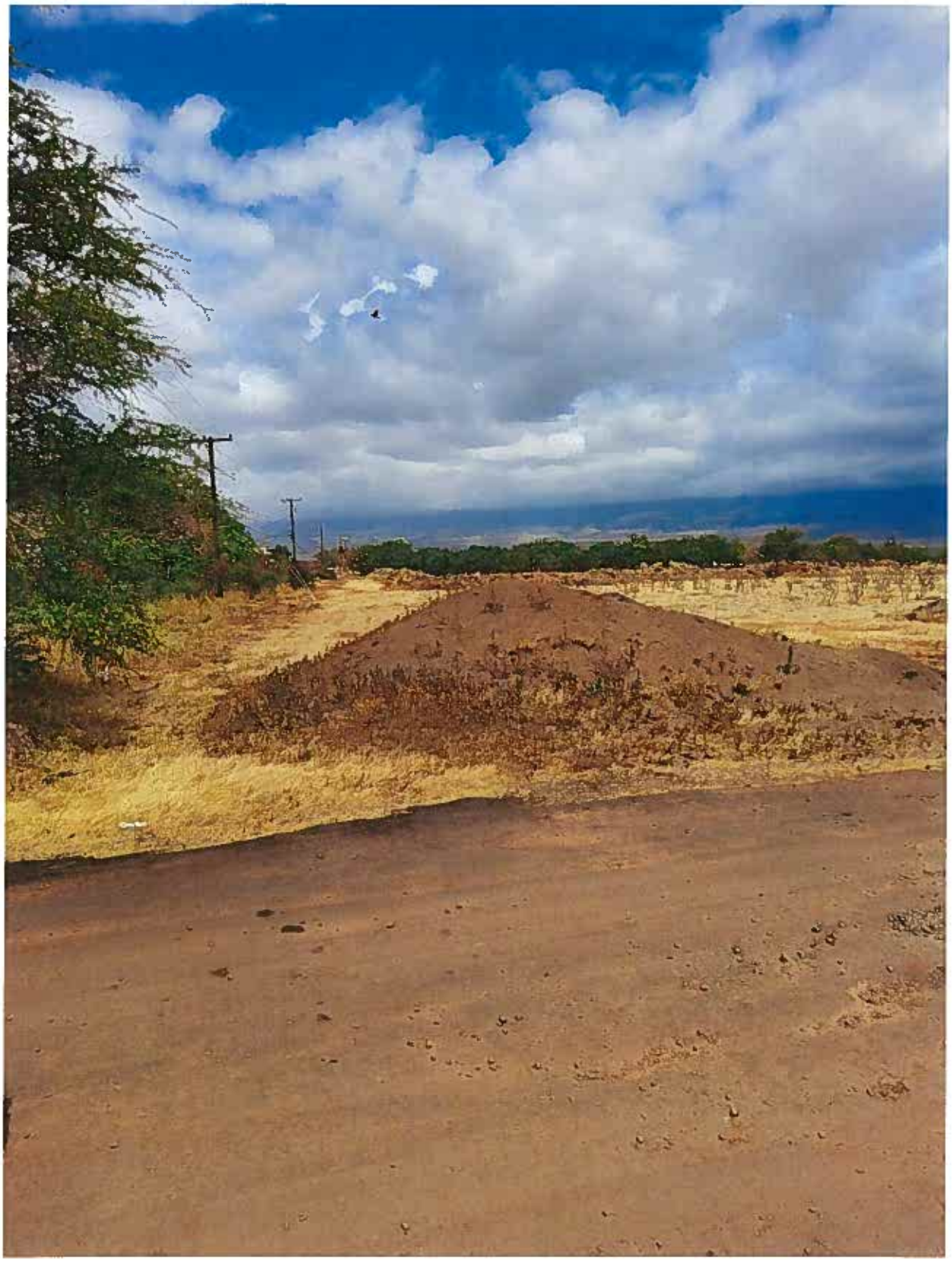


Figure 11: Overview as seen from Ohukai entrance, view to East

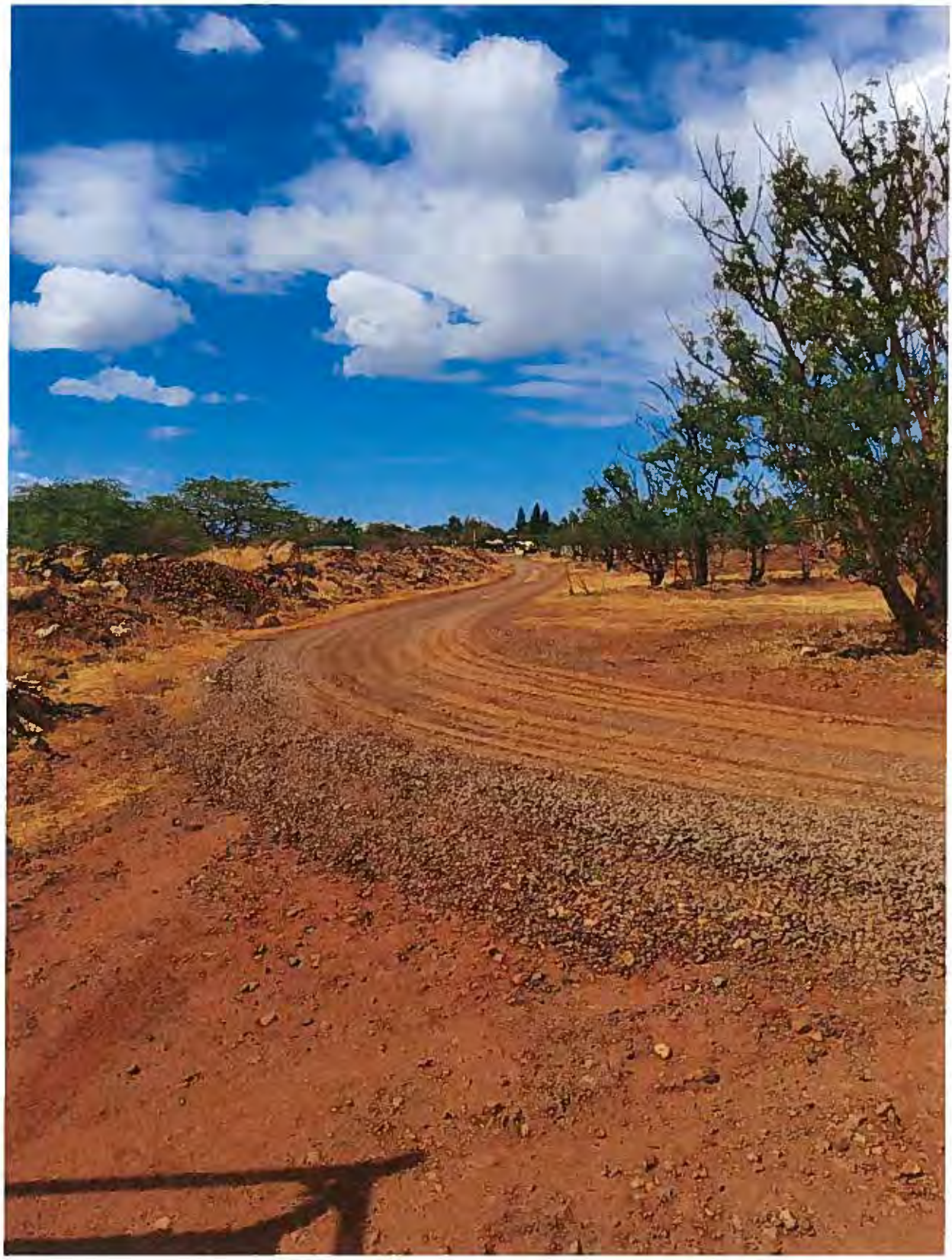


Figure 12: Property interior overview from Southwest property corner, view to North

Figure 13: Overview of property from Southwest corner, view to Northeast

Figure 14: Project area overview from central portion of lot, view to East

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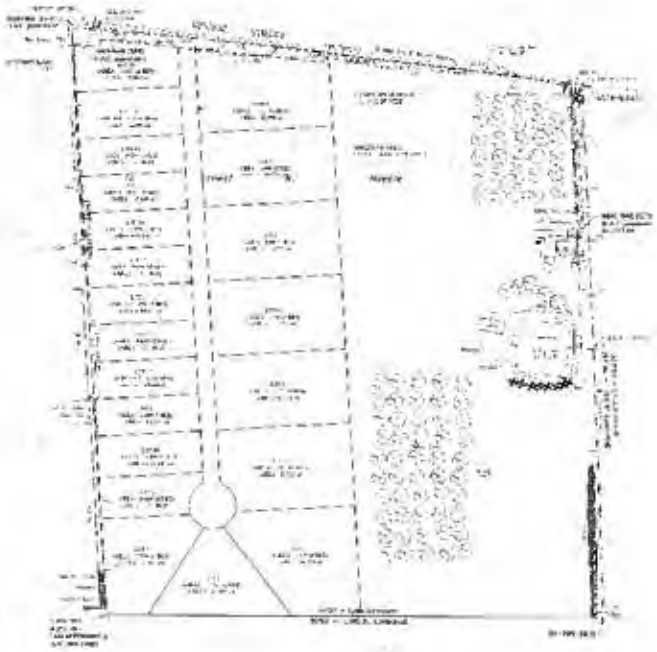
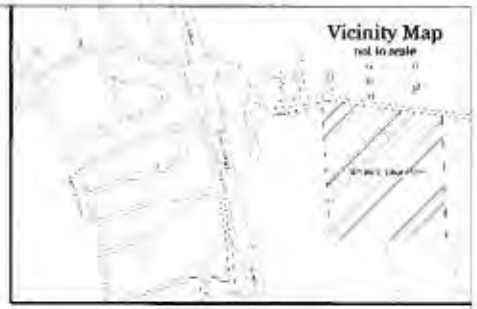
APPENDIX A: CONSTRUCTION PLANS OF THE PROJECT AREA





6.3 - Permit Set of Drawings

CDF Engineering LLC

Site Plan

Mango Estates Affordable Homes
Cultural Impact Assessment

TMK: (2) 3-9-001:034

by
Katherine Kamaʻemaʻe Smith
Historical/Cultural Consultant
Honu Media, LLC

October 9, 2020

Prepared for
Chris and Candy Hayes
454 Ohukai Road
Kīhei, HI 96753

EXHIBIT 19

Mango Estates Affordable Homes Project
Cultural Impact Assessment Study
Table of Contents

I. Images

Figure 1. The subject parcel, (2) 3-9-001:034, is in the center is outlined in yellow. It is a portion of the developers' home and business base yard, outlined in green.

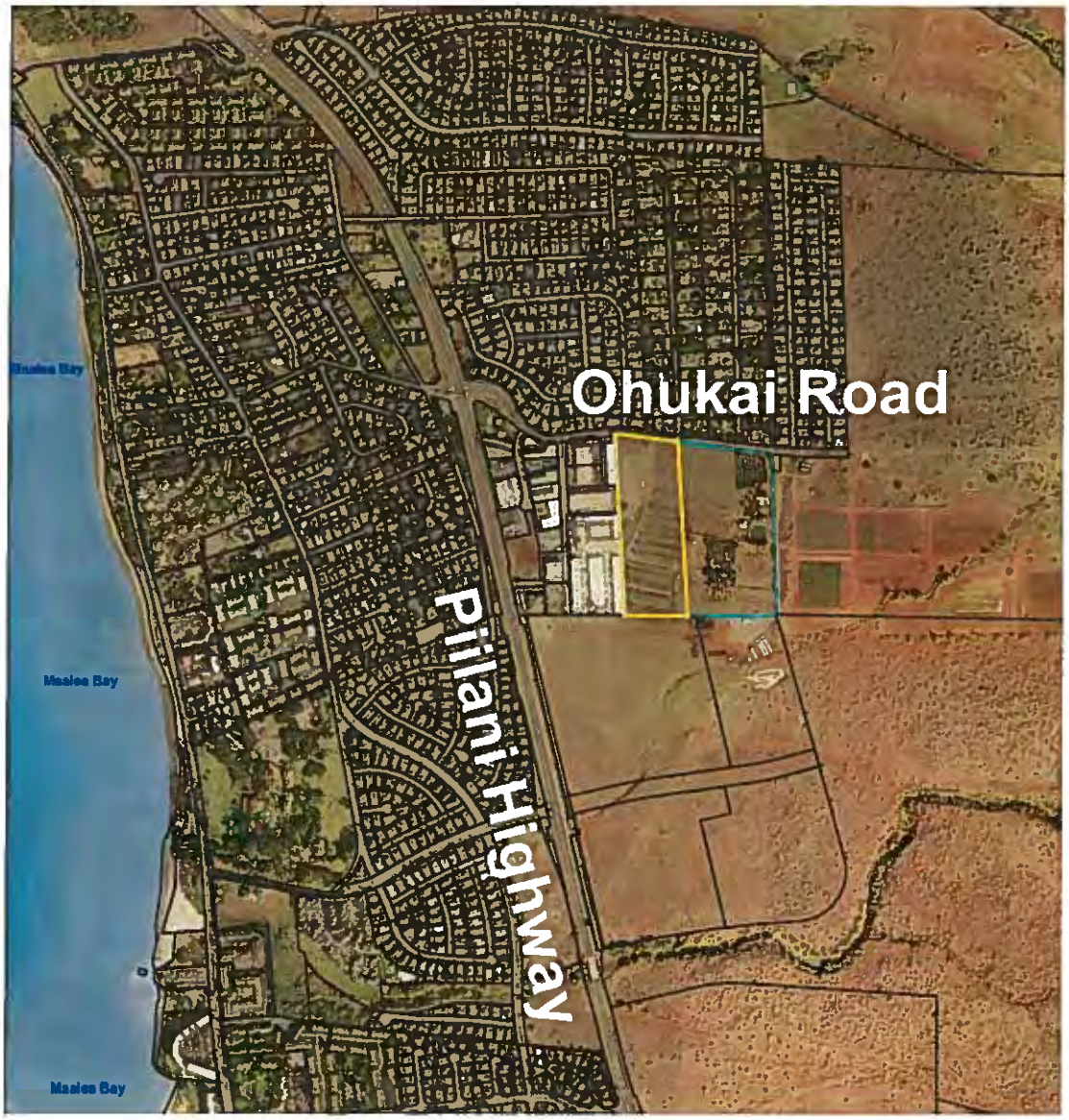


Figure 2. Hawai'i State Map of Ohukai Road area with tsunami zones in red and yellow. This parcel is high ground, not within a flood zone.

Figure 3. Mango Estates location in relationship to Kīhei Commercial Plaza.

Figure 4. Looking Eastward up Ohukai Road. Mango Estates on right.

Figure 5. Looking through the fence: brush, old push piles of boulders beside the old Hashimoto mango orchard, which outside the study parcel, TMK (2) 3-9-001:034

Figure 6. Looking West over top of Kihei Commercial Plaza units. The original parcel is enclosed by chain link, barbed wire and concertina wire at different locations. Access is only through the private drive at 454 Ohukai Road.

Figure 7. From southwest corner, view uphill with Haleakala in distance.

Figure 8. Base yard truck road, gravel and top soil piles.

Figure 9. Commercial trucks and equipment in base yard.

Figure 10. MECO stantions (2) along the southern boundary of study property carrying trunk lines from nearby substation to Kihei Commercial Plaza.

Figure 11. Flora is introduced grasses, uhaloa, kiawe, Koa haole. An occasional castor bean plant was observed on the study property. The ho mango, date palm, hau, and occasional castor bean.

Figure 12. Culverts, large sewer pipes, pallets and equipment are stored in the base yard.

Figure 13. Goats, chickens and cats are the only fauna besides nene geese that visit the manmade pond/reservoir on the top half of the Hayes' property near their house. The view to the southwest looks at Kaho'olawe island.

Figure 14. The pond/reservoir uphill but not on the study parcel, is not habitat for wading birds due to very steep sides, but it attracts mallards and visiting nene geese.

Tall, mature date palms next to the reservoir may be seen from the study property.

Figure 15. On the north side of Ohukai Road and the base yard are subdivided lots with single family homes. A pile of crushed blue rock was observed in the base yard.

II. Introduction: Mango Estates Study Parcel Description and Abstract

The study parcel is in Kula Moku, Waiakoa Ahupua'a in north Kīhei, accessible by a private driveway at 454 'Ohukai Road, on the south side of Ohukai and mauka of Honoapi'ilani Highway.This rectangular, 14.8-acre study area is located immediately East (mauka) of the Kīhei Commercial Plaza, and runs the length of the plaza to a drainage easement in a small gulch, the boundary between Waiakoa and Ka'ono'ulu ahupua'a.

The parcel was subdivided from a larger 28.7-acre parcel, formerly known as Hashimoto Farm, and approximately represents the lower half of that farm. The tomato farm ceased operations about 11 years ago. Since that time, the downhill areas were first leased out by the Hashimoto family as a base yard and then the whole parcel was sold in 2017, and subdivided. The current owners, who are developers for Mango Estates Affordable Housing, run an excavating business and use the study parcel as a base yard for their excavating business. They live on the uphill portion, which has a modern era house, reservoir, water tank, a brackish well, sheds, stone walls, a chicken coop, goats and various rock and boulder push piles.

The study parcel is relatively flat with a maximum elevation of approximately 126 feet ASMI in the northeast upper corner. The land gently slopes down hill and to the south. The northwest corner is approximately 111 feet and lowest point is the southwest corner at about 101 feet ASMI.

A drainage easement running along the parcel's southern boundary marks the boundary between Waiakoa and Ka'ono'ulu in this area. On the Ka'ono'ulu edge of the gulch, and mauka of the study parcel MECO has substation that serves Kīhei Commercial Plaza. Several stantions along the drainage easement. support overhead lines, and other trunk lines are underground. Two of the stantions are on the southern boundary of the study parcel. Immediately mauka of the developer's homestead and the substation are Bayer AG (formerly Monsanto) test fields.

Makai of the study parcel is the Kīhei Commercial Plaza and Pi'ilani Highway. Makai view lines are obscured by the plaza structure and the highway. Northerly view lines are broken by housing developments. A glimpse of the distant West Maui Mountains may be seen over rooftops to the north. Mauka views to the east and southeast show grazing lands on the flanks of Haleakala and the summit as one looks over a land crest that runs north to south along the Eastern boundary of the original parcel. The south end of the study parcel looks out to a distant view of the ocean and the island of Kaho'olawe.

Results of Pedestrian Survey

The fine red clay and rocky soil of this area of Kihei varies in depths from a few inches to a meter. "Blue rock" basalt does not outcrop on the study parcel, and boulders were obviously moved to the edges of cultivated areas. Large areas of this parcel have ample soil that supported 80 years of agriculture, but now mixed with rock gravel.

Several findings indicate that surface soils on this parcel have been graded, tilled and replaced. (See SHPD Letter permitting grading and grubbing in 2018.) No cultural surface features were observed. Bulldozer push piles, recorded agriculture over an extended period, and Hawaiian Kingdom referring to this area as grazing land means that any surface cultural features, if they existed, are unlikely to be uncovered during this project. The piles of gravel and top soil, crushed stone may be from this area or other areas of Maui. From aerial maps from when the farm was in operation, most of the study parcel looks like a tomato farm (see earlier aerials when the farm was operating). The central area was the site of a petroleum spill and soil replacement clean up in the 90s. In spite of these disturbances, some furrows and upright wood poles that were used to support tomato plants are still visible.

Aside from kiawe trees and 'uhaloa, current flora on the study parcel appear to be introduced or alien volunteers: grasses and sedges and koa haole. An occasional castor bean plant was observed.

No fauna were observed on the study parcel. The adjacent homestead has cats, chickens, goats and nene geese in their reservoir/pond. The trees around the pond may be habitat for Hoary Bat. Pu'eo owl are known to forage for rodents in this area, but no in-flight owls were observed, and ground nesting is probably not safe due to predators. No insects were observed on the site visit. Birds observed were common mina, dove, francolin and round eye.

The land is surprisingly quiet for its proximity to the commercial plaza and bypass highway. This calm may be due to decreased traffic during the pandemic, or the plaza building itself is acting as a sound barrier. Had it not been for the electrical wires on the southern boundary, the southwestern views toward kaho'olawe and Kealakahiki as well as Cloud Warriors at Red Hill on Haleakala and the Mākena cloud would be inspiring. Morning and evening views of Haleakalā, though distant, encompass nearly 120 degrees with a full view of ke kuamauna. At the southern end, one is impressed by the connection of sky, mountain and sea. This connection to the universe and the land are the basis for Hawaiian cultural beliefs and can be viewed as a cultural resource.

No previously documented cultural features, or historical objects more than 50 years old were seen on the property under study and no cultural or historical mentions were found in pre-Western contact primary sources, historical primary sources or identified in cultural informant interviews.

No rock alignments or pōhaku o Kāne were observed. No cultural or historical features were noted. -- no glyphs or fitted stone walls were observed; no solitary erect stones. There were no historical stone walls, platforms, water-worn pebbles or coral seen on any part of study parcel.

An adjacent neighborhood on the north side of Ohukai Road between Wainohia and ʻOe Streets is composed of well-maintained single-family dwellings.

III. Cultural Historical Study Methodology

A. Previous Studies and Filings for TMK (2) 3-9-001:034 and Surrounding Properties
On July 2, 2019 a search of DLNR SHPD resources and previously registered Cultural Impact Assessments on this parcel. Subsequently, an archivist at Kapolei SHPD Library was able to provide all the archaeology and cultural reports in their archives.

B. Primary Historical Data
A search of online historical resources and primary source historical literature was conducted, searching for all mentions of the ahupuaʻa and original grantee. Searches were also made on Ulukau and Papakilo Database for histories, moʻolelo, kaʻao, palatal and mentions of this area of Waiakoa and the original grantee in NūpepaʻŌlelo Hawaiʻi. No data was withheld.

C. Solicitation of Cultural Informants
A notice asking for cultural information ran in The Maui News Thursday June 9th and Sunday, June 13. June 9, 2020 a press release was issued to online and print outlets, local Hawaiian churches, cultural associations, practitioners and educators seeking lineal descendants of previous grantees of this land or cultural descendants of Waiakoa with knowledge of cultural practices on this parcel in the past or presently. An online research was conducted to locate descendants of the original Waiakoa Homesteads Land Commission Grant 11400, of which this study parcel is a part.

D. Search of Hawaiian Kingdom Land Records
Since this ahupuaʻa was assigned as Crown Land at the Mahele and Government Land after 1893 and sold to homesteaders in 1918, a search was conducted for grant 11400 palapala.

E. Review of Settlement Patterns in Kula Moku
A review of habitation sites on Maui was studied to determine the probability of pre-Western contact kauhale in this area of Kīhei, based on its location and land features of the property. Works of authors Ziegler, Kirsch, Handy & Handy and Sterling were researched.

F. Maps of the Parcel and Ahupuaʻa
Historical maps, historical aerial photos and current Google map satellite photos of the property were studied. All place names researched for possible mentions in Hawaiian literature, and links to persons and events associated with the study parcel or its ahupuaʻa were researched.

G. Review of Periodical Literature
A search of Hawaiian and WWII era newspaper stories was undertaken to find legends, folktales, reports and or historical fragments related to the ahupua'a of Waiakoa lowlands or North Kīhei lowlands that had not been previously reported or recorded in archeological reconnaissance, reports, cultural impact assessment, environmental assessment or environmental impact assessment reports for the study area.

H. Site Visit
A Site visit was conducted on the morning of May 7, 2020 to inspect the study parcel and experience its orientation, sites, sounds and view lines. A pedestrian survey was conducted for surface cultural landforms, features and artifacts, and natural resources useful for Hawaiian cultural practices.

IV. History of Parcel (2) 3-9-001:034

This rectangular study parcel is located in Waiakoa Ahupua'a, which is now called Kīhei, a seaside community about 12 miles from Wailuku within the Wailuku Moku, District of Maui.

The Hawaiian Islands were colonized by Polynesians via Sāmoa, and the Marquesas between 800 and 1100 AD. The Tahitians brought their systems of governance and religion later in the 10th century, and the ahupua'a system of land managing ali'i controlled lands for the duration of the Hawaiian Kingdom. In the reign of Kamehameha III lands of Hawaii were divided among the crown, the ali'i and maka'āinana farmers. This event is known as the Great Mahele.

According to Ka Buke Mahele, Waiakoa Ahupua'a was awarded to Ali'i Nui Charles Lunalilo in 1848 and soon returned to Kauikeaouli Kamehameha III as Crown Lands.

Waiakoa is the northernmost of five ahupua'a in the moku of Kula that run from mountain to sea. The boundary of Waiakoa Ahupua'a on the coast of Mā'alaea Bay begins at Kalaepōhaku, with Pūlehu Ahupua'a to the north. It runs to Kaipukaihina, the northern boundary of Ka'ono'ulu Ahupua'a. Waiakoa has two gulches: Waiakoa Gulch, which is north of the study parcel, and Kūlanihāko'i gulch further south. Pre-Western contact and post contact settlement patterns for this area were a few scattered coastal fishing kauhale separated from the main population of agricultural villages at elevations above 2,000 feet.

An 'ōlelo no'eau implies that Kūlanihāko'i was once a water source for farmers, who used dams to control the flow of and collect rain run-off. Kūlanihāko'i is the name of a mythical pond in the sky. Catchment was one of several strategies used by Kīhei farmers to take advantage of intermittent storms.

Kīhei has always been an arid, leeward land, without running streams, where people had to dig wells or rely on spring water to grow subsistence food crops. However, its abundant fishing grounds drew permanent and seasonal fishermen. Four Kīhei fishponds developed robust aquaculture. The Akina family have been fishing this area for many generations, and at the turn of the twentieth century were also commercializing the thick kiawe forests on the Kīhei coast, for "algaroba" beans used as cattle feed, and wood to make charcoal. Licenses to work the Kiawe forests were prized and the wood was sold to other islands.

> Kula unahi pika pika he'e. *Kula people, scalers of the suckers on the tentacles of octopus.*
>
> O Kula I ka hoe hewa. *Kula of ignorant canoe paddlers.*

Old Kihei fishers who lived at the shore referred to uplanders as poor paddlers and people so foolish they scraped off the suckers from octopus. But most of the Kula population was upcountry and for some 50 years following the Mahele, upland Waiakoa was farmed by Chinese farmers. After the overthrow of Lili'uokalani in 1893 and formation of the Territory of Hawai'i, Crown Lands became "Government Lands."

Waiakoa government land was not surveyed until 1889. By that time E.D. Baldwin had difficulty finding the old kuleana boundaries:

Sept. 1888. I first made a quick rough survey of Omaopio and then went to Waiakoa. Mr. David
Eldridge kindly took us up to his house at Waiakoa, located about a mile above the Government Road.

During 1888, Kula was an open country, there were no fences to stop you from riding in any
direction that you wished, even as far as Makawao or Wailuku. There were none of the owners of Waiakoa kuleanas living above the Government Road and only a few makai of said road.

David Eldridge lived about a mile above the Government Road on Gov't land and a few native paniolas of Cornwell lived above the road. Waiakoa had been over run with cattle for years and about a mile above the Government road. Chinamen had planted Irish potatoes and corn for years so that the location of the numerous kuleana had been almost obliterated.

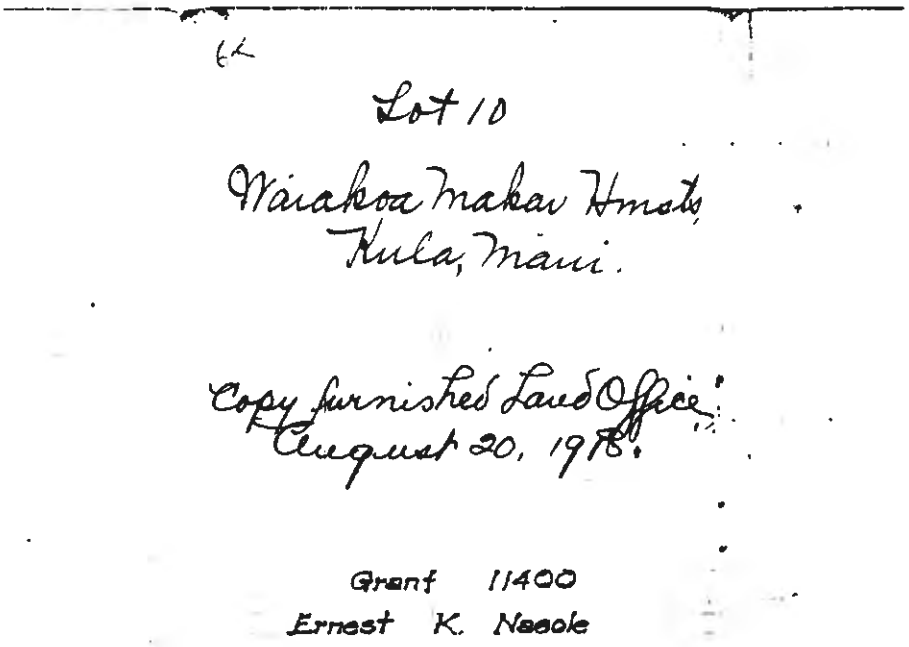
We found only one old kamaaaina left on mauka Waiakoa, old "Puanau," who knew approximately the .location of the kuleanas. But he piled many of them on top of each other and s we had to lay out the Government portion of the land in Homesteads, there was only one thing to do and that was to give each kuleana its location, bathed as close as necessary, as the land seemed all of equal value; this we did and they have ever since stayed where we located same.

June 1889. Left for Maui to appraise Waiakoa Lots and investigate dispute over land near Piiholo Idill between Brewer and Hocking.
June 27, rode over to Waiakoa and met Mr. Chillingworth and Mr. Bailey at John Howlands, from there we rode over to Waiakoa taking a general look at the land, and appraised it from 3, 5 to 6 dollars an acre.

E.D. Baldwin, Personal Recollections of My Life. MS SC Sterling 9.I.239,258. Extracted from "Sites of Maui," by Elspeth Sterling.

No kuleana were claimed on the study parcel, and in general, Waiakoa kuleana were almost entirely in the uplands, above 2700 feet elevation, an area of prized, rich agricultural and grazing lands. Lands in the lowlands behind the beach were not suitable for year-round cultivation, and were primarily used by Cornwell, Haleakala and Ulupalakua ranchers for winter (rainy season) cattle grazing. The land was also suitable for grazing horses and for piggeries.

This study property was a portion of Territory of Hawai'i Waiakoa Homesteads Land Grant 11400, Makai Lot # 10, granted in 1918 to Ernest K. Nae'ole, a Hawaiian Resident of Honolulu and Maui. Other than the Maui County Plat Map, Only citations and handwritten archive locations for the original grant were available.


Lot 10
Waiakoa Makai Hmsts
Kula, Maui.

Copy furnished Land Office
August 20, 1918.

Grant 11400
Ernest K. Naeole

Little is written about Ernest K. Nae'ole, but Maui lineal descendants Clifford and Iokepa Nae'ole descend from this Paniolo. Other parts of Ernest's lands become part of Ka'ono'ulu Ranch. In Ka Nūpepa Kū'oko'a, No.15 April 1901 the committee of Ka Aha Kula Sabati o Kalaupapa, Moloka'i mourned the passing of Mrs. E. K. Nae'ole, who worked with the orphans at Kalaupapa. They honored her with this kanikau:

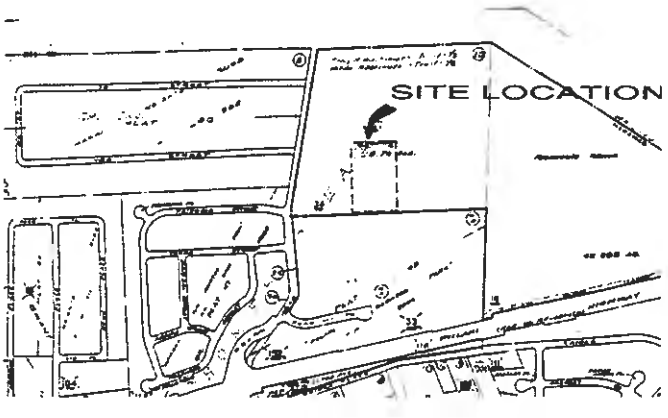
A'ole wahi pa'a ma'ane'i	*There is no permanence here at all*
Nolaila ko ke ao 'uwe	*therefore our season of mourning;*
A'ole na'e ka mea maika'i	*Nevertheless, the good person*
He maha kona maluna 'ē	*finds his repose elsewhere above*
Ma kēlā ao, ma kēia ao	*now and forever*

Another article September 22,1916 article lists an A.K. Nae'ole as "māka'i" police officer in Kalihi, Honolulu. These persons were related to Ernest.

An interview with Harry Hashimoto, whose father and mother started Hashimoto Farm, revealed that the farm was started during WWII. Maui County Tax Assessor records that the Hashimoto family purchased the land in 1970, so it is likely that the Hashimoto were leasing the land from Nae'ole for about 30 years. The farm produced mangoes at a time when all mangoes sold on Maui came from local orchards. Now commercial mangos come from the mainland and international growers. Hashimoto were famous for their tomatoes. Another arm of the family grow persimmons in Kula.

This January 1965 aerial map of the subject property (located by the lower section of Ohukai Road and the reservoir/pond on the Hashimoto farm) illustrates the long history of agricultural use of this property. Plainly see is the "government road" that divided Mauka homesteads from Makai homesteads in Waiakoa. In Kihei, Piilani Highway traces the old government road.

The family also leased the lower flats of the land as base yard area. One tenant, Selland Construction Company had a petroleum leak in 1994. The spill was examined by authorities years later.and the Hashimoto family engaged a professional clean-up and testing of the soils after remediation. Petroleum-contaminated soils located in the midsection of the the study property, were excavated, removed and replaced with fresh soils to meet EPA guidelines for clean-up. Besides commercial farming, major excavation and soil replacement occurred in the center of the study parcel, according to this map from the clean up report to EPA.



Waiakoa Area ʻŌlelo Noʻeau:

342, page 42 ʻElo'elo ka wai o Kūlanihāko'i." *Drenched by the fresh water of Kūlanihāko'i.*

443, page 54 Hāmama nā punawai of Kūlanihāko'i." *The dams of Kūlanihāko'i are open."*

469, page 56 Hanini ka wai o Kūlanihāko'i." T*he water of Kūlanihāko'i spills out."*

All these sayings refer to a heavy downpour.

744, page 82. "Hele ka ho'i a hiki i Kealia ia napo'o ka lā." This expression might be said of someone who procrastinates, playing on the word, "alia," *to wait. Go now, until (you) reach Kealia at the setting of the sun.*" Kealia pond was the terminus of Waikapū stream, where the flow slowed down nearly to the ocean at Kihei, and stopped.

#1911, page 205 "Kula unahi pikapika he'e."*Kula people, scalers of octopus suckers.* Said in fun of Kula people unaccustomed to life at the coast.

2447 page 267 " ʻO ka wai kai no ia o Ke'anae; ʻo ka ʻō lei ho'owei ʻuala ia o Kula, I*t is the sea pool when at Ke'anae; it is the digging of sweet potatoes when in Kula.*

2274 page 270 "O Kula i ka hoe hewa," *Kula of the ignorant canoe paddler.*

Waiakoa Land, Climate and Agriculture From Mahele to 20th Century

Between 1848 and 1853, over 20 maka'āinana submitted Waiakoa kuleana land claims to the Board of Land Commissioners and Quiet Claims. The awards were often for several 'āpana and acreage ranged from under one to almost 30 acres. All but two kuleana were in the uplands, accessible by the old Kula Road.

Most crown lands had rich natural or cultural resources and good mauka lands were the jewel of Waiakoa. From 1820 to 1860, Waiakoa farmers primarily produced Irish potatoes and 'uala sweet potatoes for provisioning whalers at Lahaina Roads and for export to California during the potato blight of 1850. Mahele testimony also documents a koa farm, a green banana grower, and a bird/feather harvesting range in upcountry Waiakoa. One kuleana next to Waiakoa creek maintained five lo'i kalo.

The population of Waiakoa lowlands in the mid 1850s was small, and most of Maui's some 20 thousand inhabitants lived in other population centers: Wailuku, Waihe'e, Waikapū, Wai'ehu and Lāhainā, near running streams. When Chinese families immigrated to Maui in the 1850s, some settled in Kula and began farming.

In 1889, Waiakoa ahupua'a into large Mauka homestead lots, and smaller Beach homestead lots, priced at between 3 and 6 dollars per acre. Homesteads were placed for sale in 1891.

Kīhei: Dry Leeward Coast

Coastal Kīhei is described by all historians as a dry place without annually running streams. The coastal population were by and large fishermen.The annual rainfall in Kīhei is from 10-20 inches, with higher rainfalls during La Nina events, about every five years. Soils are dry clay, often shallow and covering fine-grained basalt flows that locals call "blue rock." Early settlers subsisted on fresh water from artesian springs at places where Haleakala leeward lava tubes broke the surface. Kīhei water lens is close to the surface, so even shallow wells were productive. However, gravity irrigation used at higher elevations was not always possible, so "kihapai" farming style, in small patches next to water sources was often utilized.

Behind the kiawe forest at the beach was dry land forest which greened up in the winter wet season, and as early as the 1840s, was used as spring pasture for upland cattle. Above 2,000 feet elevation, Waiakoa village in upper Kula had a running stream, and ample rainfall year-round. Farmers cultivated vegetables and sugar cane.

Deforestation of Waiakoa and Kula uplands began with Hawaiian Kingdom harvesting ʻiliahi sandalwood for sale to Canton in the early 1800s. After the end of sandalwood trade and the the later bust of whaling trade in the 1850s, Cornwell, Haleakalā and ʻUlupalakua forests were doomed to be converted to grasslands for grazing cattle. In other ahupuaʻa trees were removed for sugar cane and pineapple. Remaining native forest hardwoods were felled in the early 1860s. Cattle trampled what was left.

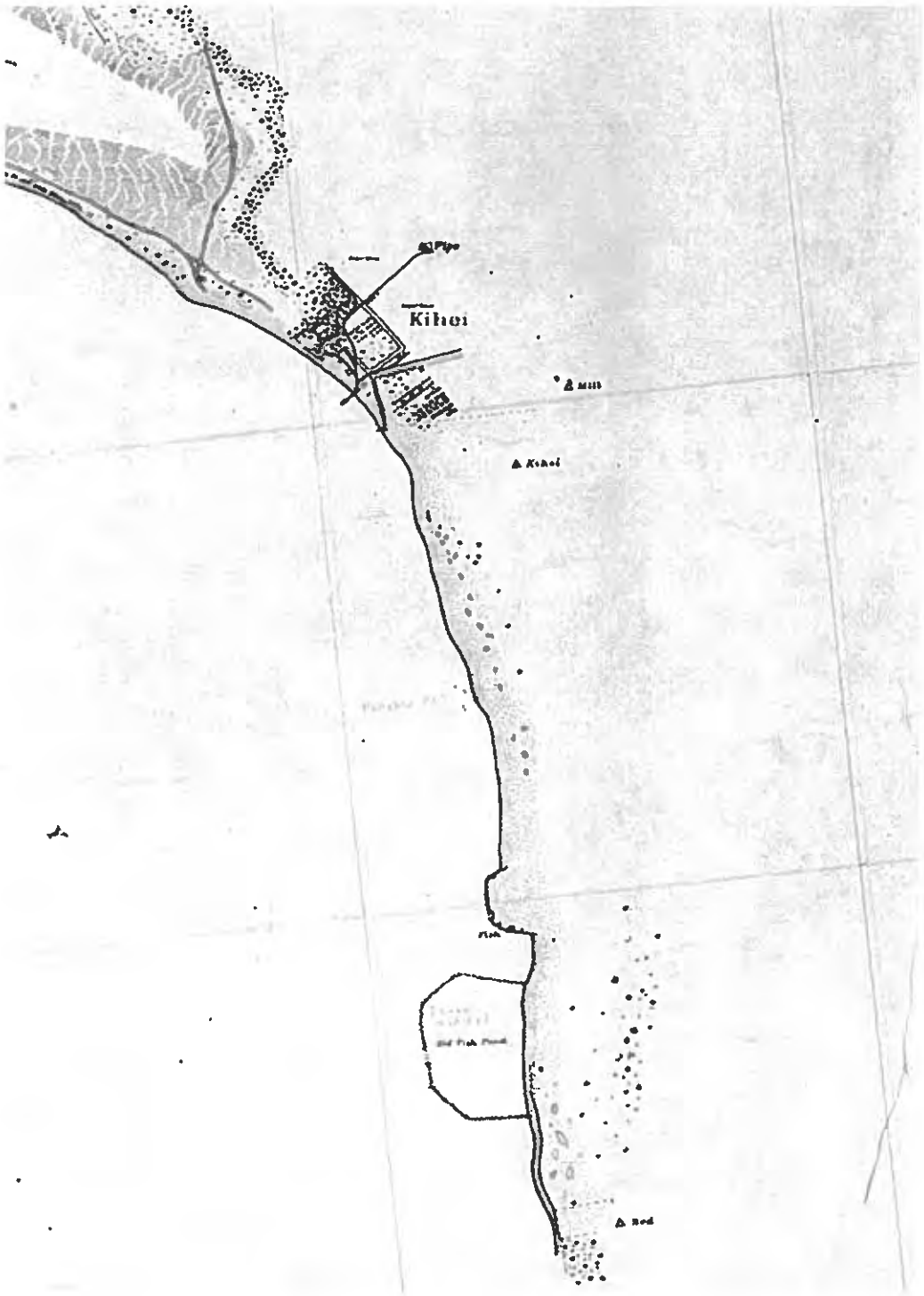
The effect of deforestation reduced forest drip contribution to ground water, and pushed the condensation line further east. Kīhei lowlands became a drier place, and increased erosion moved red soil downhill, filling in the loko of Laʻie and ancient fishponds of South Kīhei. The place name "Kalepolepo" commemorates red dirt carried down to the coastlands.

Kīhei in Hawaiian Literature

There are scant mentions of Waiakoa in the old mele and early accounts of the Sandwich Isles. Early archaeological studies and maps located "villages" at Kalepolepo, and further south at Keawakapu and Honuaʻula, with no other permanent habitation along the intervening coastline. A 2006 archaeological report for this area states, "The density of human occupation was probably never great in this area of Maui."

Kīheipūkoʻa is mentioned in Fornander's account at the end of King Kekaulike's life, when he was pursued by Hawaiʻi's famous war leader, Alapaʻi. Hearing of the death of the great Moʻi and that his body was being taken to ʻIao, Alapaʻi "refrained from hostilities" and met with the new young king, his nephew Kamehamehanui and the highest chiefs of his family: Kalola, Kahekili, and Kekuʻiapoiwanui at Kīheipūkoʻa, "and peace was concluded" between Hawaiʻi and Maui. A pūkoʻa is a coral head or reef that breaks the waves before the beach – a preferred landing in for all kinds of canoes. Paddling is still a preferred Hawaiian cultural practice in South Maui.

In "Ruling Chiefs of Hawaii," Samuel M. Kamakau also mentions that Kalaniopuʻu, a ruling chief of Hawaiʻi Island landed in Kīhei in 1752, and Kamehameha landed canoes at Kealia and Māʻalaea as part of his 1790 invasion of Maui.



This 1900 map of Mā'alaea Bay indicates the fishpond at La'ie, Henry P. Baldwin's small Kīhei Sugar Plantation, and the Kīhei Wharf which he built, and no village or house sites in the vicinity of the study parcel. The plantation only lasted nine years. There was also a siding of narrow gauge rail to transport harvests to Pioneer Mill for processing. The "pipe" may be water from the Lowrie Ditch.

The importance of water to the development of Waiakoa and all of South Maui cannot be overstated. This quote from Gail Bartholomew Ainsworth in "Maui Remembers" shows how small a population the land supported in 1930:

> "During the first decades of the twentieth century, there was little to attract people to South Maui, other than the commercial harvest of kiwi and good fishing, and by 1930, only 350 people made Kīhei their home. The government offered 11 beach lots for sale in 1932 with the hope of spurring development of a desirable residential district, but few paid notice and only 6 were sold."

Before the Maui County water line from Central Maui was installed in the 1960s, the population of Kīhei was about 1,500, all living on well water. Today, it is home to over 31 thousand residents.

The Great Mahele Kuleana Claims in Waiakoa Ahupua'a

			Nā Mahele 'Āina Waiakoa Ahupua' Imina			
No.	LCA/RP Helu	Name	'Ili name	NT/ NR	Name	Land Use/ Succession Notes
1	7971F/2205	Nāuliuli	Kalihi& Mo'oinui	NT	Kawelo	
2	8462B	Kailianu	Kalihi and Mo'onui & Pakaka	NT	Kawelo	received from parents i ka wā Kamehameha I; plenty kihapai 'uala maoli, kekahi hale,ho'ikahi mala mai'a
2	/6252	Ka'ilianu				no data
3	10145	Meana'ole	Kalihi & Mo'onui	NT	Kawelo	
4	10883/7892	Pahu'āina	Kalihi	NT	Haua'e and Kawa'alau	5 lo'i, mala sweet potatoes and Irish potatoes; total 8 Waiakoa kuleana;Father received land from Konohiki Kānepaina in 1836;
5	8655/2202	Kaho'opākī	Waiakoa Mauka	NT	Kawelo	Received from the ancestors of his parents. Grows green banans and 'uala haole
6	8654/2204	Kapa'ole	Kalihi & Mo'onui	NT	Keawe	Land by the road in Waiakoa. 1 apana in mo'onui, 4 in Pakaka, 6 in Kalihi
7	4750/2206	Maia	Mo'onui	NR		South of Alaloa; Parents of wife lived here and farmed multiple kihapai
7	7971B/2205	Maia	Mo'onui & Kalihi	NR		Mo'onui from time of Kamehameha; Land between Nāuliuli and Makahiki. Kalihi from Hewa'awa in 1847.
8	10483/7883	Naha		NT	Kawelo	
8	10482	Naha	Kalihi	NT	Kawelo	1 kahua ahle on kahawai in Kalihi; 8 apana in Kalihi; 2 planted with Irish potatoes. Reference to plikia and ho'oponopono regarding money.
9	10144/5396	Makahiki	Kalihi & Pakaka	NT	Kapa'ole	14 kuleana, 3 of which are in Waiakoa, received in the time of Kamehameha I.
				NR		Makahiki was Konohiki of Kealahou II

10	8642/7884	Kawa'alau	Waiakoa Mauka	NR		7 kihapai sweet potato, 2 kihapai foreign potato
				NT	Ka'ilianu	1 flat house lot and hale in Waiakoa village. Kuleana conferred by Luna Haone on behalf of the King.
11	7971C	Nāmakahano-hano	Mo'onui & Kalihi	NT	Kama'ilio	
12	8653/4752	Kehapai	Kalihi	NT	Kama'ilio	1 apnan of 'ulall
13	7952	Kawelo	Waiakoa Mauka	NR		land in the creek of Waiakoa received from Ka'auwai in 1846
13				NT	Ka'ilianu	3 farms in Waiakoa called Ho'omo'ole'a
14	10480	Nāipuala	Kalihi	NR		4 ma;a 'ulal haole "keali'ali'amu"
				NT	Kehapai	Land in Kalihi
15	7952/104480	Ikeiki	Mo'oho'ole'a	NT	Kawelo and Ka'ilianu	
16	2383/5532	Z. Ka'auwai	Waiakoa Mauka	NR		10 Eka of 'uala in Waiakoa, and grows taro in Omapi'o too. Palapala written from Hale Kauila in Honolulu.
17	4794	Nawaiki	?	NR		Received land from Ka'ahu'āina as early as 1776 and 1790
18	5271	Kahullukau'ōpi'o		NR		1 houselot, 1 bird range, 1Irish potato farm
19	5449	Pi'i	Pohaku	NT	Kimakea	the Konohiki for this land is Keamaka Wiwi'ole, I am Konohiki for Kalalhoulll. Pi'i farms haole potato.
20	7125	Kealohaaukai	Waiakoa Mauka	NR		kuleana acreage for kumu la'au koa. He lives in Makawao
21	5271	Kahulukau i 'ōpi'o		NR		many farms of Irish potatoes. In Waiakoa, 1 moku manu, 1 mala 'uala haole

Homestead Land Grants in Waiakoa

In 1911, Act 21 of the Territory of Hawai'i reported to the United States Department of the Interior Office of Indian Affairs on newly approved mauka and beach Waiakoa Homestead lots for sale. A large parcel of Waiakoa mauka homestead land was awarded to Haleakala Ranch, but other land grant recipients also grazed cattle, horses, and pigs. Additional grants were awarded over the next three decades.

The study site is part of land grant 11400, to Ernest K Nae'ole. A Reverend J.M. Nae'ole, in the generation just before Ernest K, served at Po'okela Church in Haiku. Hawaiian practitioner and waterman Iokepa Nae'ole and Ritz-Carlton Kapalua Cultural Director Clifford Nae'ole are descendants of this Maui arm of the Nae'ole family.

A prominent upland Waiakoa landholder was Judge Zorebalela Ka'auwai, born in Kona in 1799 and graduated from Lahainaluna Seminary. He became an assistant to Governor Hoapili on Maui (1824-1840) and later, an assistant judge of the first Supreme Court of the Hawaiian Kingdom. Ka'auwai joined the Land Commission Board in 1848 to assist with kuleana claims, served in the House of Representatives in 1851 and 1854, and served on the Maui 2nd Circuit Court until his death in 1856.

Reverend John Mahele Kukahiko, 1889-1978, was a Waiakoa homesteader.This beloved pastor of the Hawaiian Congregational Church served at Lahuiokalani Kā'anapali, Waiola, Honolua, Olowalu, Keawala'i and Makena Churches. The Plunkett family living in Waiakoa descend from Reverend Kukahiko and still live in Waiakoa. Vernon Kalnikau is a lineal descendant of the Kahoa family homesteaders.

Waiakoa Makai Beach Homestead Lots				
Homesteaders	Lot	Grant	Year	Acreage
G Robinson	1A	11166	1939	
S. Yamamoto	1B	12179	1939	7.55
S. Toshiyuku Yamamoto	1C		1939	
Ahina Apeau	2	10478	1933	28
John Kupakau	3	7209	1918	
Leialoha	4	7108	1918	26.3
L. Kahoa (Kuhoa?)	5	7107	1918	27.3
J. Kukahiko	6	12195	1941	37.74
John E. Ventium	7	11258	1941	34.6
John Y. Chang	8	8841	1918	41
Ernest Kia Nae'ole	9	11400	1914	30
Ernest Kia Nae'ole	10	11400	1918	27.8

Since the 1930s, a large portion of lower Kīhei land above the government road (now Pi'ilani Highway) has been part of Haleakala Ranch(land grant 9325). The ranch was incorporated in 1888 and since that time has used in Kula lowlands only during the winter and early spring, when the grasses bloom in Kīhei. Cattle were moved to lush pastures at higher elevations during the rest of the year. Since the 1990s, Haleakala Ranch is a calving operation, transporting young cattle to the mainland for grazing.

The Cornwell Ranch built the fencing for the Kula Forest Reserve in 1913-14 to reign in wild cattle and allow reforestation of the uplands, which at the time were "of too poor a character for grazing." The fencing ran from Waiakoa to Keōkea. Later, Cornwell Ranch became Ka'ono'ulu Ranch.

Kīhei Fishing Traditions

The southern leeward coast of Maui was a rich fishing area because of the many springs of fresh water off the flanks of Haleakala bringing nutrients to the inshore waters. Cool water encouraged growth of limu and coral reefs. Limu-eating fish flourished, as well as octopus and predator species of fish.

Subsistence fishing and seasonal fishing kapu kept fish populations stable and abundant. Throw net fishing was a late method that increased the amount of fish a single fisher could collect each day (Handy & Pukui 1972 ed. Part 5,p 511), (T.S. Dye & Colleagues Review of Archaeological and Historical Data Concerning Reef Fishing in Hawai'i and American Samoa, 2004.)

Fishing practice in early Hawai'i consisted of traditional gathering shellfish, growing seaweed eating fish in salt ponds, trapping fresh water shrimp and fish, netting school fish and hooking large predator fish. Turtles were also caught and eaten, as evidenced by deposits of turtle bones discovered in nearby Waiohuli lands (Fredericksen & Fredericksen, 1995 Xamantek Researches.) Fishing practice was never to fish more than your family required, Traditional values and practice sustained the family and placed responsibility for the future with all those who gathered resources: farmers, fishers, builders, bird catchers and gatherers.

Kīhei is also famous for he'e (octopus) and net fish: akule, 'ōpelu and other mackerel. Traditional seine net fishing by hukilau and other methods of netting is still carried out in Maui waters by fishing families like the Akinas.

Fishing ko'a in Kīhei were used to offer some of the catch to Ka'ulala'au, the fishing god. These shrines were placed strategically in places with view lines to the sea where fishermen might spot schools of fish and analyze weather patterns. No ko'a were found on the study property. While it may have had a distant view of the ocean before development, it is largely obscured by Kīhei Commercial Plaza.

Hawaiian Beliefs Regarding Ka Honua

Land ownership is a western concept adopted on Pacific Islands in the mid-nineteenth century. The Hawaiian Kingdom and other Polynesian nations under economic stress sought revenues from land sales to foreign planters who wished to commercially cultivate sugar cane. Hawaiian farming traditions and values are still deeply held.

The waters of the god Kāne nourished the land with life giving fresh water and god of the ocean, Kanaloa, nourished and protected resources of the sea. The god Lono was the giver of plant food, a god who brought the sweet potato to Hawai'i and prospered fertility, planting and harvest. Hawaiians experience sky, land, sea and people as one balanced whole. The spiritual and mundane are never separated. Mele trace their heritage back to the interface of land and sky. They are descended from Hāloa, the first taro.

Besides the gods and kalo from whom Hawaiians descend, 'aumakua are other important guardians of some families. The 'aumakua can take animate form, but always interact with and protect family members through prayer and rite. 'Aumakua are connected to a family member through bloodline, and tribute. Their physical forms differ, but common forms are owl or shark.

The importance of artesian springs, waterways, ponds and underground water to survival is expressed in Hawaiian belief as reverence for and tribute to mo'o goddesses like Kihawahine of Maui. Kīhei families depended on spring and well water for survival. Early maps show many loko behind the beaches in addition to the larger loko at La'ie.

Hawaiians know that underground fresh water inside their islands flows from a deep source. Guarding these waters are large supernatural black lizards called mo'o. They inhabit and guard fresh water pools streams and springs. We are reminded of the mo'o

in silhouettes of our mountain ridges as they roll down to the sea. They resemble the profiles of huge mo'o, with heads looking out to sea.

Mo'o connect sky, land, sea and people balanced whole, as they swim through cavernous lava tubes under the islands, appearing in various ponds and watercourses. Hawaiians understand the underwater lava interlocking islands of Maui Nui, the archipelago, and Hawaii to all the islands across the Pacific—and the Mo'o appear wherever there is fresh water.

Kihawahine is a deification of the daughter of Pi'ilani, high chief of Maui in the late 1400s. Kihawahine is noted as a goddess of Kahekili, Kalola and Keōpūolani. When Kamehameha the Great took Keōpūolani as his queen, Kihawahine became his goddess too, along with Kūka'ilimoku, a god of war and other gods. Hawaiian practitioners honor this mo'o today, and Hawaiian practitioner Vernon Kalanikau of Waiakoa recognizes his kuleana for the mo'o protecting the underground waters of Kīhei and La'ie. The voyaging canoe of Maui is named for her: Mo'okiha o Pi'ilani, "Lizard goddess Kiha of Pi'ilani." Governor Hoapili and his Lahaina descendants are the the Maui keepers of Kihawahine in Waine'e.

Place Names in Waiakoa Ahupua'a

PLACE NAMES IN WAIAKOA

NAME	FEATURE	MEANING	
WAIAKOA	AHUPUA'A; GULCH & MAUKA VILLAGE	WATER OF THE WARRIOR	
KULA	MOKU O MAUI	AGRICULTURAL PLAIN	
KEALIA	POND AT MA'AALEA	WAITING; HOLDING BACK	
KĪHEI	SAND SPIT; WHARF	CLOAK; ALEXANDER MAP "KEHIE" MEANS "THE BEAUTY"	
PULEHUNUI	AHUPUA'A; GULCH	BIG BURNING	
KA 'ONO 'ULU	AHUPUA'A; GULCH	THE DELICIOUS BREADFRUIT	
KAIPUKAI HINA	COASTAL SOUTH BOUNDARY OF WAIAKOA	HINA'S MEAT DISH	
PU'U 'ULA'ULA	MAUKA SUMMIT HILL	RED HILL	
PU'U KA HALA	MAUKA HILL	PANDANUS HILL	
MAI POINA 'OE IA'U	BEACH IN WAIAKOA	DON'T FORGET ME	
KA'ULA'ULA	KA'ONU'ULU VILLAGE INLAND	THE REDDENING?	
KALAEPOHAKU	NORTH COASTAL BOUNDARY OF WAIAKOA	ROCK POINT	
PAMUKU	WAIAKOA VILLAGE INLAND	CUT OFF PLACE	
PU'UO KALI	MAUKA HILL	STANDBY HILL	
KULANIHAKO'I	GULCH ABOVE WAIAKOA	NAMED AFTER A MYTHICAL POND IN THE SKY	
KEAHUAIWA	GULCH ABOVE WAIAKOA & MAUKA VILLAGE	THE GATHERING OF FRIGATE BIRDS	

Previous Cultural /Environmental Studies of Waiakoa Area

Note: Although Kīhei coastal area has long beaches and lots of sandy soil, burials have been reported in a few distinct places. Some 50 burials were reported off South Kihei Road near Maui Lu. The historical record does not reveal any battles or raids at Kīhei during the one hundred years of civil wars before 1795. It was a landing site for Kalanikuapu'u of Hawai'i when he attacked Kahekili in 1752.

Battles created large burial sites or scattered bones. By contrast, family burials are carefully cared for in Hawaiian cultural practice. For many years the only reported single burial in North Kīhei area was at Villages, Phase 1. Another burial was unearthed in construction of a subdivision on Pakalana Street, and many shallow graves have been reported and preserved at several locations downhill near the beach.

LISTING

1. An Archaeological Inventory Survey for On- and Off-Site Improvements Associated with the Proposed Piilani Promenade Project, and Updated Recommendations for Sites Identified in a 1994 Archaeological Inventory Survey, Ka'ono'ulu Ahupua'a, Wailuku and Makawao Districts, Island of Maui (on-SiteTMK (2) 3-9-001: 16,169-174, and off-Site TMK (2) 2-2-002: 016,077, and 082, (2) 3-9-001: 148, (2) 3-9-048: 122) , Prepared by Xamanek Researches, LLC, Pukalani, Maui, Erik M. Fredericksen, 26 August, 2015. This study found over 20 stone and earth surface sites that included a habitation site and a temporary habitation site as well as agricultural features and complexes. Historical land use was grazing, which allowed these features to be preserved. See Appendix

2. An elegant history of the Hawaiian people and their practices may be found in the cultural impact assessment for Maui Research and technology Park Master Plan Update, prepared by Hana Pono, LLC for Maui R&T Partners, LLC, Kīhei Maui in 2006.

3. Important information on the flora and fauna of this area is contained in the environmental Assessment of the NOS Kīhei Facility Project Final Report, October 5, 2001, from the Department of Commerce Oceanic and Atmospheric Administration National Ocean Service, National Marine Sanctuary Program.

4. Draft EIS for Kīhei High School, State of Hawai'i Department of Education Facilities Development branch, prepared by Group 70, December 2011. See Appendix

5. Draft Environmental Assessment for the proposed Kenolio Apartments 100% Affordable Rental Project, TMK (2) 3-9-01: 157&158, May 2014. Prepared by Pacific West Communities, for Chris Hart and Partners, Inc.

6. Preservation Plan for Site 50-50-10-2512 of the Pi'ilani I and II Kīhei Community Park Project, Kīhei, Keōkea Ahupua'a, Makawao District, Island of Maui, Hawai'i, TMK 2-2-02;42 by Michael Dega, Ph.D. October 2005.

7. Pantaleo, Jeffrey. "An Archaeological Inventory Survey of a proposed Residential Subdivision, Wailuku District, Maui Island, TMK 3-9-02: 116,150, 151," Archaeological Services Hawai'i, LLC, Wailuku, 2003.

8. Conley-Kapoi, Andree-Michelle, MS An Archaeological Inventory Survey of 0.99 Acres for the Proposed Subdivision of Lot 1 of the David P Ting Subdivision into Lots 1-A,1-B,1-C, 1-D, 1-E, and 1-F, Waiakoa Ahupua'a, Wailuku District, Maui Island, Hawai'i; TMK 920 3-9-024:30, November, 2015.

9. Fortini, Bill, BA and Dega, Michael F, Ph.D., Archaeological Inventory Survey of 15.6 Acres in Kīhei Town, Waiakoa Ahupua'a, Kula District, Maui Island, Hawai'i, TMK (2) 3-9-35:1 and (2) 3-9-35:2; June 2002.

Heiau Sites recorded for Waikoa Area

A site in the Recreational Area off Welakahao Road has recently been interpreted as a ceremonial platform and site. Kīhei fishing ko'a have along coast are also identified.

Winslow Walker visited Maui in the 1930s to inventory all the cultural sites still visible. His papers on on file at the Maui Historical Society archives. His work was reviewed and compiled in 1998 by Elspeth P Sterling and published by Bishop Museum Press as "Sites of Maui." Three of five Kīhei heiau are listed:

1. Walker site 219 is "located a ¼ mile below the main road, beyond the fork and on the edge of the gulch." The fork in Waiakoa creek gulch is in the mauka homesteads. 31 x 40 feet; low walls trampled down by cattle; inside the small end, a 5-foot circle of stones. No name or data

2. Walker site 220 is "on the north side of the branch road leading up to the main road, about a mile away. An open platform 36 x 45 feet, facing north with a view to the ocean. No name or data.

3. Pu'u Maile Heiau mentioned in writings by Solomon Peleioholani, the last genealogist of the past age, in "Ka Na'i Aupuni" in an article by Joseph Mokuohai Poepoe, "Kamehameha I: The Conqueror of Hawai'i." "Location and data unknown. Pu'u Maile is the name of a cinder cone in Haleakalā crater, roughly where the ahupua'a of Kula converge, but this name has never been assigned to any earthwork remains."

Thrum lists two more in the *Thrum's Hawai'i Annual for 1890*:

> Kalihi Heiau was at Kō'ie'ie, and Kealalipoa was in back of the Kīhei Mormon Church, but was destroyed.

Kīhei in World War II

During World War II, from 1943 through 1945, Maui was the rest and retraining encampment for 17,000 members of the 4th Marine Division, and many more Army, Navy and Naval Air Command personnel. Kihei beaches and Mā'alaea Harbor were sites for advanced amphibious attack training before troops were deployed to reclaim central Pacific islands taken by the Japanese Imperial Army: Saipan, Tinian and Iwo Jima.

Armaments were installed to simulate enemy defense. (personal communications, Roy Earle, 4th Marine Division 2017). This picture shows Kīhei residents watching military training operations through barbed wire. The study site was not reported as a WWII training site, nor was it part of the entrenchment fortifications built to defend the Island of Maui or train WWII American forces.

Kīhei was also the location of an Underwater Demolition Training Command at Kama'ole Beach. This unit became the Navy "Frogmen" of the 1950s and modern Navy SEALS. Because WWII training facilities, encampments, airfields, maneuvers and embattlements were top secret, very little information about them survived. However, Aerials from that era show significant numbers of buildings and roads from Kama'ole to Kealia, that were no longer there in the 1960s.

Naval Air Station Pu'unene was just north of the study parcel, which was in the landing approach from the south. The facility was a training site for over 3,000 Navy carrier pilots. When air craft carriers came to Hawai'i, their planes flew to NAS Pu'unene and Kahului fields. While their carrier proceeded to Pearl Harbor, pilots trained in the airspace above Maui. Informants on Maui during WWII report that the Navy was also testing new technologies on Maui — drones and early rotorcraft.

VI. Oral Interviews

1. **Mr. Harry Hashimoto**
Harry H. Hashimoto of Kula is a Maintenance Project Manager for Bayer AG and owned the Hashimoto Farm with his siblings. His parents, Tony and Hildegard Hashimoto operated the farm from the 1940s until 2011.

"We grew tomatoes, watermelon, cucumbers, zucchini, oranges, grapefruit and mangoes. At one time Maui farmers were supplying produce to the whole state, We supplied O'ahu too. In Kihei we could grow tomatoes year round. In Kula, they cannot grow them in the winter months.

"My dad told me that it was grazing land when he bought it from an old Hawaiian man during WWII. My dad actually drew up in Kula. My grandfather John Hashimoto and his brother were both on Maui. I remember growing up when Kīhei was a small community. Then it started to grow in the 60s. In those days, if you went to the beach and found another family already on the beach, you would go to another beach that was empty! We had one store, Suda's Store that is now a 7-11. The Kahului side of the building was the Kīhei Post Office. Across from the wharf was the old Kīhei School and the fire station. Mauna Ventura was the Postmaster and she lived in the first house beside the church.

"Waiakoa Stream is further north from the farm —up by where they are building the new High School. On Pi'ilani Highway, there is a concrete marker indicating where the road crosses the stream. Down by the low road, there is a little dip in the road and a culvert where the Waiakoa stream empties into the ocean.

"There were no cultural artifacts or what you call cultural resources on that farm when we had it. We didn't even have no stone walls around the gardens. Keeping the birds under control was my job. All kinds of birds came to eat in the garden, so I had to apply for a DLNR permit to harvest the birds and protect the crops. Francolins, and pheasants caused the most trouble, and wild turkeys only came when the date palms were fruiting. You see, we were on the edge of very large open lands. To the East were Haleakala Ranch lands, and to the South were Ka'ono'ulu Rand lands.

1. **Mr. Teruo Ozai of Kahului**, Age 93. Mr Ozai used to grow mangoes less than a mile south of the Hashimoto Farms, on Kaiola. He grew up in Kahului, and lives in Maha'olu 'Ekahi.

Ozai:
I lived my whole life in Kahului. I went to Kahului School and graduated from Baldwin High School in 1945, you know. I worked for Pu'unene Mill as a machinist. When I started working, I walked to the mill from Kahului. They had one train that went to the docks and back and forth to the mill. I rode that train too.

In 1950 or close to that I bought a piece of land in Kīhei. You know it was a ling time ago and I planted a mango orchard. I didn"t live there, I just went down there with my brother and we took care of the trees.

Do you remember another mango farmer over on Ohukai Road?

Ozai:
I don't know. There was a lot of farming in Kīhei in those days.
Do you remember the Hashimoto Family?

Ozai:
Yeh, yeh, yeh I remember that farm. Tomatoes. They grew tomatoes.

So they were growing back in the early 50s?

Ozai:
Yeh their farm was big. Bigger than mine. And I think they had a well. I had to bring in water you know. Later I irrigated. I sold my mangoes in Wailuku. No more mango business now, you know. But it was good then.

Do you know anything else about that land?

Ozai:
Nah. It was a nice farm, you know. But I didn't live there, I just went down to work in the orchard.

2. **Teo Angel and Larry Rojas, Retired Contractors**
Teo Angel grew up on Moloka'i after coming to Hawai'i from the Philippines at age 11. He moved to Kīhei in the 70s, when the only road was South Kīhei Road, and there were no traffic lights. He is retired from a 45-year construction and excavation business in the Kīhei area.

Larry Rojas has lived in Kihei most of his life and recalls the Hashimoto property during WWII.

Teo:
"I was in excavation. I was a macadam guy. We put down layer after layer. Some for the airport runways too. Layer on layer makes 'em strong. Many projects. I worked on many projects ever since Kīhei was small farms. I remember mostly tomato farms and I remember Hashimoto guys.

"I never remember any Hawaiian stuff on that land. I never did any excavation up there. All I remember is that it was there when I came to Kīhei and was going for a long time until the old man died. I think they had a well up there. What are they doing now?

"I have my friend Larry [Rochas] with me and he says the Hashimoto guys go way back to WWII. Larry said one day he was up by Hashimoto place and scared the devil out of him — a chopper came up over the hill behind the farm. It was before we ever know about helicopters. He said it was such a weird sight. It shocked him and he will never forget it.

"But about Hawaiian cultural stuff, you have to talk to the Hawaiians about that. I'm just a macadam guy."

3. **Vernon Kalanikau, Po'o o Kula Makai** Hawaiian cultural advisor for the Kula Makai District, formerly with the Council of 'Aha, Moku Maui Inc. Vernon's ancestors go back at least four generations in Ka'ono'ulu and perhaps six. He also has connection to Kalepolepo village. His family name is Waiwai'olekalanikau and is related to the Kahoa and Kanoho family lines. Kahoa was one of the original homesteaders of Waiakoa. As a practitioner, Vernon has a family and cultural kuleana regarding Kihawahine, Mo'o goddess of Maui.

"With this parcel up there — the Ohukai road parcel with the Mango trees, just above the Self Storage place? Do I have mana'o on that? As kids we stole mangos! — not the tomatoes.

"Up Ohukai was called Kīhei Heights. If you lived up there in the 70s it was like living in Wailea. Very elite. We kids ran our bikes up there and loved eating the figs in season, star fruit, and mountain apples. Kids. Nothing cultural.

"The Monsanto fields are right behind the Hashimoto property and the MECO Substation. And there are cultural findings on the Promenade property right next door.

"I don't have much to say about that land. There's not that much soil up there, but down the hill, there is more. Just have to be careful because soil runs and off and things get exposed. You just have to be careful for iwi and monitor if you move any soil.

"Back in the day, there were not much people in Kihei. My mom was the health nurse at the school and she also worked at the old Suda Store building down on South Kihei Road, because next door was our post office. She and another woman sorted all the mail from Kīhei to Makena and delivered the mail.

"I think you should talk to the Plunkett family. They are related to the Kukahiko family and have been there a long time. One of their family babysat me when I was little. I will go up to the house and let them know that you need to talk to them."

4. **Florence and John Plunkett, Waiakoa Residents**
'I talked with my husband John about what we could tell you about the Hashimoto Farm. We are a Hawaiian family and our house is on Kukahiko land. My husband comes down from the original settler, John Kukahiko. Our house was a plantation house in Waikapu, and we brought it over to this site on Kaiola street in 1959. My father-in-law could not get over how Kihei grew. He could have never imagined that Kihei desert land would become so populated.

"Our tutu spoke Hawaiian all the time and told us satires —shared their wisdom. I loved to listen to them and so did my children. But now that they are gone, we are the last ones to hear the kūpuna tell about the old ways. We are the last to experience that. For me it's sad, because we can only tell their stories. My mother-in-law, Kalani Ku'ulei Plunkett passed away in 2008. She was the family genealogist and we had some very big family reunions to keep contact with all our cousins —the gatherings were huge! Ku'ulei would go down to a place near St Theresa's church to collect lipoa. She would collect hinahina plants to make some kind of medicinal treatment too.

"His father was John Kukahiko Plunkett and her grandfather was the Kukahiko clan from Mākena. Of course they are related to Uncle Earl Kukahiko and Auntie Barbara who were in Lāhainā. My husband and his brothers were at Uncle Earl's celebration of life at Waiola Church.

"We don't know any Hawaiian culture or practices on that Hashimoto land. We went up there after the fires last year, and there was a lot of damage up Ohukai Road. That's about it."

5. **Alan DeCoite, WWII Aircraft Expert**
"At the beginning of the war, the Territory of Hawai'i turned over lands to the Navy and DoW. The Naval Air Station Pu'unene was to be the training field, but it was not big enough, so later they built NAS Kahului. But during the war, both fields were in full use.

—An informant told me that in 1945 he saw a helicopter come over the hill in Kīhei as it took off - probably from Pu'unene field. Is that possible?

"Yes, The Navy were using Sikorsky "dragonflies" in WWII, but only for rescues off carriers. They could not fly very far, and only held two men. They could land anywhere, so they were used on carriers. They could do some reconnaissance, but mainly they served downed pilots or pilots going overboard. Hard to stop or turn a carrier around. PBY seaplanes were also used for pilot rescues.

"I can give you a story right now and it's something you will never read about. I stumbled on it by accident. When I got home from the Marines, I was full of life and vinegar, and I wanted to learn how to fly a helicopter. I started out with lessons in a Cessna 150 at Kahului and eventually I got myself a helicopter. In 1979, there were three helicopters on Maui: Tommy Helpin had one in Olinda, the Magnum PI helicopter

was parked down at Wailea, and mine was parked in my sister's front yard in Makawao. I was zooming and I was herding cattle and they called me crazy but as I was flying I was spotting airplane wreckage all around the island. Then I began to going out to pick them up. One day I was down Kīhei way - that was the approach to Pu'unene field and I saw a wreck in a kiawe tree on Haleakalā Ranch. I asked about It and the old cowboys knew about it —yea yea yea that old plane bus' up. It was an early corsair, an O2U from the 1920s, that had a disabled propeller. I went and got it and now it is in the aviation museum in Pensacola Florida.

"Well, in that same area I stumbled upon a little airplane that that couldn't carry a pilot — but is was a remote-controlled airplane made of stainless steel with all the controls on board, and stuck in a kiawe tree. It was a major operation to get the airplane down, and when I called the Naval Historic Center in Washington DC, they told me I had stumbled upon a top secret "drone project" and the Navy was flying drones out of NAS Pu'unene to the lava fields in Mākena. This was from the middle to the end of WWII. That's in the museum now too.

"So I have no doubt that Mr. Rochas saw what he saw, because the Navy was testing all kinds of innovations during the war."

VII. Confidential Information Withheld/Conflicts of information

No confidential information regarding the history or cultural resources or significance of the study parcel has been withheld from this report and no conflicts of information concerning this research about this property have been observed.

VIII. Conclusion and Effects on Plan

No cultural items, artifacts, earthworks, sites or record of any cultural practice was uncovered in this study. No natural resource valuable for the practice of Hawaiian culture was found or reported. No historical stories, events or artifacts significant to the history of Kīhei were found or known to be registered with the State of Hawai'i or any national heritage organization. No historical archaeological reports for this parcel or for Kihei Commercial Plaza were found in online and SHPD Archives.

A recent study of property just south of the study parcel found stone surface features that were associated with pre-Western contact agriculture and habitation. Historical land use as winter grazing allowed these artifacts to be preserved. In contrast, the study parcel has been continuously commercially tilled, graded grubbed and regraded for eight decades.

Hawaii State Historic Preservation Department has no record of any historic cultural properties having been identified on the Hashimoto Farm parcel. They approved grading and grubbing and crushing of rock piles for 11.404 acres in June, 2018 with the proviso that should any human remains, cultural deposits, artifacts, sand deposits, or

sink holes be identified during the project, that work would cease immediately, the find protected and SHPD be notified. None were observed.

Previous property owners of Hashimoto Farm and lineal descendants of the first grantee, Ernest K. Nae'ole were identified and contacted. Two local Kīhei historians were solicited: Vernon Kalanikau, Po'o 'Aha for Kula Kai Moku (the district to which Waiakoa Ahupua'a belongs), and Kimokeo Kapahulehua, who led the renovation of Kō'ie'ie Fishpond and launch of Mo'okiha o Pi'ilani voyaging canoe. Other Maui residents familiar with the last 50 year of history with this parcel were identified and interviewed. Two career excavators intimately familiar with Kihei soils and locations of previous cultural artifacts since the 1970s were interviewed. Their knowledge includes construction projects completed before current preservation regulations were in place. My request for informants via The Maui News, Maui Now and personal press release went to all sectors of the Maui community. Their oral histories of the informants are preserved in this public document. None were able to identify cultural features, practices or resources connected to the study parcel.

No informant testified to the presence of any ceremonial or cultural practices or presence of burials or ceremonial sites connected to this parcel.

Due to the absence of cultural and historical artifacts and resources on the study property, I conclude that there is no effect on plan. I recommend archeological on-site monitoring when earth is moved, graded or excavated in the course of the building project, and adherence to the practices that SHPD recommends.

I further recommend that should names be selected for parts of the development, that the developers consider selecting "preservation" names of Hawaiian historical place names for Waiakoa or names of the old families who loved and worked this land.

IX. Individuals and Groups Contacted

State Historic Preservation Department, Land and Natural Resources Division Kapolei
Archivist, Stacy K. Naipo
Leonard Kimokeo Kapahulehua, President, 'Ao'ao o nā Loko I'a o Maui, Ko'ie'ie Fishpond Foundation
A&B Sugar Museum Archives
Wilson Angel, member, Kīhei Canoe Club
Jill Engledow, Historian and author of *Haleakalā: A History of the Maui Mountain*
Vernon Kalanikau, Po'o o Kula MaKai District.
Rev. John Tomoso, Good Shepherd Episcopal Church, Wailuku
Teo Angel, retired
Larry Rochas, retired
Alan DeCoite, WWII Aviation Historian
Iokepa Nae'ole, Waterman and Activities Director, Ka'anapali Beach Hotel

Clifford Nae'ole, Cultural Director, Ritz-Carlton Kapalua
Florence Plunkett, Waiakoa resident
Harry Hashimoto, Descendant of Tony and Hildagard Hashimoto
Letter Requesting Cultural Information sent to 19 Native Hawaiians on Maui.
Maui Native Hawaiian Chamber of Commerce

X. Resources and Bibliography

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XI. Appendix Listing: Documents provided as a folder on Dropbox.

1. Maui CountyPlat Map of Grant 11400 and Study Area
2. Kula Ahupua'a Map 1885 W.D. Alexander
3. Mango Estates Property 2014 Aerial
4. Hashimoto Farm Easement Agreement 1965
5. Lot 10 Waiakoa Title Survey 2016
6. MECO Limited Easement Record 1964
7. Image of MECO Substation adjacent to Developer Homestead
8. Kihei Gateway Plaza
9. Soil Description and Drainage Statement
10. Grading and Grubbing permit letter from SHPD 2018.
11. Surrender of Alii Mahele Land Awards
12. Wife of Rev JM Nae'ole passes 1901
13. Papainoa (nā māka'i o Honolulu) 1916
14. DOH letter re: completed clean-up of 1994 oil spill
15. Auction of Waiakoa Lands 1891 Hawaiian Gazette
16. Cornwell Fencing Forest Reserve in Kula. 1913
17. Algaroba Licenses in Kihei 1917
18. Dates of Colonization of HI - 2014 Study
19. Montessori School SHPD Letter
20. 1944 Us Military Helicopter
21. 1945 Puunene NAS tower and Approach locations
22. Aerial of Puunene NAS Remains
23. Exhibit A Archaeological Survey Piilani Promenade
24. Legal Ads placed in The Maui News
25. Press Release to Maui Cultural Resources and Online Outlets
26. Xamanek Researches, LLC Piilani Promenade Project Archaeology

CDF Engineering LLC
Civil Engineering & Land Surveying Consultants
P.O. Box 2985 Wailuku, HI 96793
Phone: (808) 891-2400 - Fax: (808) 879-2402
www.cdfengineers.com - Lic. No. ABC -33139

PRELIMINARY ENGINEERING REPORT

FOR

OHUKAI LIGHT INDUSTRIAL PARK

Kihei, Maui, Hawaii

T.M.K.: (2) 3-9-001:034

Prepared for:

Christopher Robert Hayes
Candice Cay Hayes
454 Ohukai Road
Kihei, Maui, Hawaii 96753

March 2022

EXHIBIT 20

TABLE OF CONTENTS

1.0 INTRODUCTION

The purpose of this report is to provide information on the existing infrastructure that will be servicing the proposed project. Additionally, this report will evaluate the adequacy of the existing infrastructure and anticipated improvements which may be required for the proposed project.

The project is located on the island of Maui in the town of Kihei (See Exhibit A, Location Map, (Figure 1)). The subject parcel is identified as T.M.K.: (2) 3-9-01:034, and encompasses an area of approximately 28.7 acres. It is also known as Lot 10 of the Waiakoa Makai Homesteads Subdivision, portion of LPGR 11,400. It is bordered by undeveloped land to the east and south; Ohukai Road to the North; and the Kihei Commercial Plaza and Kihei Commercial Condominium to the West (See Exhibit B, Vicinity Map (Figure 2)); and a Maui Electric Substation to the South.

Access to the project site is from Ohukai Road. There is an existing traffic signal at the Pi'ilani Highway – Ohukai Road intersection with a left turn storage lane and a right turn deceleration lane.

The project parcel is currently zoned County Rural with a State Agricultural designation. The current intent of the project is to work with the Maui Island Plan of light industrial zoning and have nine (9) units ranging in size from 0.723-acres to 1.13-acres and twelve (12) units ranging in size of 0.404-acres to 0.505-acres (See Exhibit B, Preliminary Site Plan (Figure 2)). This would allow for a total of twenty-one (21) new units available for purposes of leasing. Including roadway infrastructure (0.938-acres), there is 14.626-acres involved with the project area which leaves 12.074-acres remaining to the current use of agricultural (mango orchard/grazing) with a farm dwelling. Other proposed improvements include paved private roadways, sewer upgrades, and landscaping. Underground domestic water, sewer, and drainage as well as overhead electrical and telecom systems will also be constructed.

2.0 EXISTING INFRASTRUCTURE

2.1 ROADWAYS

The Pi'ilani Highway is located approximately 1,000 feet west of the project site. The highway is a four-lane undivided State Highway which runs in the north-south direction into Kihei town. The speed limit is 40 miles per hour (mph) near the

signalized intersection of Ohukai Road with existing left turn pockets in both directions.

Ohukai Road is a two-lane County collector roadway that works to convey traffic to the Kihei Commercial Center and to the subdivisions of Waiakoa Kai Estates, Makai Heights, and Ohukai. This is a mixed use of commercial, light industrial, residential, and rural zoned properties. The posted speed limit on Ohukai Road is 20 mph.

Access to the project site will be from Ohukai Road. There is adequate sight distance in both directions.

2.2 DRAINAGE

The parcel is trapezoidal shaped with a longer base on the makai side of the property. The gradual slope of the property is from northeast at approximate elevation 140' Mean Sea Level (MSL) to southwest at approximate elevation 100' MSL (See contours on Figure 1). The approximate slope is 2.6%.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soil within the project site is classified as Waiakoa extremely stony silty clay loam (WID2). It is characterized as being extremely stony, eroded soil with a typical profile ending with bedrock at 28-32" in depth. It is classified as "Not Prime Farmland" and a high runoff class (See Appendix A).

Presently, onsite surface runoff sheet flows across the southwestern portion of the parcel in a northeast to southwest direction. A 42" stormdrain pipe is stubbed into the parcel at this location for future development purposes. The stormdrain ties into the County of Maui and State of Hawaii stormwater conveyance system via easement in favor of the parcel.

According to Panel Number 1500030580F of the Flood Insurance Rate Map, dated September 19, 2012, prepared by the United States Federal Emergency Management Agency, the project site is situated in Flood Zone X (See Appendix B). Flood Zone X represents areas outside of the 0.2% annual chance

flood plain.

It is estimated that the present 50-year, 1-hour runoff from the project site is 40.18 cubic feet per second (cfs) and the corresponding runoff volume is 32,949 cubic feet.

2.3 SEWER

Currently, the farm dwelling on the property is served by an existing cesspool for purposes of wastewater disposal. Additionally, there is an 8-inch sewerline stubbed into the property at the southwest corner of the property. The sewerline connects to the County of Maui Wastewater Reclamation Division's collection system which flows into the Kihei Wastewater Reclamation Facility.

2.4 WATER

Domestic water and fire flow for the Ohukai area is serviced from the 2,000,000-gallon Ohukai concrete water tank, which is at base elevation 220 feet MSL. A 16-inch waterline traverses along Ohukai Road from the tank to the Pi'ilani Highway. The waterline is located adjacent to the property along the entire Ohukai Road frontage. There is a 36" concrete pipe that feeds the Ohukai water tank immediately mauka of the property. This concrete pipe is the main water transmission line feeding South Kihei.

The main source for this portion of the water system is from the Wailuku/Waihee region. The property is currently served by a 1-inch irrigation water meter as well as a 5/8" domestic water meter. Additionally, there is a 20-hp motor and water pump installed in a permitted well on the property. The well was historically used to irrigate the mango orchard on the property. There is a 75,000-gallon reservoir on the property that works in conjunction with the well.

2.5 ELECTRIC AND TELECOM

There is an existing electrical easement blanketing the project site. The easement is granted to Maui Electric Company, Ltd, for purposes of future transmission line extensions. An existing electrical distribution system is located

adjacent to the Ohukai Road frontage. Additionally, 3-phase power was brought in to the property to service the well. That power source is still in use.

3.0 PROPOSED INFRASTRUCTURE

3.1 ROADWAYS

Access to the proposed project site will be from Ohukai Road. From Ohukai Road, there will be access to the Pi'ilani Highway to the west.

The interior project streets will have a 35-foot right-of-way and will have 20' of pavement for all weather access. The culdesac will have an edge of pavement of 40 feet and a right-of-way radius of 50 feet. The larger traffic lane and culdesac radius are to accommodate larger truck traffic use in the project area. Ohukai Road, fronting the project site has an existing right-of-way of sixty (60) feet. The roadway is currently improved to County of Maui standards as required by the Department of Public Works. The right-of-way does not currently have sidewalks or driveway aprons that meet current standards.

A Traffic Assessment Report was completed for the project on October 8, 2021 by Traffic Management Consultants (TMC). The conclusion of this report is that "the traffic generated by the proposed 454 Ohukai Base Yard is not expected to significantly affect traffic operations in the study area."

3.2 DRAINAGE

The project's drainage system will be designed to accommodate the change in stormwater flow generated by the development of the entire project site. It is estimated that the post development 50-year, 1-hour runoff from the project site is 62.3 cubic feet per second (cfs) and the corresponding runoff volume is 56,109 cubic feet. A retention basin with a minimum of 23,160 cubic feet (858 cubic yards) of storage will be constructed at the southwest corner of the developed portion of the property to accommodate the increase in runoff generated from the development. Therefore, the project complies with Chapter 4, "Rules for the Design of Storm Drainage Facilities in the County of Maui." Additionally, the Owner intends

to construct an additional retention basin adjacent to Ohukai Road to holdback stormwater that enters the property from the County Right-of-Way. The retention volume is anticipated to be 237 cubic yards (40' wide x 40' long x 4' deep).

3.3 SEWER

Presently, there are no plans to connect to the County of Maui wastewater collection system. Due to the nature of the uses on the property, the Owner has elected to use portable toilets on all lots requiring wastewater collection.

3.4 WATER

The project's water system is comprised of a private fire suppression system that will come from an 8-inch tap off of the water main in Ohukai Road. The tap will feed an 8-inch double check detector assembly (DCDA) and all associated improvements will be to DWS Water System Standards. An 8-inch, C900 PVC waterline will convey water to the development area from the DCDA. The fire flow requirement is 2,000 gpm, with a 2-hour fire fight duration, and fire hydrant spacing of 250 feet.

Domestic water will be provided by the County of Maui 1-inch water meter servicing the property.

3.5 ELECTRICAL AND TELECOM

The proposed electrical and telecom distribution system to the subject project will be installed overhead from the existing overhead facilities located along the adjacent Ohukai Road frontage to the north. Within the project site, the electric and telecom systems will be installed overhead in accordance with utility company rules and regulations. Street lights will be installed along the access road at intervals determined to be necessary by the electrical engineer.

4.0 REFERENCES

A. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.

B. Water System Standards, Department of Water Supply, County of Maui, 2002.

5.0 EXHIBITS

A. LOCATION MAP

B. PRELIMINARY SITE PLAN WITH VICINITY MAP

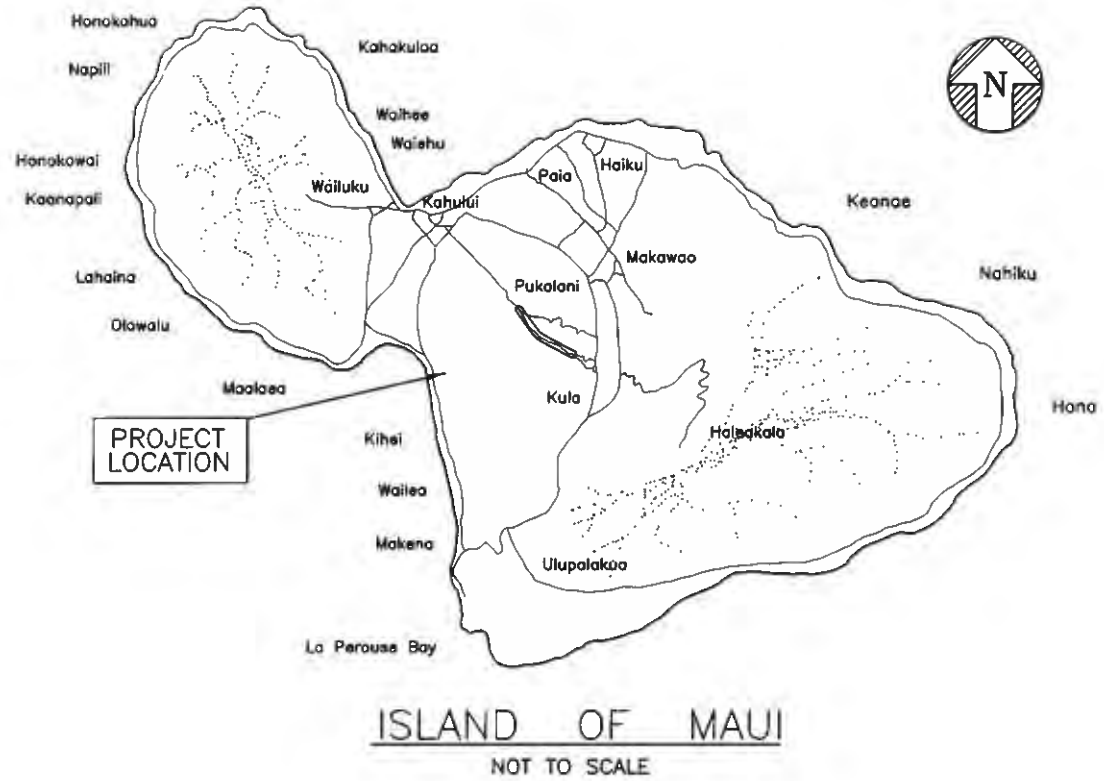
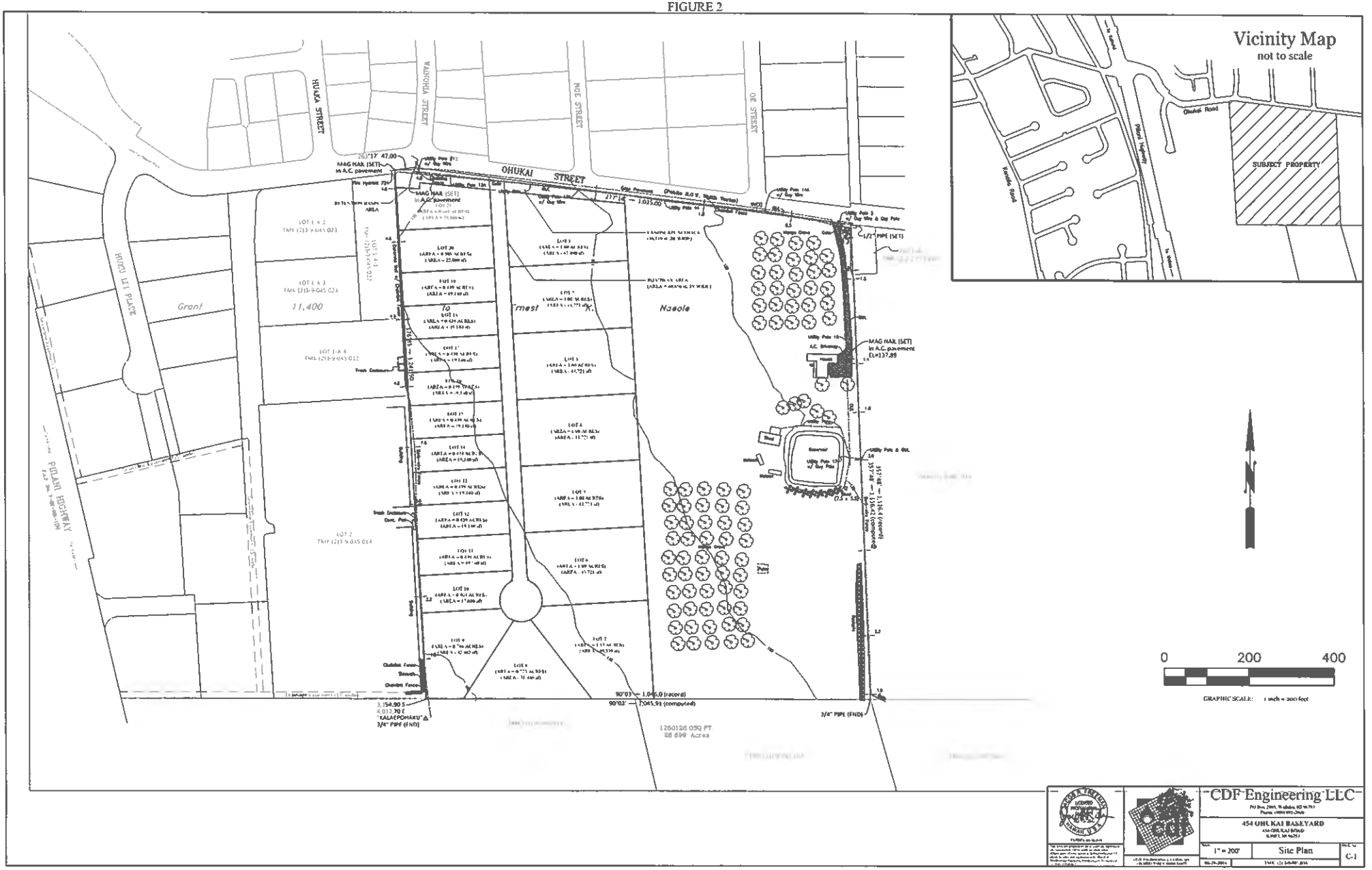

Honokohau
Napili
Kahakuloa
Waihee
Waiehu
Honokowai
Kaanapali
Wailuku
Kahului
Paia
Haiku
Keanae
Makawao
Lahaina
Pukalani
Nahiku
Olowalu
Maalaea
Kula
Hana
PROJECT LOCATION
Kihei
Haleakala
Wailea
Makena
Ulupalakua
La Perouse Bay
N
ISLAND OF MAUI
NOT TO SCALE

FIGURE 1

FIGURE 2


Vicinity Map
not to scale
SUBJECT PROPERTY
OHUKAI STREET
HOOKA STREET
WAIKOKA STREET
NOE STREET
OE STREET
PUULANI HIGHWAY
Grant
Ernest
Naeole
11,400
MAG NAIL (SET) in A.C. pavement
1/2" PIPE (SET)
3/4" PIPE (FND)
"KALAEPOHAKU"
3,154.90 E
4,012.70 E
90°03' — 1,046.0 (record)
90°03' — 1,045.91 (computed)
1260126.030 FT
28.899 Acres
0
200
400
GRAPHIC SCALE: 1 inch = 200 feet
CDF Engineering LLC
454 OHUKAI BASEYARD
1" = 200'
Site Plan
C-1

6.0 APPENDICES

A. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii

B. Flood Insurance Rate Map

C. Preliminary Drainage Report

APPENDIX A

SOIL SURVEY OF ISLANDS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Island of Maui, Hawaii

June 25, 2018

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:2,550 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 4N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Island of Maui, Hawaii
Survey Area Data: Version 15, Oct 3, 2017

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 31, 2009—Feb 14, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
WID2	Waiakoa extremely stony silty clay loam, 3 to 25 percent slopes, eroded	30.4	100.0%
Totals for Area of Interest		**30.4**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Island of Maui, Hawaii

WID2—Waiakoa extremely stony silty clay loam, 3 to 25 percent slopes, eroded

Map Unit Setting

National map unit symbol: hqbx
Elevation: 100 to 1,000 feet
Mean annual precipitation: 12 to 20 inches
Mean annual air temperature: 73 to 75 degrees F
Frost-free period: 365 days
Farmland classification: Not prime farmland

Map Unit Composition

Waiakoa, extremely stony, and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Waiakoa, Extremely Stony

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope, rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Basic igneous rock

Typical profile

H1 - 0 to 1 inches: extremely stony silty clay loam
H2 - 1 to 20 inches: extremely stony silty clay loam
H3 - 20 to 28 inches: stony silty clay loam
H4 - 28 to 32 inches: bedrock

Properties and qualities

Slope: 3 to 25 percent
Percent of area covered with surface fragments: 8.5 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C
Hydric soil rating: No

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APPENDIX B

FLOOD INSURANCE RATE MAP

Flood Hazard Assessment Report

www.hawaiinfip.org

Property Information

COUNTY:	MAUI
TMK NO:	(2) 3-9-001:034
WATERSHED:	HAPAPA; WAIAKOA
PARCEL ADDRESS:	454 OHUKAI RD KIHEI, HI 96753

Notes:

Flood Hazard Information

FIRM INDEX DATE:	NOVEMBER 04, 2015
LETTER OF MAP CHANGE(S):	NONE
FEMA FIRM PANEL:	1500030580F
PANEL EFFECTIVE DATE:	SEPTEMBER 19, 2012

THIS PROPERTY IS WITHIN A TSUNAMI EVACUTION ZONE: NO
FOR MORE INFO, VISIT: http://www.scd.hawaii.gov/

THIS PROPERTY IS WITHIN A DAM EVACUATION ZONE: NO
FOR MORE INFO, VISIT: http://dlnreng.hawaii.gov/dam/

0 400 800 ft

Disclaimer. The Hawaii Department of Land and Natural Resources (DLNR) assumes no responsibility arising from the use, accuracy, completeness, and timeliness of any information contained in this report. Viewers/Users are responsible for verifying the accuracy of the information and agree to indemnify the DLNR, its officers, and employees from any liability which may arise from its use of its data or information.

If this map has been identified as 'PRELIMINARY', please note that it is being provided for informational purposes and is not to be used for flood insurance rating. Contact your county floodplain manager for flood zone determinations to be used for compliance with local floodplain management regulations.

FLOOD HAZARD ASSESSMENT TOOL LAYER LEGEND

(Note: Legend does not correspond with Map)

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD - The 1% annual chance flood (100-year), also know as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. SFHAs include Zone A, AE, AH, AO, V, and VE. The Base Flood Elevation (BFE) is the water surface elevation of the 1% annual chance flood. Mandatory flood insurance purchase applies in these zones:

	Zone A: No BFE determined.
	Zone AE: BFE determined.
	Zone AH: Flood depths of 1 to 3 feet (usually areas of ponding); BFE determined.
	Zone AO: Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined.
	Zone V: Coastal flood zone with velocity hazard (wave action); no BFE determined.
	Zone VE: Coastal flood zone with velocity hazard (wave action); BFE determined.
	Zone AEF: Floodway areas in Zone AE. The floodway is the channel of stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without increasing the BFE.

NON-SPECIAL FLOOD HAZARD AREA - An area in a low-to-moderate risk flood zone. No mandatory flood insurance purchase requirements apply, but coverage is available in participating communities.

	Zone XS (X shaded): Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.
	Zone X: Areas determined to be outside the 0.2% annual chance floodplain.

OTHER FLOOD AREAS

	Zone D: Unstudied areas where flood hazards are undetermined, but flooding is possible. No mandatory flood insurance purchase apply, but coverage is available in participating communities.

APPENDIX C

PRELIMINARY DRAINAGE REPORT

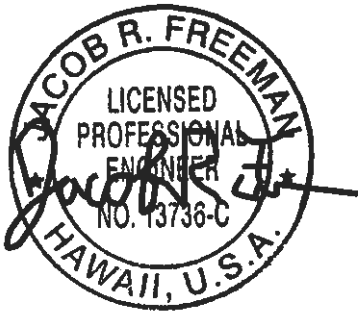
Preliminary Drainage Report

OHUKAI LIGHT INDUSTRIAL

Kihei, Maui, Hawaii
TMK: (2) 3-9-001: 034

Prepared for:

Chris Hayes
454 Ohukai Street
Kihei, Maui, Hawaii



This work was prepared by me
or under my supervision

Date: March 18, 2022

TABLE OF CONTENTS

INTRODUCTION:
The purpose of this report is to evaluate the existing and proposed drainage conditions for the subject project.

PROPOSED PROJECT:
LOCATION:
The project is located on the island of Maui in the town of Kihei (See Exhibit 1). The subject parcel is identified as TMK: (2) 3-9-01:034, and encompasses an area of approximately 28.7 acres. It is also known as Lot 10 of the Waiakoa Makai Homesteads Subdivision, portion of LPGR 11,400. It is bordered by undeveloped land to the east and south; Ohukai Road to the North; and the Kihei Commercial Plaza and Kihei Commercial Condominium to the East (See Vicinity Map, Exhibit 2).

PROJECT DESCRIPTION:
The scope of the project includes; creating 21 "spaces" for light industrial purposes, roadway infrastructure, sewer & electrical upgrades, and landscaping. Each of the developed spaces are assumed to have a total of 5,000 square feet of impervious surface including rooves and driveways. The remaining disturbed area will maintain the drainage characteristic of the existing condition. There are 14.97 acres involved with the light industrial project area which leaves 13.73 acres mauka to remain in the existing condition to the current use of agricultural (mango orchard) with a farm dwelling.

EXISTING CONDITIONS:
ADJACENT LAND USE:
The project is located in Kihei on Ohukai Road. It is bordered by undeveloped land to the east and south; Ohukai Road to the North; and the Kihei Commercial Plaza and Kihei Commercial Condominium to the East

ONSITE CONDITIONS:
The majority of the existing project area is open, non-cultivated, poorly vegetated farm land.

TOPOGRAPHY AND SOIL CONDITIONS:
The lot slopes at approximately 2-3%, and elevations on the site range from approximately 134 feet to 98 feet.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soils within the project site are classified as WID2, Waiakoa Extremely Stony Silty Clay Loam 3-25% slopes. This soil type is characterized as having high runoff, low permeability, and a slight to moderate erosion hazard.

HYDROLOGY:
For drainage areas of 100 acres of less, the Rational Method, as described in the "Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, rules for the design of Storm drainage Facilities in the County of Maui" are used in calculating rainfall runoff. Calculations are based on a 50-year storm event.

Existing runoff volume for the project site is estimated at **16,793 CF**, sheet-flowing in a westerly and southerly direction offsite towards adjacent properties.

The total developed runoff volume is **17,618 CF** (See Appendix C for calculations). The post-development drainage pattern includes directing all surface runoff that comes in contact with impervious surface through the above ground retention systems.

The required storage volume for stormwater quality is **12,575 CF** (See Appendix D for calculations).

PROPOSED DRAINAGE MITIGATION:
The post-development runoff will be conveyed via swales along the roadway into a new underground conveyance system and into the new retention basins located in spaces 9 and 21 respectively. The proposed basins' capacities total **over 19,000 CF**.

CONCLUSION:
The total 50-year 1-hour storm volumes for the existing and proposed conditions across the entire site are Utilizing the SCS method, the existing runoff volume is calculated to be **16,793 CF**. The proposed improvements to the area are expected to generate a surface runoff volume of **17,618 CF**. The proposed minimum total capacity of the proposed above-ground retention basins are **19,000 CF.**

The proposed drainage system will prevent the increase in runoff from adversely affecting the adjacent and downstream properties. Adjacent and downstream properties will not be adversely affected by the proposed project.

APPENDIX:

A. SOIL EROSION CONTROL PLAN

B. SWALE AND RETENTION AREA OPERATIONS AND MAINTANCE PLAN

C. HYDROLOGIC CALCULATIONS

D. STORM WATER QUALITY CALCULATION (TITLE MC 15-111)

APPENDIX A: SOIL EROSION CONTROL PLAN

GENERAL:

The following measure will be taken to control erosion during the construction period.

1. Minimize construction time.
2. Retain existing ground cover as long as possible.
3. Early installation of erosion control measures.
4. Use temporary area sprinklers in non-active areas when ground cover is removed.
5. Provide water for immediate sprinkling, as needed, in active areas.
6. Use temporary erosion control measures where needed.
7. Thoroughly water graded areas at the end of each work day and weekends.
8. Provide temporary irrigation system, and grass all cut and fill slopes within 30 days after grading work is completed.

MINIMUM BMP CHECKLIST FOR SMALL PROJECTS:

1 STABILIZED CONSTRUCTION ENTRANCE

All points of egress and ingress to a site shall be protected with a stabilized construction entrance. 20' x 20' min.

2 STOCKPILES

Stockpiles shall not be located in drainage ways or other areas of concentrated flows. During periods of wet weather, such as the rainy season, stockpiles shall be stabilized. Stockpiles covered in plastic when not in use.

3 DUST CONTROL

Dust control should be applied to reduce dust emissions. Contractor to spray water as necessary.

4 SEDIMENT BARRIERS OR TRAPS

Sediment trapping devices such as fences, trap basins or barriers shall be used down slope of all disturbed areas and around the base of all material stockpiles. Stockpiles to be covered with plastic.

5 INLET PROTECTION

All storm drain inlets on site, and those offsite that may receive runoff from the site shall used an inlet protection device.

6 PERMANENT STABILIZATION

All disturbed areas shall be permanently stabilized prior to removing Erosion and sediment measures. All temporary erosion and sediment Control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed. Trapped sediment and areas of disturbed soil which result from the removal of the temporary measures shall be immediately permanently stabilized. Area to be permanently seeded/mulched within 14 days of final grade except house area which will be formed and slabbed within 14 days.

APPENDIX B: SWALE & RETENTION AREA OPERATIONS AND MAINTENANCE PLAN

Regular maintenance designed to ensure the long-term efficiency of these systems shall include:

1. Periodic removal of the sediment/soil that is deposited in the vegetated swales and/or retention areas and restore to the original dimensions.
2. Overgrown vegetation on the bottom, sides, and benches of the retention areas shall be removed by means of mowing and/or herbicide spraying.
3. Maintain a vigorous growth of vegetation on all swales and bare soil which includes re-seeding, mulching/matting to protect the disturbed area while vegetation becomes established. Overgrown vegetation along swales shall be removed by means of mowing. If possible avoid herbicides in these areas.
4. Do not pave over, drive over or trample grassed swale and retention area.
5. Keep all culverts free flowing and maintain the original construction ridge height and capacity of vegetated berms and swales. The surface of the berms should be compacted to avoid a blow out if a very large storm occurs. Vegetative growth and accumulated silt deposits at all drainage outlets and at all overflow weirs shall be removed and kept clear at all times.
6. Mosquito infestation shall be controlled by removing stagnant water at bottom of retention areas.
7. After the occurrence of a major storm even, visually inspect the retention basins and swales for accumulation of sediment and debris. Immediately remove any obstruction or blockage in culverts and retention areas. Removal of sediment and debris shall be done after it is deemed safe to accomplish remedial work.
8. All access paths to the retention basin shall be maintained and clear of obstructions. Vegetative growth and accumulated silt shall be removed. Loose gravel/dirt within access path shall be compacted to maintain a safe route for vehicles used for the maintenance of the retention basins.
9. Roof drains, swimming pool or spa back flush, foundation drains and drainage from other sources producing intermittent or constant volumes of water should not be piped directly into swale or retention area.
10. In the event that the property is sold, the current owner shall pass this operations and maintenance plan to the new owner.

APPENDIX C:

Hydrologic Calculations – (50-yr 1-hr storm event)
Hydrographs

Date: March 18, 2022

EXISTING CONDITION - DRAIN AREA 1

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 123,194 SF = ***2.83***

II. Determine Pre-Development Runoff:

Pre-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
Runoff Coeff., $C_{undeveloped}$:		0.32

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{0\ SF \times 0.95 + 0\ SF \times 0.25 + 123{,}194\ SF \times 0.32 + 0\ SF \times 0.85}{123{,}194\ SF} = \mathbf{0.32}$$

= ***0.32***

Pre-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		18
Higher Elev. (ft):	124	
Lower Elev. (ft):	106	
Approx. Runoff Length (ft):		576
Average Slope:		3.1%
Time of Concentraion (min.):		16.0

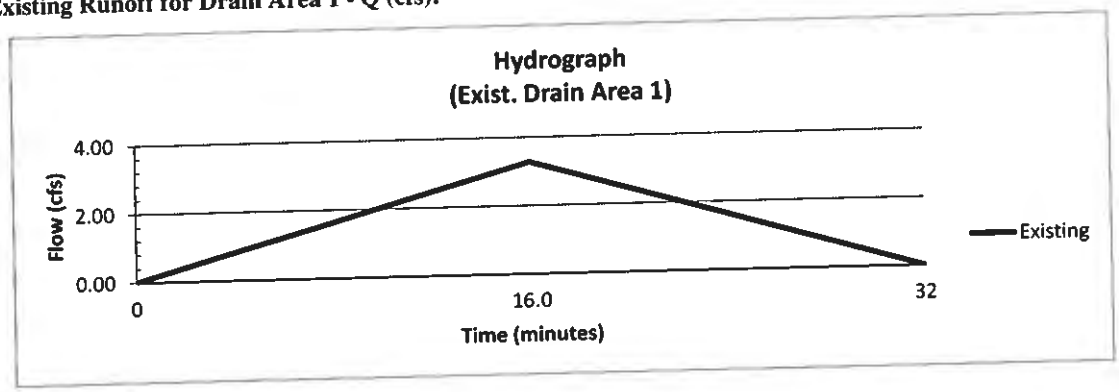
Pre-Development Intensity:

Intensity (in/hr.): ***3.62***

Pre-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 3.28

Existing Runoff for Drain Area 1 - Q (cfs): **3.28**



Exist. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *3.28 cfs x 16.0 min. x 60 sec.*

Total Pre-Development Runoff Volume: **3,149** **cubic feet**

Date: March 18, 2022

PROPOSED CONDITION - DRAIN AREA 1A

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 51,060 SF = ***1.17***

II. Determine Post-Development Runoff:

Post-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	High (50-90%)	0.00
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.29

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{10{,}000\ SF \times 0.95 + 0\ SF \times 0.25 + 41{,}060\ SF \times 0.29 + 0\ SF \times 0.85}{51{,}060\ SF} = \mathbf{0.42}$$

= ***0.42***

Post-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		8
Higher Elev. (ft):	114	
Lower Elev. (ft):	106	
Approx. Runoff Length (ft):		272
Average Slope:		2.9%
Time of Concentraion (min.):		10.0

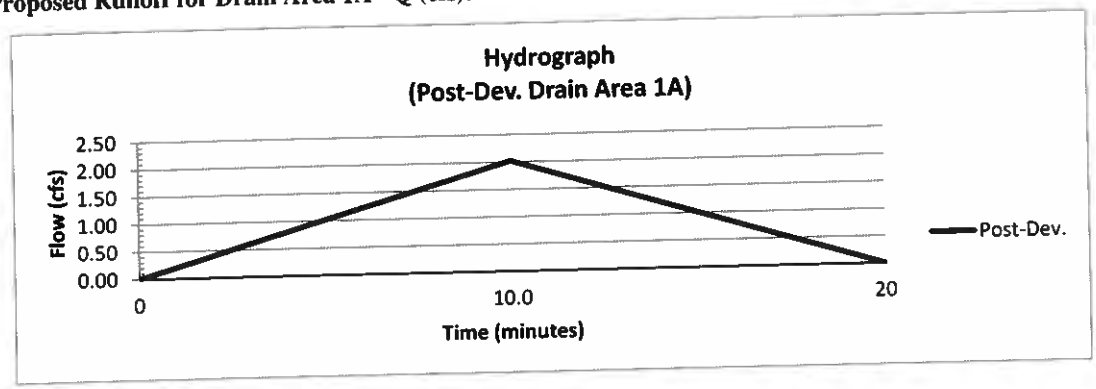
Post-Development Intensity:

Intensity (in/hr.): ***4.1***

Post-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 2.02

Proposed Runoff for Drain Area 1A - Q (cfs): **2.02**



Prop. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *2.02 cfs x 10.0 min. x 60 sec./*

Total Post-Development Runoff Volume: **1,212 cubic feet**

Date: March 18, 2022

EXISTING CONDITION - DRAIN AREA 2

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 185,982 SF = *4.27*

II. Determine Pre-Development Runoff:

Pre-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
		0.32

Runoff Coeff., $c_{undeveloped}$:

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{0\ SF \times 0.95 + 0\ SF \times 0.25 + 185{,}982\ SF \times 0.32 + 0\ SF \times 0.85}{185{,}982\ SF} = \mathbf{0.32}$$

$$= \textit{0.32}$$

Pre-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		18
Higher Elev. (ft):	124	
Lower Elev. (ft):	106	
Approx. Runoff Length (ft):		589
Average Slope:		3.1%
Time of Concentraion (min.):		18.0

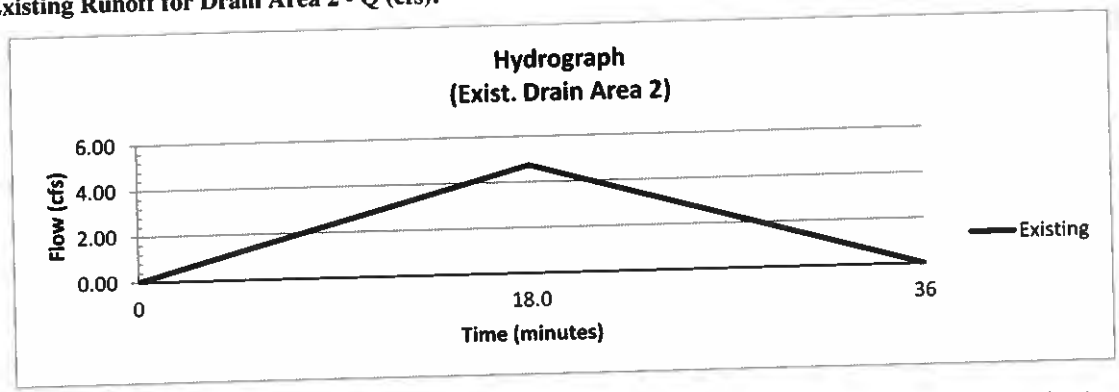
Pre-Development Intensity:

Intensity (in/hr.): *3.46*

Pre-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 4.73

Existing Runoff for Drain Area 2 - Q (cfs): **4.73**



Exist. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *4.73 cfs x 18.0 min. x 60 sec./*

Total Pre-Development Runoff Volume: **5,108 cubic feet**

Date: March 18, 2022

PROPOSED CONDITION - DRAIN AREA 2A

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 180,037 SF = ***4.13***

II. Determine Post-Development Runoff:

Post-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	High (50-90%)	0.00
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.29

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{50{,}000\ SF \times 0.95 + 0\ SF \times 0.25 + 130{,}037\ SF \times 0.29 + 0\ SF \times 0.85}{180{,}037\ SF} = \mathbf{0.47}$$

= ***0.47***

Post-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		15
Higher Elev. (ft):	114	
Lower Elev. (ft):	99	
Approx. Runoff Length (ft):		1,145
Average Slope:		1.3%
Time of Concentraion (min.):		16.0

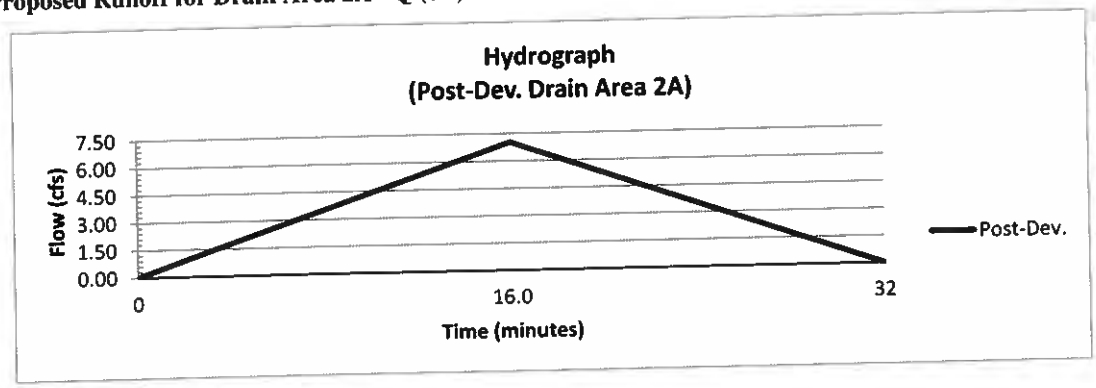
Post-Development Intensity:

Intensity (in/hr.): ***3.62***

Post-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 7.03

Proposed Runoff for Drain Area 2A - Q (cfs): **7.03**



Prop. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *7.03 cfs x 16.0 min. x 60 sec.*

Total Post-Development Runoff Volume: **6,749 cubic feet**

Date: March 18, 2022

EXISTING CONDITION - DRAIN AREA 3

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 272,336 SF = ***6.25***

II. Determine Pre-Development Runoff:

Pre-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.32

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{0\ SF \times 0.95 + 0\ SF \times 0.25 + 272{,}336\ SF \times 0.32 + 0\ SF \times 0.85}{272{,}336\ SF} = \mathbf{0.32}$$

$$= \textbf{\textit{0.32}}$$

Pre-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		22
Higher Elev. (ft):	120	
Lower Elev. (ft):	98	
Approx. Runoff Length (ft):		665
Average Slope:		3.3%
Time of Concentraion (min.):		15.5

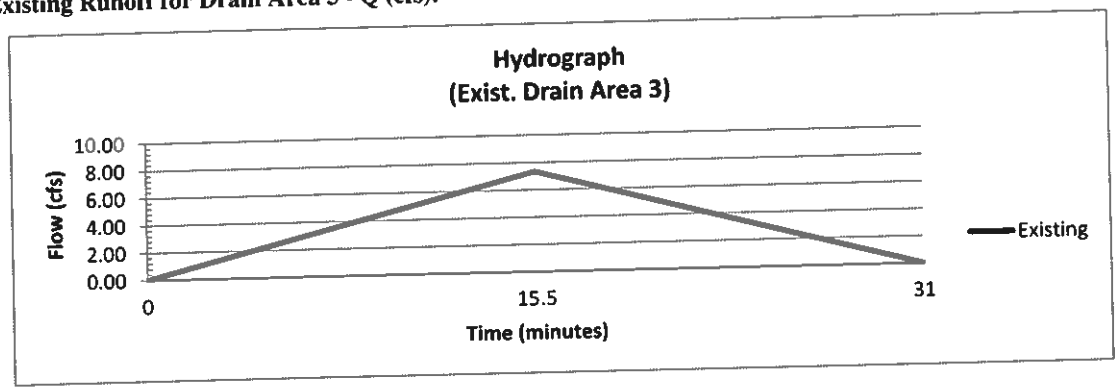
Pre-Development Intensity:

Intensity (in/hr.): ***3.66***

Pre-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 7.32

Existing Runoff for Drain Area 3 - Q (cfs): **7.32**



Exist. Runoff Volume (area under hydrograph) = Q_{peak} x T_{conc} x 60 seconds/minute = *7.32 cfs x 15.5 min. x 60 sec.*

Total Pre-Development Runoff Volume: **6,808 cubic feet**

Date: March 18, 2022

PROPOSED CONDITION - DRAIN AREA 3A

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 266,566 SF = ***6.12***

II. Determine Post-Development Runoff:

Post-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	High (50-90%)	0.00
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.29

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{49{,}814 \text{ SF} \times 0.95 + 0 \text{ SF} \times 0.25 + 216{,}752 \text{ SF} \times 0.29 + 0 \text{ SF} \times 0.85}{266{,}566 \text{ SF}} = \mathbf{0.41}$$

$$= \textit{0.41}$$

Post-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		15
Higher Elev. (ft):	122	
Lower Elev. (ft):	107	
Approx. Runoff Length (ft):		1,141
Average Slope:		1.3%
Time of Concentraion (min.):		16.0

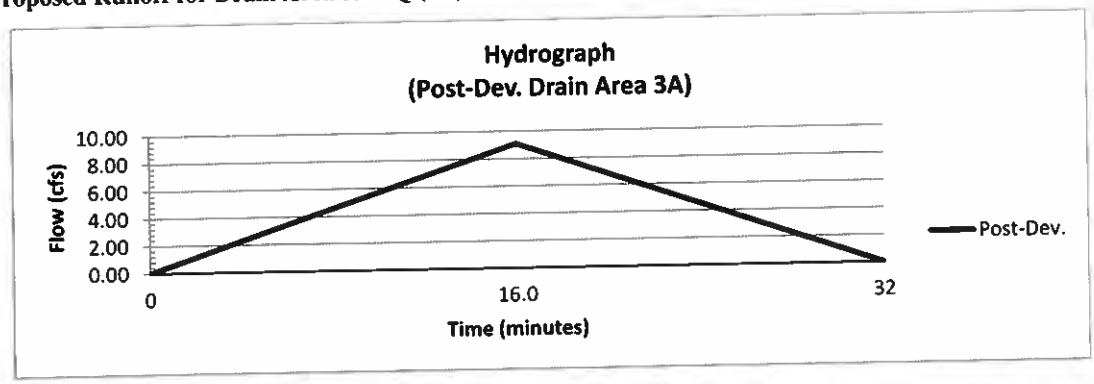
Post-Development Intensity:

Intensity (in/hr.): ***3.62***

Post-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 9.08

Proposed Runoff for Drain Area 3A - Q (cfs): 9.08



Prop. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *9.08 cfs x 16.0 min. x 60 sec./*

Total Post-Development Runoff Volume: **8,717 cubic feet**

Date: March 18, 2022

EXISTING CONDITION - DRAIN AREA 4

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 70,650 SF = ***1.62***

II. Determine Pre-Development Runoff:

Pre-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.32

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{0\ SF \times 0.95 + 0\ SF \times 0.25 + 70{,}650\ SF \times 0.32 + 0\ SF \times 0.85}{70{,}650\ SF} = \mathbf{0.32}$$

$$= \textit{0.32}$$

Pre-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		17
Higher Elev. (ft):	115	
Lower Elev. (ft):	98	
Approx. Runoff Length (ft):		540
Average Slope:		3.1%
Time of Concentraion (min.):		15.0

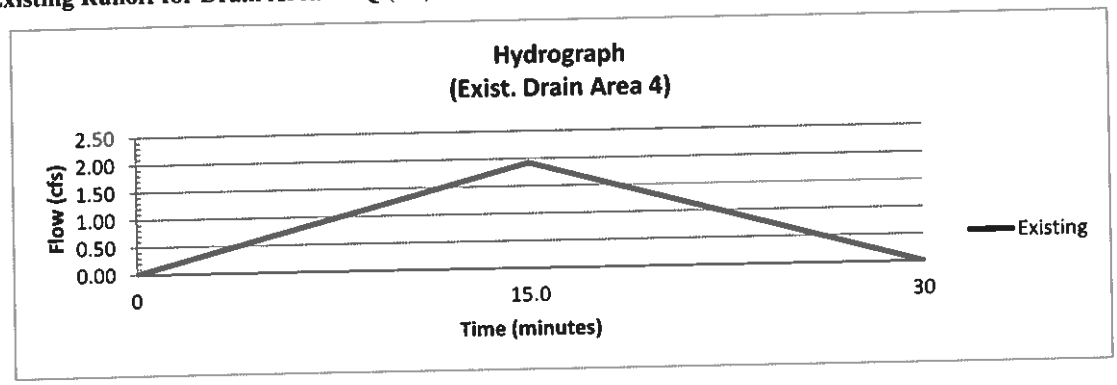
Pre-Development Intensity:

Intensity (in/hr.): ***3.7***

Pre-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 1.92

Existing Runoff for Drain Area 4 - Q (cfs): **1.92**



Exist. Runoff Volume (area under hydrograph) = Q_{peak} x T_{conc} x 60 seconds/minute = *1.92 cfs x 15.0 min. x 60 sec./*

Total Pre-Development Runoff Volume: **1,728** **cubic feet**

Date: March 18, 2022

PROPOSED CONDITION - DRAIN AREA 4A

Reference: Title MC-15, Department of Public Works and Waste Management, County of Maui, Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Unified Rational Calculations are used to determine the increase in volume of runoff.

I. Project Parameters:

50-Yr. - 1-Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for North Kihei, Maui
R(50 Yr. - 1 Hr.) = 2.00 inches

Total Area:

Area (Ac.): 26,571 SF = ***0.61***

II. Determine Post-Development Runoff:

Post-Development Runoff Coefficients:

Infiltration:	Slow	0.14
Relief:	Flat (0-5%)	0.00
Vegetal Cover:	High (50-90%)	0.00
Development Type:	Agricultural	0.15
Runoff Coeff., $c_{undeveloped}$:		0.29

$$C_{weighted} = \frac{A_{impervious}C_{impervious} + A_{landscaped}C_{landscaped} + A_{unimproved}C_{unimproved}}{A_{total}}$$

$$\frac{25{,}000\ SF \times 0.95 + 0\ SF \times 0.25 + 1{,}571\ SF \times 0.29 + 0\ SF \times 0.85}{26{,}571\ SF} = \mathbf{0.91}$$

= ***0.91***

Post-Development Time of Concentration:

Approx. Elev. Diff'l (ft):		2
Higher Elev. (ft):	110	
Lower Elev. (ft):	108	
Approx. Runoff Length (ft):		75
Average Slope:		2.7%
Time of Concentraion (min.):		6.0

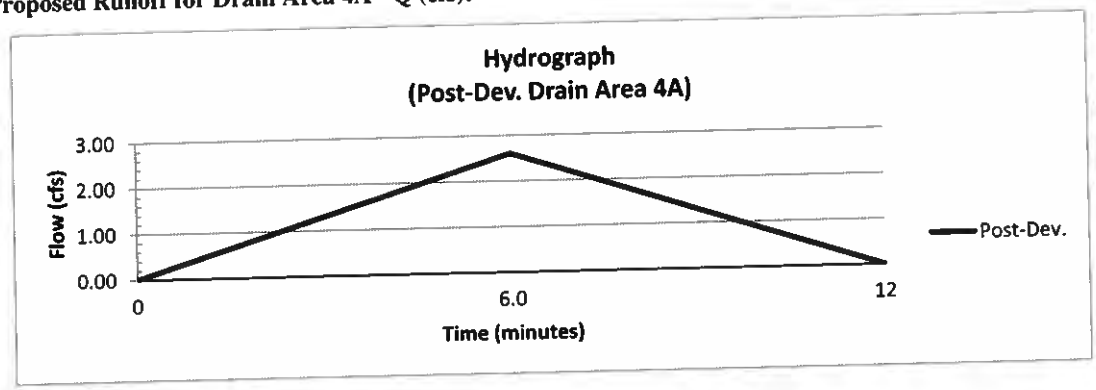
Post-Development Intensity:

Intensity (in/hr.): ***4.7***

Post-Development Runoff:

$Q = C_{weighted} \times I \times A$ (cfs): 2.61

Proposed Runoff for Drain Area 4A - Q (cfs): 2.61



Prop. Runoff Volume (area under hydrograph) = $Q_{peak} \times T_{conc} \times 60$ seconds/minute = *2.61 cfs x 6.0 min. x 60 sec./*

Total Post-Development Runoff Volume: **940 cubic feet**

OHUKAI LIGHT INDUSTRIAL
TMK (2) 3-9-001: 034

APPENDIX D. - STORM WATER QUALITY CALCULATION

CONTRIBUTORY AREA DETAILS:

BASIN AREA = 14.97 Acres; Percent Impervious = 20 %

PER MC 15-111-06 (2) - (Dry Extended Detention Ponds)

PER MC 15-111-06 (5) - Water Quality Design Volume (WQDV)
Reference: Figure 1

BASIN - WQDV = 840 CF/Acre (x 14.97 Acres = 12,575 CF)

PER MC 15-111-06 (6) - Average Outlet Discharge Rates
Reference: Figure 2

BASIN - "Full to Half" Flow Rate = 0.010 cfs/Acre (x 14.97 Acres = 0.150 cfs)
"Half to Empty" Flow Rate = 0.004 cfs/Acre (x 14.97 Acres = 0.060 cfs)

Figure 1
Required Water Quality Design Volume for
Detention Based Systems

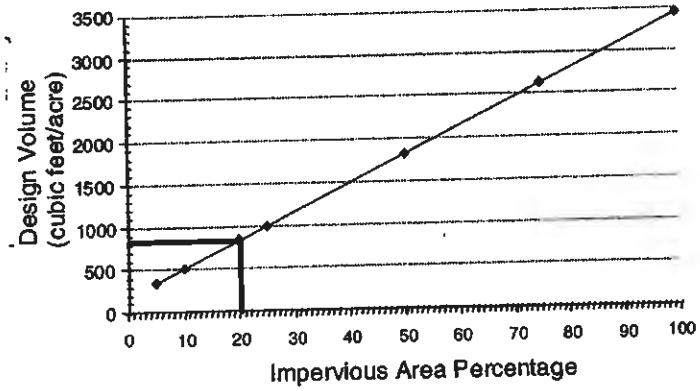
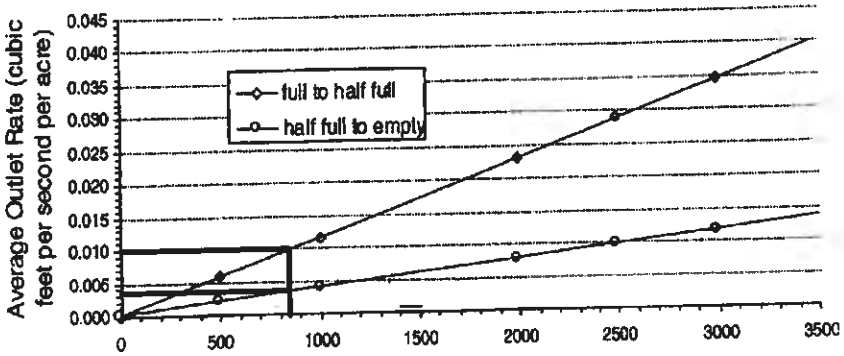
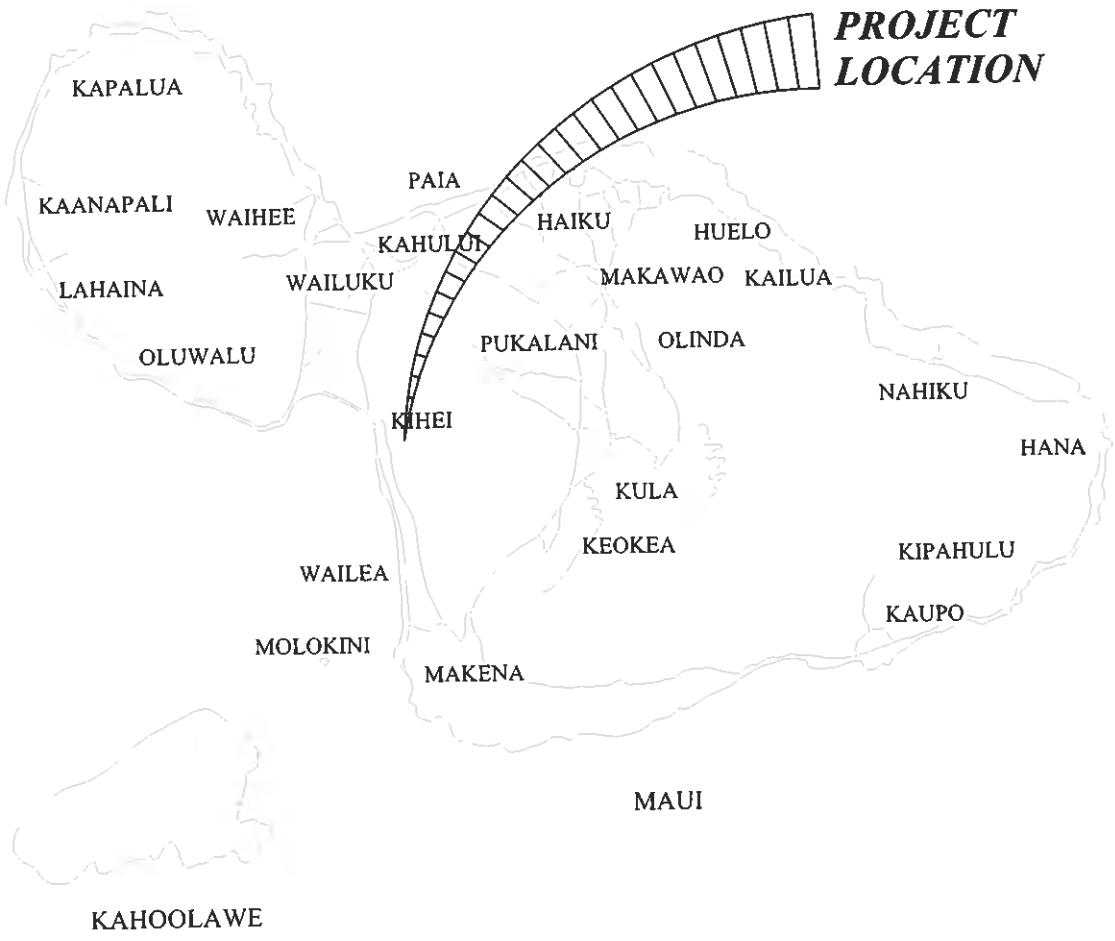


Figure 2: Required Average Outlet Discharge Rates
for Extended Detention Volume



EXHIBITS

1. Location Map
2. Vicinity Map
3. Soil Survey Map
4. Existing Condition Drainage Area Map
5. Proposed Condition Drainage Area Map



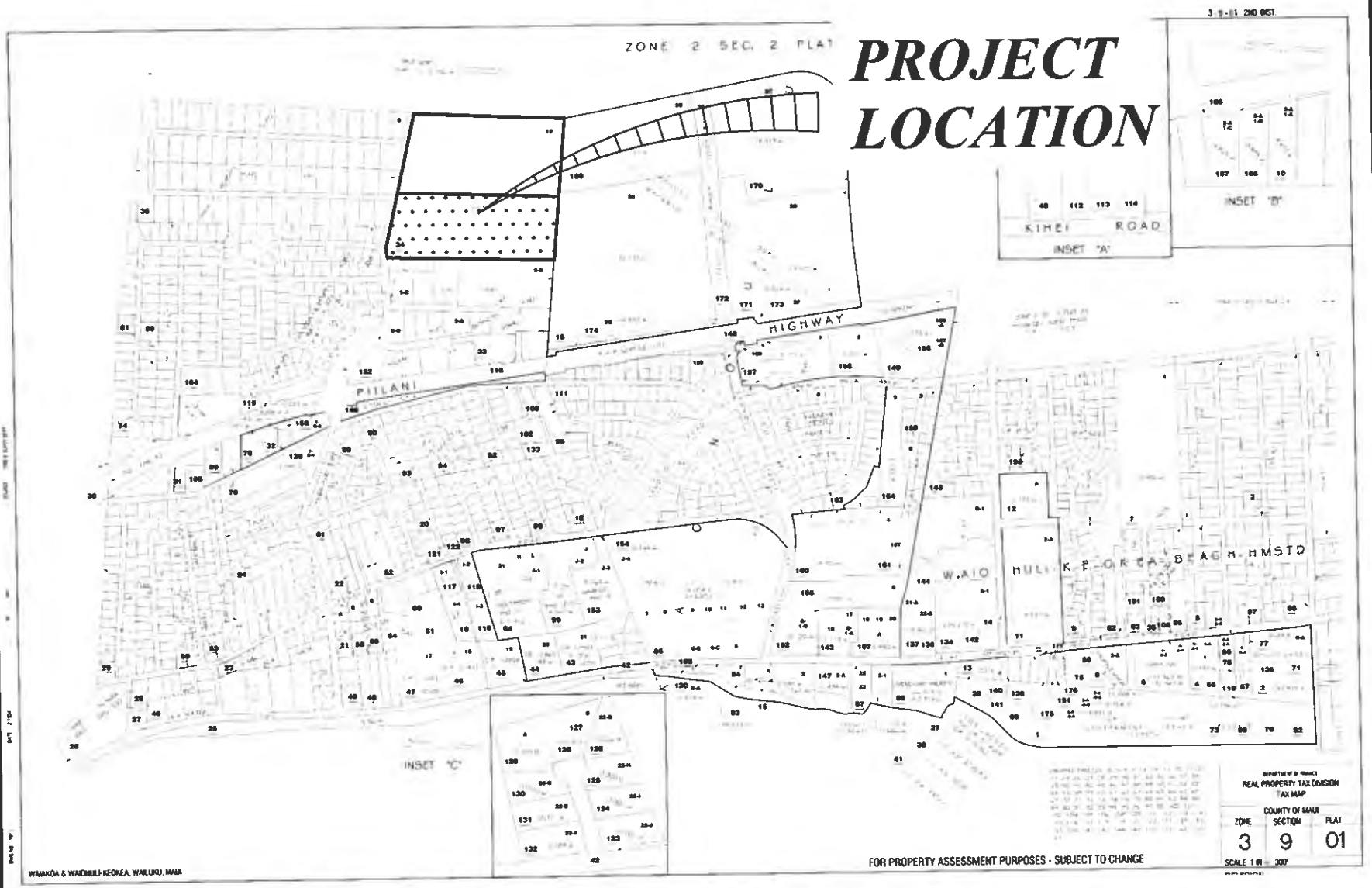
OHUKAI LIGHT INDUSTRIAL
454 OHUKAI ROAD

EXHIBIT 1

ISLAND LOCATION MAP

OHUKAI LIGHT INDUSTRIAL
454 OHUKAI ROAD

EXHIBIT 2
VICINITY/TMK MAP



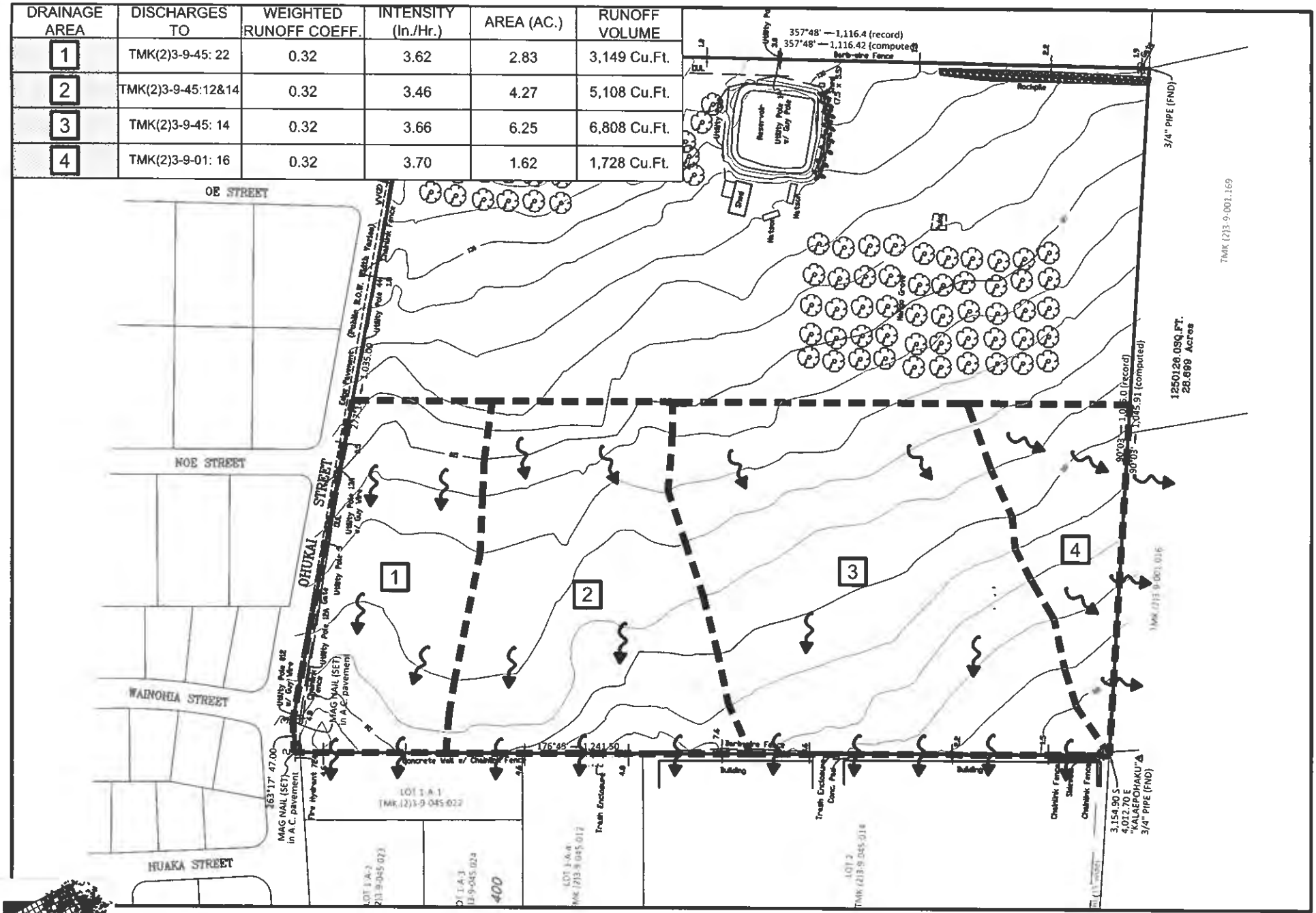
PROJECT LOCATION

SOIL TYPE = WID2

OHUKAI LIGHT INDUSTRIAL
454 OHUKAI ROAD

EXHIBIT 3
SOIL TYPES

DRAINAGE AREA	DISCHARGES TO	WEIGHTED RUNOFF COEFF.	INTENSITY (In./Hr.)	AREA (AC.)	RUNOFF VOLUME
1	TMK(2)3-9-45: 22	0.32	3.62	2.83	3,149 Cu.Ft.
2	TMK(2)3-9-45:12&14	0.32	3.46	4.27	5,108 Cu.Ft.
3	TMK(2)3-9-45: 14	0.32	3.66	6.25	6,808 Cu.Ft.
4	TMK(2)3-9-01: 16	0.32	3.70	1.62	1,728 Cu.Ft.

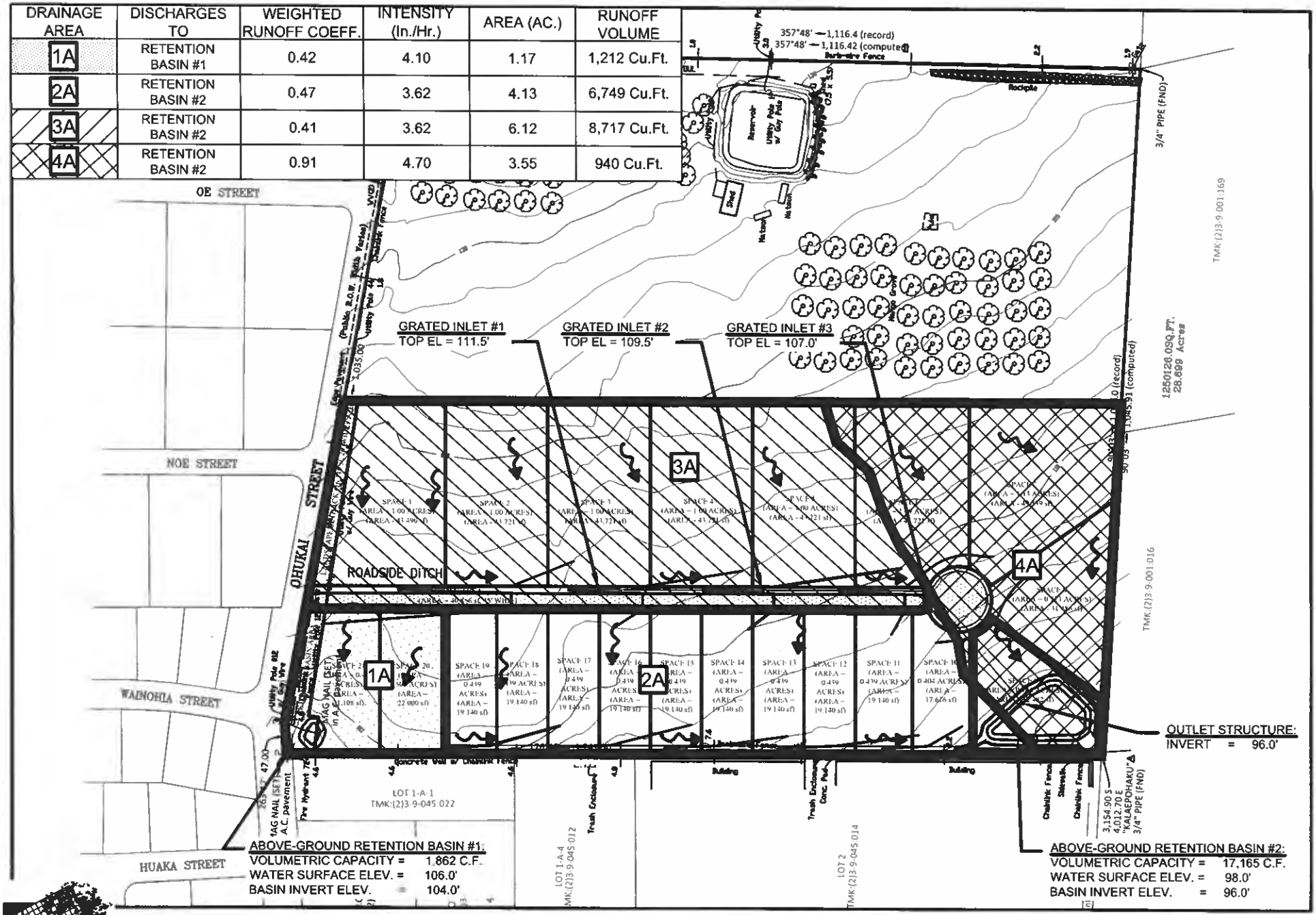


OHUKAI LIGHT INDUSTRIAL
454 OHUKAI ROAD

EXHIBIT 4

EXISTING CONDITION

DRAINAGE AREA	DISCHARGES TO	WEIGHTED RUNOFF COEFF.	INTENSITY (In./Hr.)	AREA (AC.)	RUNOFF VOLUME
1A	RETENTION BASIN #1	0.42	4.10	1.17	1,212 Cu.Ft.
2A	RETENTION BASIN #2	0.47	3.62	4.13	6,749 Cu.Ft.
3A	RETENTION BASIN #2	0.41	3.62	6.12	8,717 Cu.Ft.
4A	RETENTION BASIN #2	0.91	4.70	3.55	940 Cu.Ft.



OHUKAI LIGHT INDUSTRIAL
454 OHUKAI ROAD

EXHIBIT 5

PROPOSED CONDITION

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

PREPARED FOR

CHRIS HAYES

MAY 23, 2022

PREPARED BY

THE TRAFFIC MANAGEMENT CONSULTANT

EXHIBIT 21

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

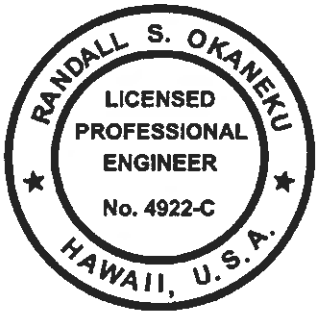
KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

PREPARED FOR

CHRIS HAYES

MAY 23, 2022



PREPARED BY

TMC

THE TRAFFIC MANAGEMENT CONSULTANT

RANDALL S. OKANEKU, P.E., PRINCIPAL * 1188 BISHOP STREET, SUITE 1907 * HONOLULU, HI 96813

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TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

I. Introduction

A. Project Description

The proposed Ohukai Light Industrial Park will consist of 21-lots, ranging in sizes from 0.4 acre to 1.13 acres. The proposed project is subject to a request for a Change of Zone from the County of Maui to General Light Industrial. The project site is located immediately to the east (mauka) of Kihei Commercial Plaza, and on the south side of Ohukai Road, between Wainohia Street and Noe Street. The 14.75-acre project site is identified as Tax Map Key: (2) 3-9-001:Portion of 034. Figure 1 depicts the project location and study area.

Site access is proposed on Ohukai Road between Noe Street and Wainohia Street. The proposed site plan, which was prepared by CDF Engineering, LLC, is depicted on Figure 2. For the purpose of this Traffic Assessment Report, the Ohukai Light Industrial Park is expected to be fully built-out and occupied by the Year 2024.

B. Purpose and Scope of the Study

The purpose of this study is to analyze the traffic impacts resulting from the development of the proposed Ohukai Light Industrial Park. This report presents the findings and recommendations of the study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadways and transportation conditions.
3. Analysis of the future traffic conditions without the proposed project.
4. Development of trip generation characteristics of the proposed project.
5. Identification and analysis of the traffic impacts resulting from the development of the proposed project.
6. Recommendations of roadway improvements, as necessary, which would mitigate the traffic impacts identified in this study.

Figure 1. Location Map and Study Area

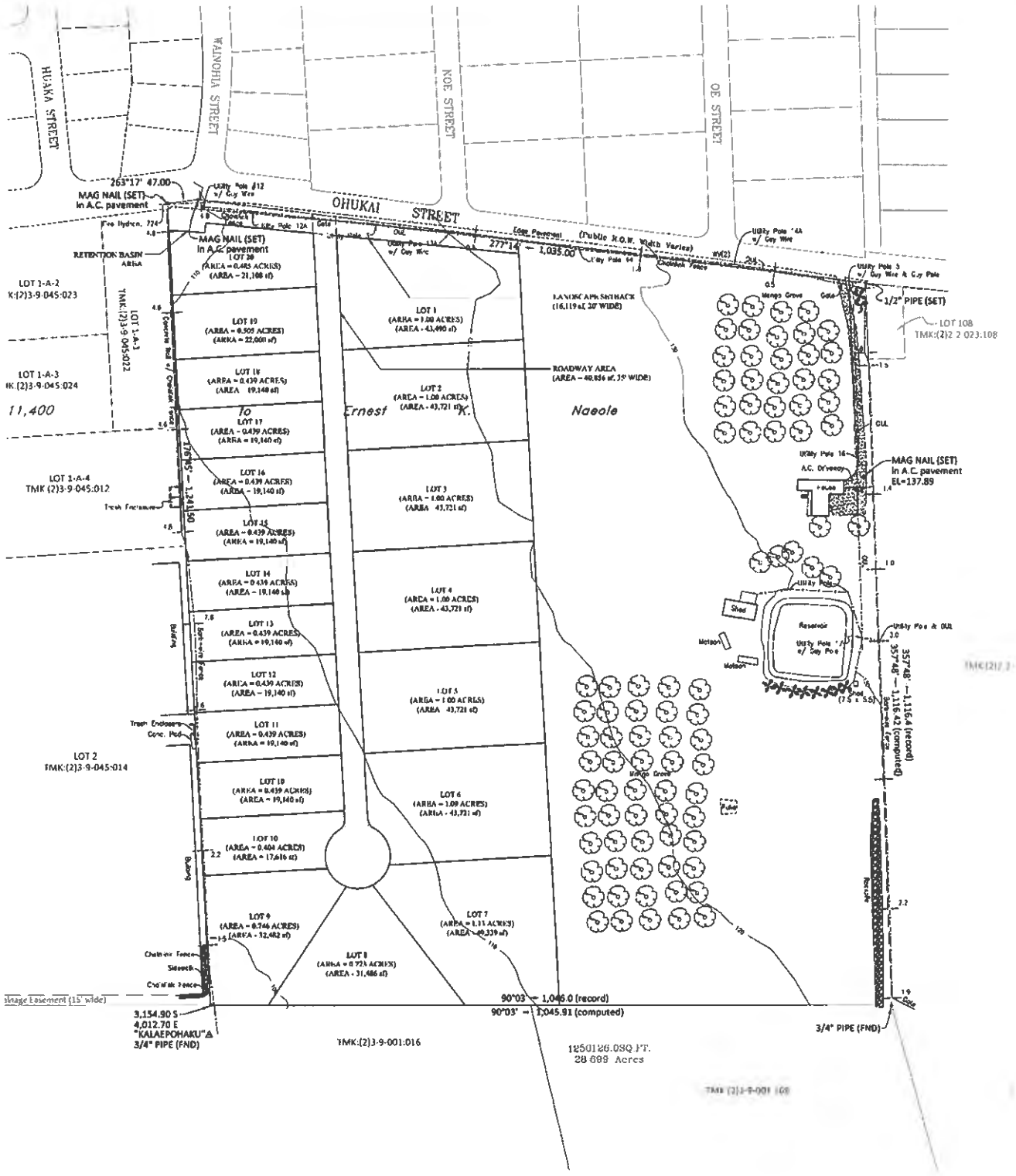

Figure 2. Ohukai Light Industrial Park Site Plan

C. Methodologies

1. Capacity Analysis

The highway capacity analysis, performed in this study, is based upon procedures presented in the Highway Capacity Manual, 6th Edition (HCM), published by the Transportation Research Board. HCM defines the Level of Service (LOS) as "a quantitative stratification of a performance measure or measures representing quality of service." HCM defines six (6) Levels of Service from the traveler's perspective, ranging from the best LOS "A" to the worst LOS "F". LOS translates the complex mathematical results of highway capacity analysis into an A through F grading system to simplify the roadway performance for decision-makers.

LOS's "A", "B", and "C" are considered satisfactory Levels of Service. LOS "D" is generally considered a "desirable minimum" operating Level of Service. LOS's "E" and "F" are undesirable conditions. Intersection LOS is primarily based upon average delay (d) in seconds per vehicle (sec/veh). Table 1 summarizes the HCM LOS criteria for signalized and unsignalized intersections.

Table 1. Intersection Level of Service Criteria (HCM)

LOS	Signalized Control	Unsignalized Control	Description
	Delay d (sec/veh)		
A	d≤10	d≤10	Control delay is minimal.
B	10<d ≤20	10<d≤15	Control delay is not significant.
C	20<d≤35	15<d≤25	Stable operation. Queuing begins to occur.
D	35<d≤55	25<d≤35	Less stable condition. Increase in delays, decrease in travel speeds.
E	55<d≤80	35<d≤50	Unstable operation, significant delays.
F	d>80	d>50	High delays, extensive queuing.

Synchro is a traffic analysis software that was developed by Trafficware Corporation. Synchro is an intersection analysis program that is based upon the HCM methodology. Synchro was used to calculate the Levels of Service for the intersections in the study area. Worksheets for the capacity analysis, performed throughout this report, are compiled in the Appendix.

2. Trip Generation

The trip generation methodology is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in the Trip Generation Manual, 11th Edition. ITE defines the General Light Industrial land use as "a free-standing facility devoted to a single use". ITE defines the Industrial Park land use as containing several industrial-related facilities, such as manufacturing, service, and warehouse facilities. Therefore, the ITE Industrial Park land use is more appropriate for developing the trip generation rates for the proposed Ohukai Light Industrial Park. ITE developed trip generation rates by correlating the total vehicle trip data with various land use activities/characteristics, such as the vehicle trips per hour (vph) per 1,000 square feet of gross floor area.

II. Existing Conditions

A. Roadways

Piilani Highway is a four-lane arterial highway between Kihei and Wailea. Bicycle lanes are provided in both directions on Piilani Highway. The posted speed on Piilani Highway is 40 miles per hour (mph). Piilani Highway is signalized at its intersection with Ohukai Road. Exclusive left-turn and right-turn lanes are provided in both directions on Piilani Highway at Ohukai Road. Protected left-turn phases are provided on all approaches of the signalized intersection of Ohukai Road and Piilani Highway.

Ohukai Road is a two-lane, two-way collector street between South Kihei Road and Hoalike Street. Ohukai Road provides separate left-turn, through, and right-turn lanes in both directions at its channelized intersection with Piilani Highway.

Huku Lii Place is a two-way, two-lane local street, which is located immediately mauka (east) of Piilani Highway. Huku Lii Place provides access to the Kihei Gateway Plaza. Huku Lii Place is stop-controlled at its Tee-intersection with Ohukai Road. An exclusive left-turn lane is not provided on Ohukai Road at Huku Lii Place.

Kahakulani Place is a two-way, two-lane local road, which provides access to the Kihei Commercial Center. Kahakulani Place is located immediately makai (west) of the proposed Ohukai Light Industrial Park. Kahakulani Place is stop-controlled at its Tee-intersection with Ohukai Road. An exclusive left-turn lane is provided on Ohukai Road at Kahakulani Place.

Huaka Street is a two-way, two-lane local street, which provides access to a residential subdivision. Huaka Street is stop-controlled at its Tee-intersection with Ohukai Road. An exclusive left-turn lane is provided on Ohukai Road at Huaka Street.

Wainohia Street is a two-way, two-lane local street, which connects to Huaka Street. Wainohia Street is stop-controlled at its Tee-intersection with Ohukai Road. An exclusive left-turn lane is provided on Ohukai Road at Wainohia Street.

Noe Street and Oe Street are part of a local loop road, which provides access to a residential subdivision. Both Noe Street and Oe Street are stop-controlled at their Tee-intersections with Ohukai Road. Exclusive left-turn lanes are not provided on Ohukai Road at Noe Street nor at Oe Street.

Hale Kai Street and Hoalike Street are part of a road network, which provides access to a residential subdivision. Hale Kai Street connects to Kaiwahine Street. Both Hale Kai Street and Hoalike Street are stop-controlled at their Tee-intersections with Ohukai Road. Exclusive left-turn lanes are not provided on Ohukai Road at Hale Kai Street nor at Hoalike Street. Ohukai Road terminates east of Hoalike Street.

B. Public Transit

The County of Maui Department of Transportation operates the Maui Bus Public Transit System (MBPTS) on the island of Maui. The Kihei Islander Route #10 provides service between Kahului and Wailea at 30-minute intervals between 5:50 AM to 7:50 PM. The Kihei Villager Route #15 provides service between Ma`alaea Harbor and Kihei at hourly intervals from 6:00 AM to 8:00 PM.

The MBPTS bus stop, closest to the project site, is located on South Kihei Road at Ohukai Road. The County of Maui Department of Transportation has considered providing bus service to project vicinity via Kaiwahine Street and Hale Kai Street. The County of Maui has decided not to provide bus service to the project vicinity, due to the physical constraints along Hale Kai Street.

C. Existing Peak Hour Traffic Volumes and Operating Conditions

1. Field Investigation and Data Collection

Turning movement traffic count surveys were conducted at the following intersections in the study area:

a. Piilani Highway and Ohukai Road (February 2019)

b. Ohukai Road and Huku Lii Place (May 2018)

c. Ohukai Road and Wainohia Street (May 2018)

Each intersection was surveyed during the peak periods of traffic over several days. The peak hour traffic volumes during the survey periods were comparable. The highest AM and PM peak hour traffic volumes during the survey periods were selected for analysis to establish the existing conditions. The traffic signal timing and phasing at

the intersection of Piilani Highway and Ohukai Road were observed during the field investigation. The traffic count surveys were not updated due to the ongoing pandemic traffic conditions.

2. Existing AM Peak Hour Traffic

The existing AM peak hour of traffic occurred from 7:15 AM to 8:15 AM. Piilani Highway carried over 3,000 vehicles per hour (vph), total for both directions, during the existing AM peak hour of traffic. East (mauka) of Piilani Highway, Ohukai Road carried about 800 vph. Fronting the project site, Ohukai Road carried about 270 vph. Seven (7) bicycles traveled on Piilani Highway, total for both directions, while five (5) bicycles traveled on Ohukai Road, during the existing AM peak hour of traffic.

The intersection of Piilani Highway and Ohukai Road operated at an overall LOS "C". The left-turn traffic movements on northbound and southbound Piilani Highway and on makai bound Ohukai Road operated at LOS "F" and LOS "E", respectively. The left-turn and through traffic movements on mauka bound Ohukai Road operated at LOS "E". The left-turn and through traffic movements on makai bound Ohukai Road operated at LOS "E" and LOS "D", respectively. The other traffic movements at the intersection operated at satisfactory Levels of Service, i.e., LOS "C" or better.

Huku Lii Place operated at LOS "C" at Ohukai Road. Wainohia Street operated at LOS "A" at Ohukai Road, during the existing AM peak hour of traffic. Figure 3 depicts the existing AM peak hour traffic.

3. Existing PM Peak Hour Traffic

The existing PM peak hour of traffic occurred between 4:00 PM and 5:00 PM. During the existing PM peak hour of traffic, Piilani Highway carried about 3,400 vph, total for both directions. Ohukai Road carried over 800 vph, mauka of Piilani Highway. Fronting the project site, Ohukai Road carried about 300 vph, total for both directions. Two (2) bicycles traveled on Piilani Highway, total for both directions, while 12 bicycles traveled on Ohukai Road, during the existing PM peak hour of traffic.

During the existing PM peak hour of traffic, the intersection of Piilani Highway and Ohukai Road operated at an overall LOS "D". The left-turn traffic movements on all approaches to intersection operated at LOS "F". The through traffic movements in both directions on Ohukai Road also operated at LOS "F". The through traffic movement on northbound Piilani Highway operated at LOS "D".

Huku Lii Place operated at LOS "C" at Ohukai Road, during the existing PM peak hour of traffic. Wainohia Street operated at LOS "B" at Ohukai Road. The existing PM peak hour traffic is depicted on Figure 4.

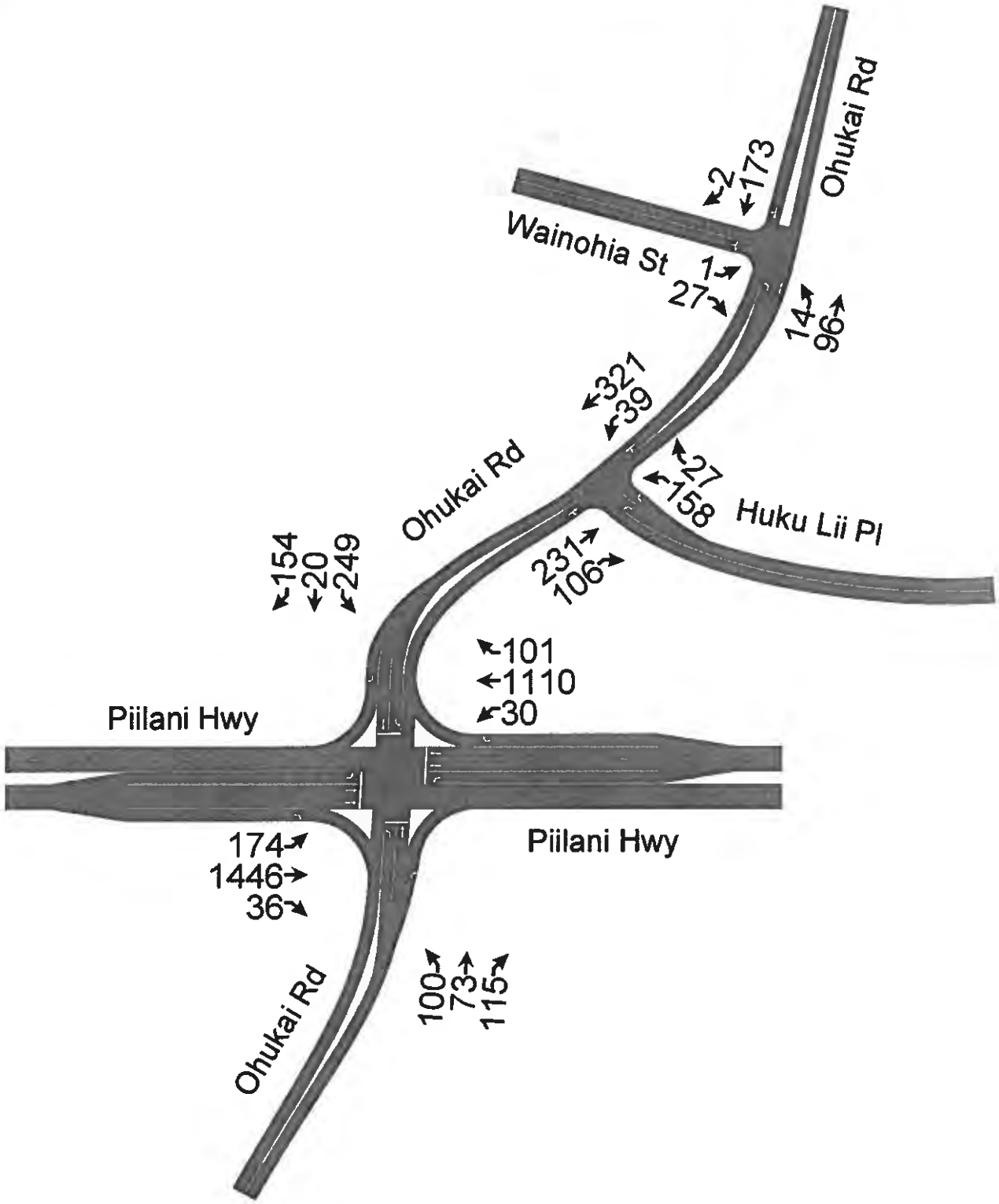

Figure 3. Existing AM Peak Hour Traffic

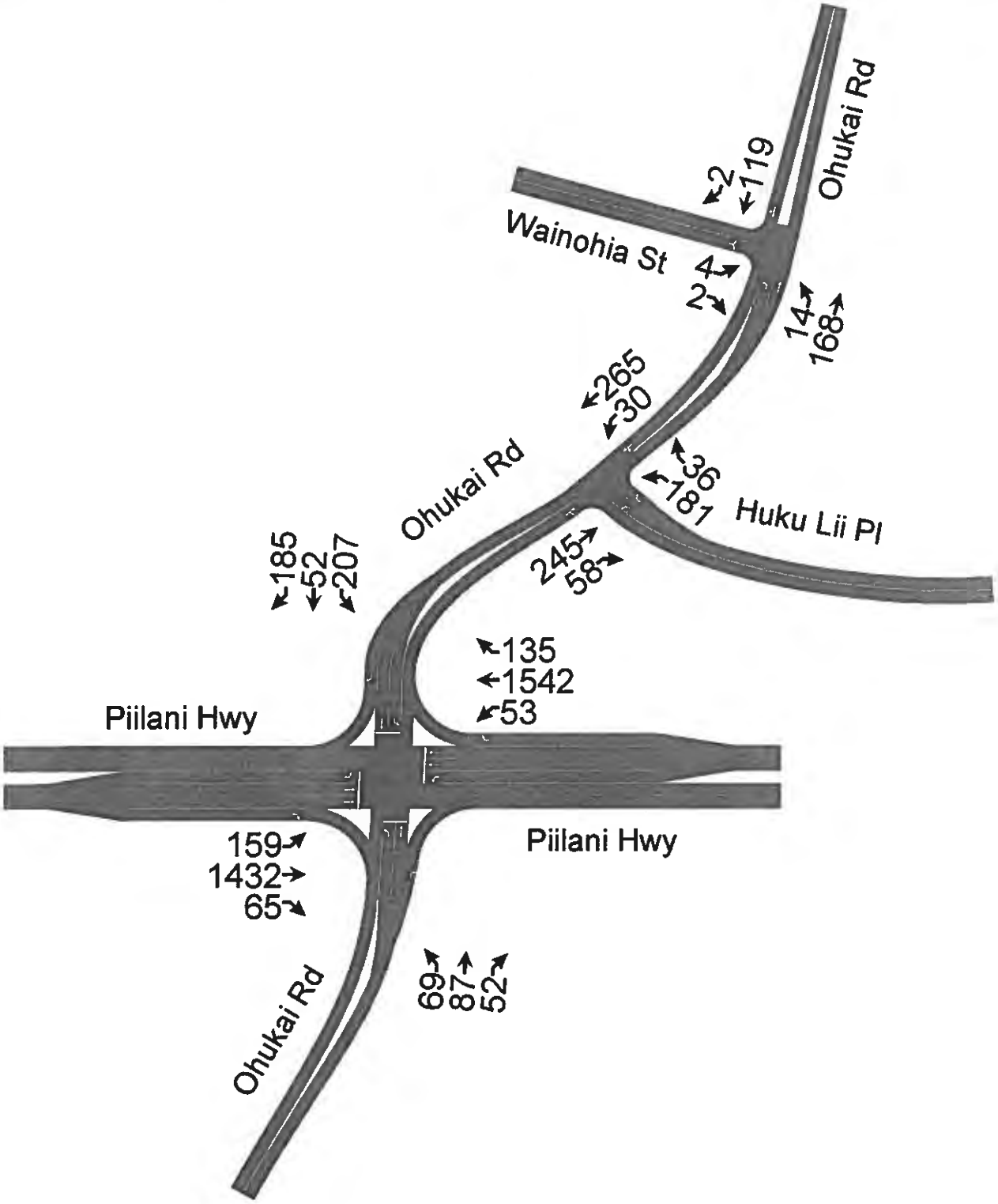

Figure 4. Existing PM Peak Hour Traffic

III. Future Traffic Conditions

A. Background Growth in Traffic

The Maui Long-Range Land Transportation Plan (MLRLTP) was prepared by the State of Hawaii Department of Transportation (DOT), in cooperation with the Maui County Department of Public Works and Planning Department. The MLRLTP projected an 84 percent increase in traffic on Mokulele Highway from the Base Year 2007 to the Year 2035, i.e., an annual average growth of 3.00 percent in traffic. For the purpose of this analysis, an annual average growth factor of 3.00 percent was uniformly applied to the existing (Years 2018 and 2019) AM and PM peak hour traffic to estimate the Year 2024 peak hour traffic demands without the proposed project.

B. Kaiwahine Village

At the time of the field investigation, Kaiwahine Village was a planned two-story multi-family housing development in Kihei, Maui, Hawaii. Kaiwahine Village will consist of a total of 120 affordable rental apartments, which will be located to the northeast of the proposed project. The project is located at the east (mauka) end of Kaiwahine Street.

The trip generation characteristics for the Kaiwahine Village project were based upon the weekday ITE trip rates for a multi-family housing (low-rise), during the peak hour of adjacent street traffic. The ITE regression equations were used to derive the peak hour trip rates. Table 2 summarizes the trip generation characteristics of the full build-out and occupancy of the Kaiwahine Village development.

Table 2. Kaiwahine Village Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Low-Rise Multi-Family Housing (220)	vph/DU	0.12	0.38	0.50	0.38	0.22	0.60
	vph	14	45	60	45	27	72

Kaiwahine Village is expected to add 27 vph and 26 vph to Piilani Highway traffic at Ohukai Road, during the AM and PM peak hours of traffic, respectively. For the purpose of this Traffic Assessment Report, it is assumed that Kaiwahine Village will be fully built-out and occupied by the Year 2024. The estimated Kaiwahine Village peak hour traffic was added to the background growth in traffic to establish the baseline traffic projections without the proposed project.

C. Kamalani

Kamalani is a 600-unit multi-family planned community, which was under construction at the time of the field investigation. Kamalani is located to the north of the proposed project. Access to Kamalani will be provided on Kaiwahine Street.

The trip generation characteristics for the Kamalani project were based upon the weekday ITE trip rates for a multi-family housing (low-rise), during the peak hour of adjacent street traffic. The ITE regression equations were used to derive the peak hour trip rates. It is estimated that approximately 100 dwelling units (DU) at Kamalani were occupied at the time of the field investigation. Table 3 summarizes the trip generation characteristics of the full build-out and occupancy of the remaining 500 dwelling units of the Kamalani development.

Table 3. Kamalani Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Low-Rise Multi-Family Housing (220)	vph/DU	0.08	0.26	0.35	0.29	0.17	0.46
	vph	50	159	209	175	103	278

Kamalani is expected to add 81 vph and 93 vph to Piilani Highway traffic at Ohukai Road, during the AM and PM peak hours of traffic, respectively. For the purpose of this Traffic Assessment Report, it is assumed that Kamalani will be fully built-out and occupied by the Year 2024. The estimated Kamalani peak hour traffic was added to the background growth in traffic to establish the baseline traffic projections without the proposed project.

D. Peak Hour Traffic Analysis Without Project

1. AM Peak Hour Traffic Without Project

The intersection of Piilani Highway and Ohukai Road is expected to operate at an overall LOS "D", during the AM peak hour of traffic without the proposed project. The left-turn traffic movements on northbound and southbound Piilani Highway are expected to continue to operate at LOS "F". The through movements in both directions on Piilani Highway are expected to operate at LOS "D". The left-turn and through traffic movements on makai bound Ohukai Road are expected to operate at LOS "F" and LOS "D", respectively. The left-turn and through traffic movements on mauka bound Ohukai Road are expected to operate at LOS "E".

Huku Lii Place is expected to operate at LOS "D" at Ohukai Road. Wainohia Street is expected to continue to operate at LOS "A" at Ohukai Road, during the AM peak

hour of traffic without the proposed project. Figure 5 depicts the AM peak hour traffic without the proposed project.

2. PM Peak Hour Traffic Without Project

The intersection of Piilani Highway and Ohukai Road is expected to operate at an overall LOS "E" , during the PM peak hour of traffic without the proposed project. The left-turn traffic movements on all approaches to the intersection are expected to continue to operate at LOS "F". The through traffic movements in both directions on Ohukai Road also are expected to operate at LOS "F". The through traffic movements on northbound and southbound Piilani Highway are expected to operate at LOS "E" and LOS "D", respectively.

Huku Lii Place and Wainohia Street are expected to continue to operate at LOS "D" and LOS "B", respectively, during the PM peak hour of traffic without the proposed project. The PM peak hour volumes without the proposed project are depicted on Figure 6.

IV. Traffic Assessment

A. Trip Generation Characteristics

The trip generation characteristics are based upon the average weekday ITE trip rates for an industrial park, during the peak hour of adjacent street traffic. At this writing, structures are not planned for the project site. The ITE trip generation rates for an Industrial Park are based upon gross floor area. ITE has not developed trip generation rates for an Industrial Park based upon land area. Therefore, the development density, i.e., building floor area to land area or floor area ratio (FAR), is based upon an assumed density of 0.50.

Based upon the average FAR of 0.50, the 14.75-acre project is analyzed as a 321,255 SFGFA industrial park. The proposed Ohukai Light Industrial Park is expected to generate a total of 109 vph – 88 vph entering the site and 21 vph exiting the site, during the AM peak hour of traffic. During the PM peak hour of traffic, the proposed project is expected to generate a total of 109 vph – 24 vph entering the site and 85 vph exiting the site. Table 4 summarizes the trip generation characteristics of the proposed Ohukai Light Industrial Park.

Table 4. Ohukai Light Industrial Park Trip Generation Characteristics

Land Use (ITE Code)	Units	AM Peak Hour			PM Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Industrial Park (130)	vph/1000 SFGFA	0.28	0.06	0.34	0.07	0.27	0.34
	vph	88	21	109	24	85	109

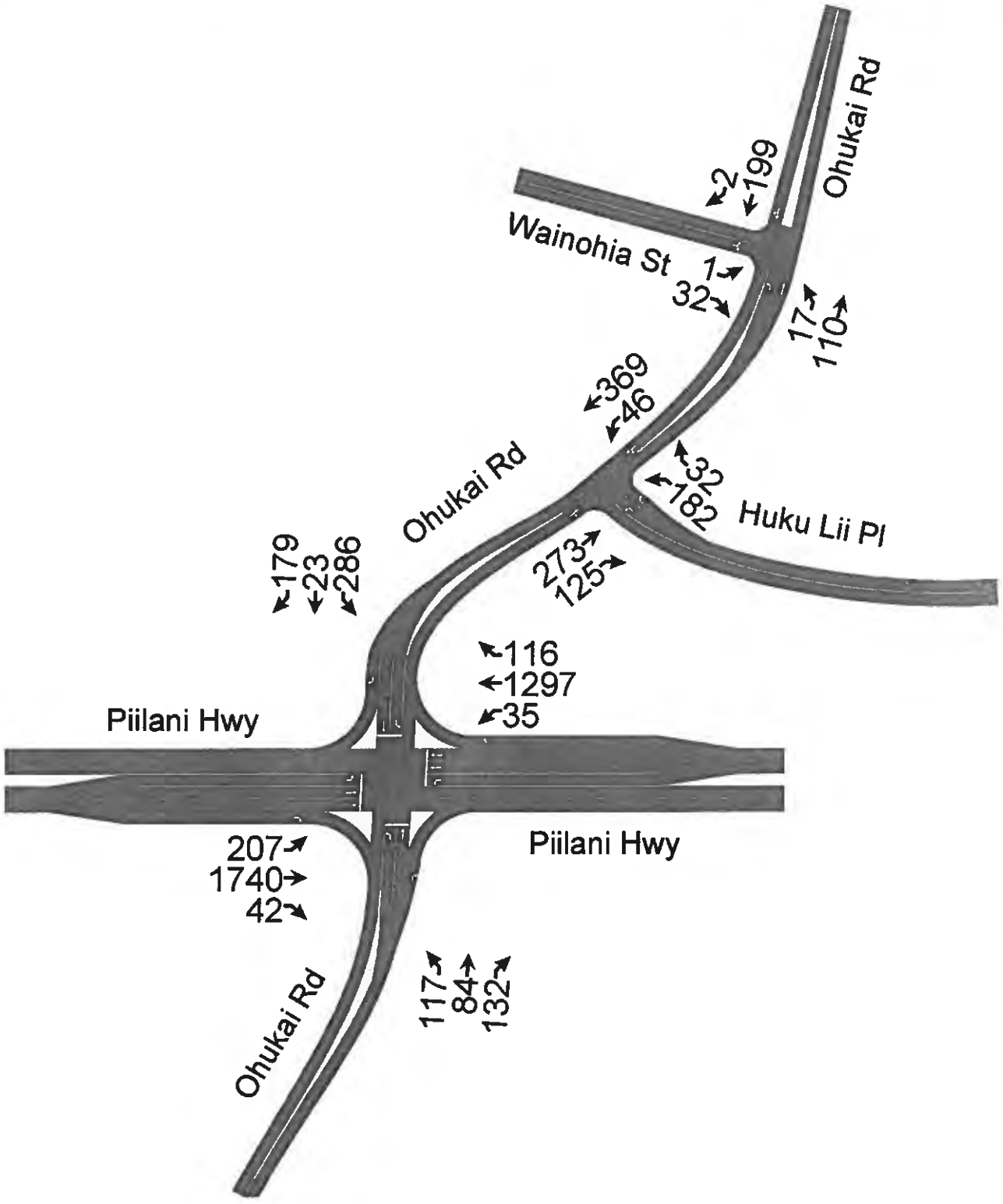

Figure 5. AM Peak Hour Volumes Without Project

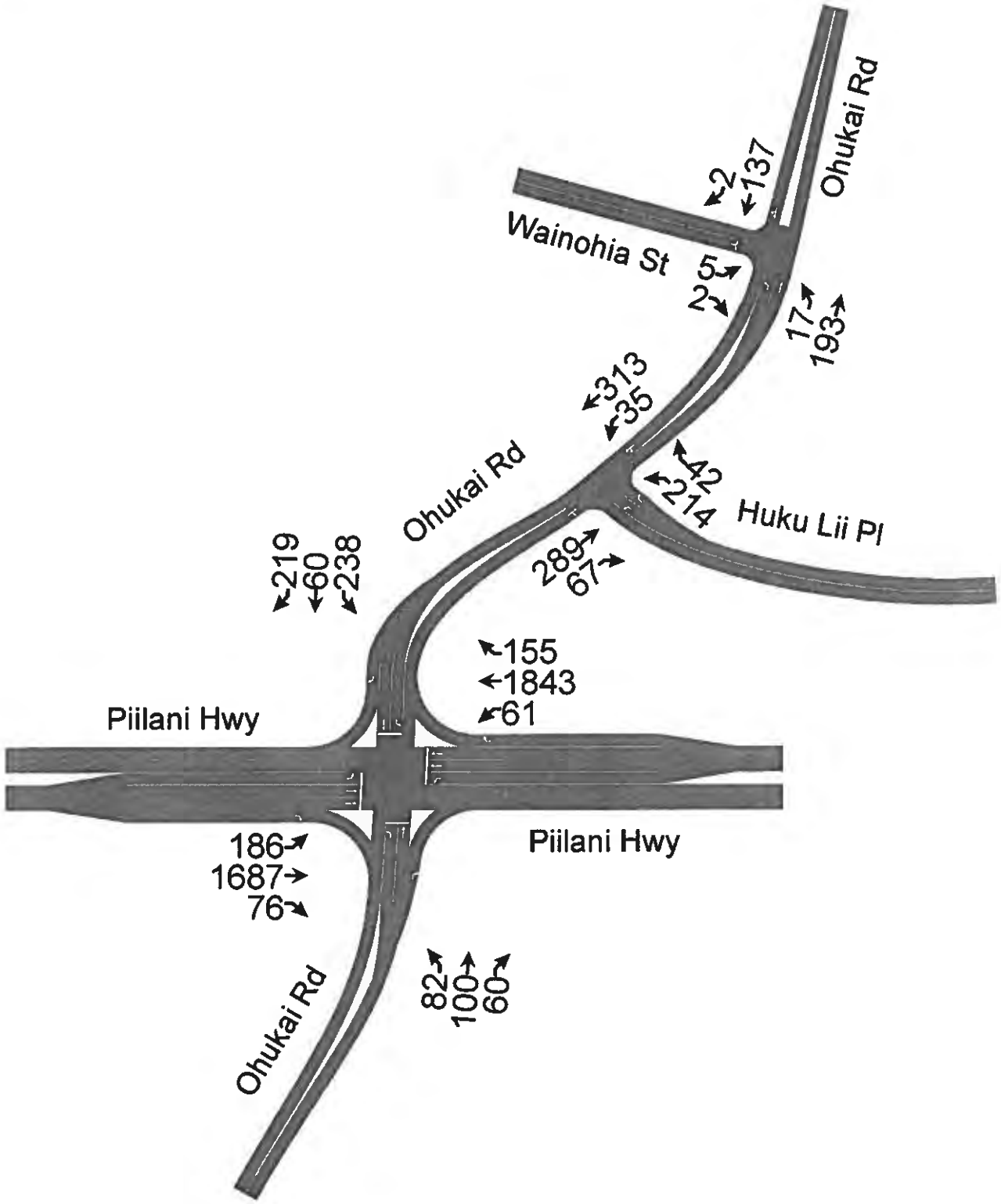

Figure 6. PM Peak Hour Volumes Without Project

B. Traffic Assignment

The traffic assignments are based upon the existing traffic patterns. Figures 7 and 8 depict the AM and PM peak hour site traffic assignments, respectively.

C. AM Peak Hour Traffic Analysis With Project

The Project Access Driveway is expected to operate at LOS "B" at Ohukai Road, during the AM peak hour of traffic with the proposed project. Huku Lii Place is expected to operate at LOS "E" at Ohukai Road.

The traffic movements at the intersection of Piilani Highway and Ohukai Road are expected to operate at the same Levels of Service as during the AM peak hour of traffic without the proposed project Figure 9 depicts the AM peak hour volumes with the proposed project.

D. PM Peak Hour Traffic Analysis With Project

During the PM peak hour of traffic with the proposed project, the Project Access Driveway and Wainohia Street are expected to operate at LOS "B" at Ohukai Road. Huku Lii Place is expected to operate at LOS "E" at Ohukai Road.

The traffic movements at the intersection of Piilani Highway and Ohukai Road are expected to operate at the same Levels of Service as the PM peak hour of traffic without the proposed project. The PM peak hour traffic volumes are depicted on Figure 10.

V. Recommendations and Conclusions

A. Recommended Traffic Improvements

1. Recommended Traffic Improvement Without Project

The traffic signal phasing at the intersection of Piilani Highway and Ohukai Road should be simplified to provide a permissive (green ball) phase in both directions on Ohukai Road. The peak hour left-turn demands on Ohukai Road at Piilani Highway do not meet the ITE warrant for exclusive left-turn phases.

2. Recommended Traffic Improvement With Project

Ohukai Road should be restriped/widened, as necessary, to provide an exclusive left-turn lane and a median refuge lane at Huku Lii Place. On-street parking should be prohibited on the south side of Ohukai Road, between Huku Lii Place and Kahakulani Place, to accommodate the proposed left-turn lane.

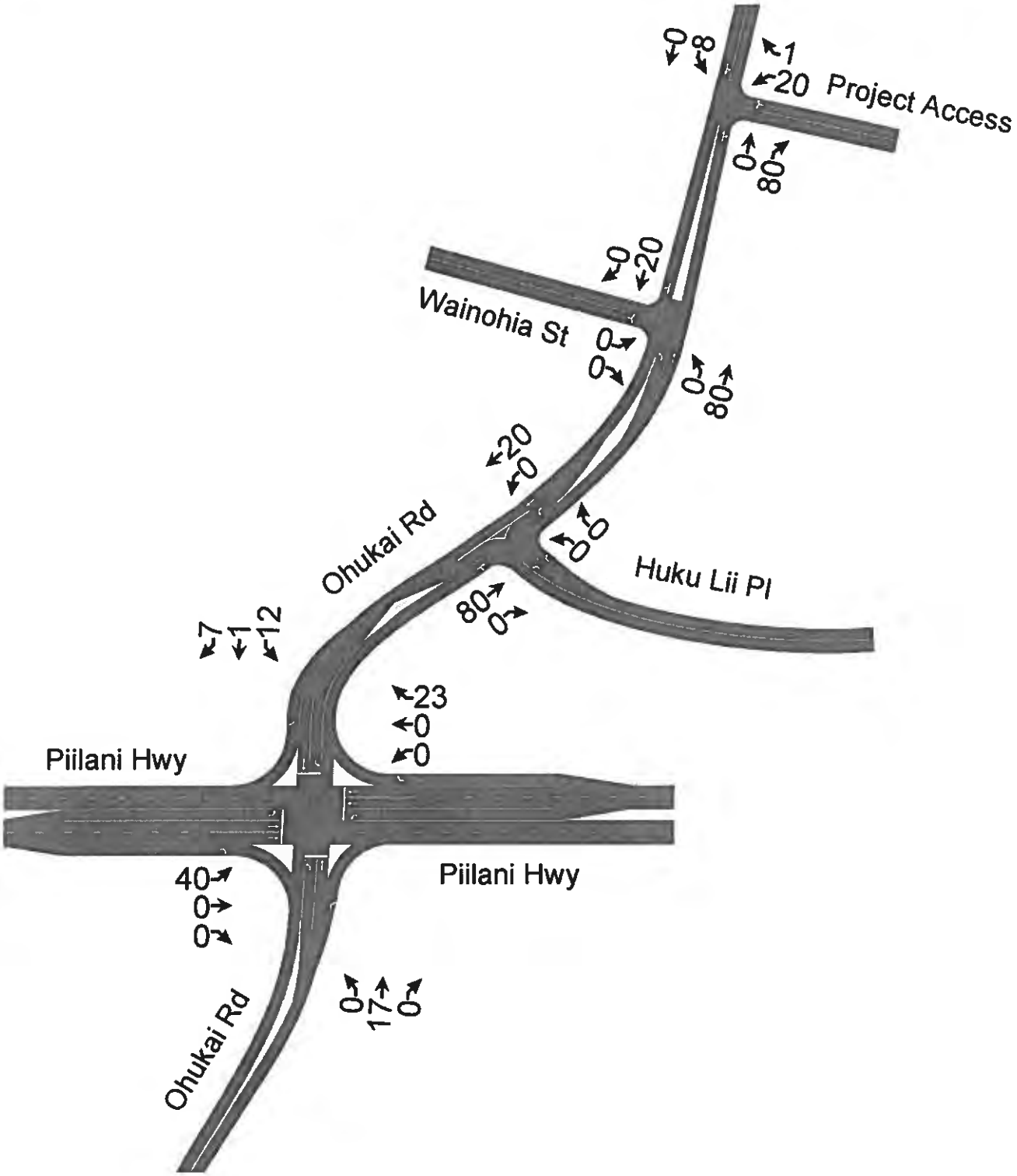

Figure 7. AM Peak Hour Site Traffic Assignment

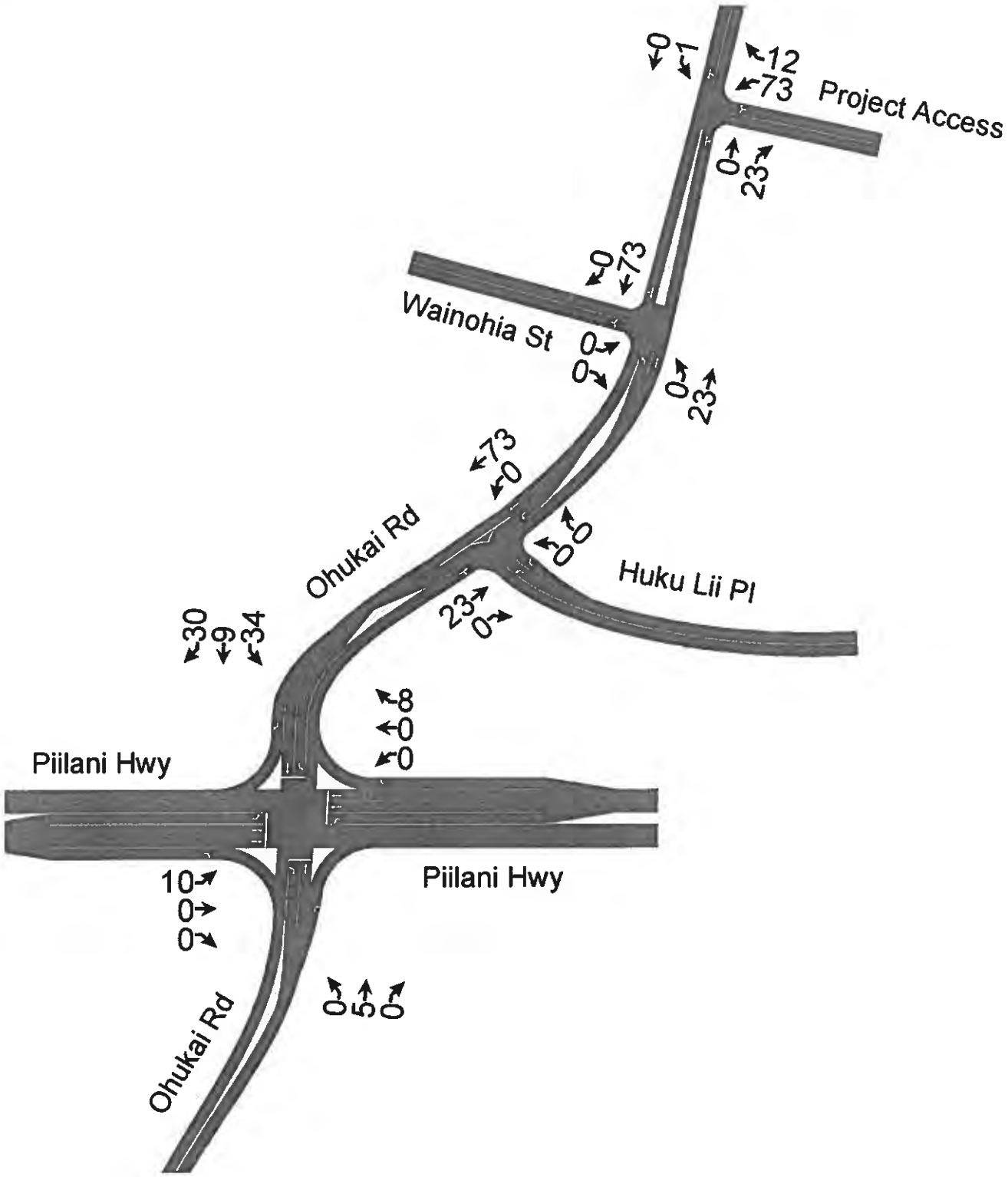

Figure 8. PM Peak Hour Site Traffic Assignment

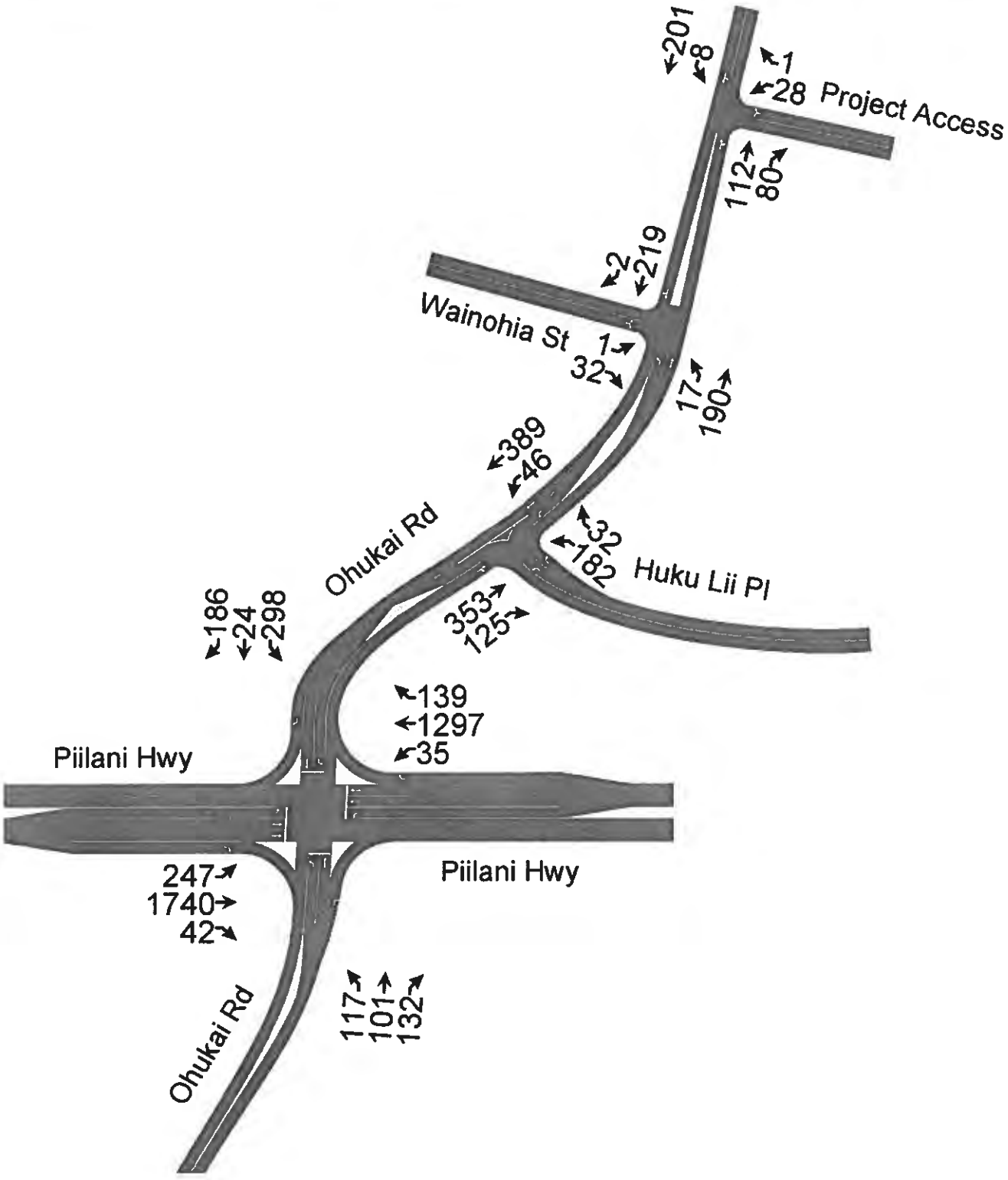

Figure 9. AM Peak Hour Volumes With Project

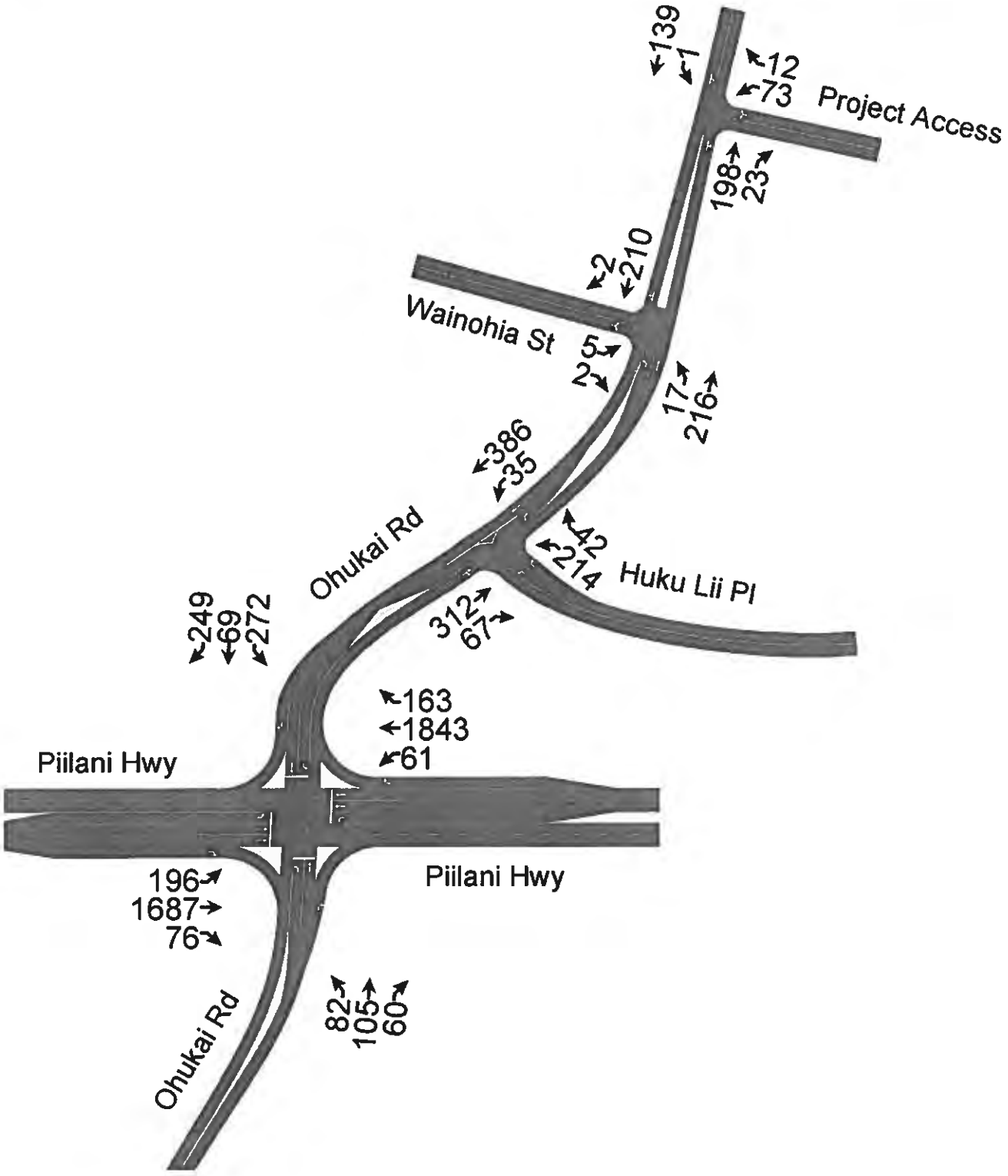

Figure 10. PM Peak Hour Volumes With Project

B. Conclusions

The traffic count data were not updated due to the ongoing pandemic traffic conditions. The traffic count data, collected in 2018 and 2019, are considered to be representative of pre-pandemic traffic conditions.

The trips generated from the proposed project are expected to increase traffic at the intersection of Piilani Highway and Ohukai Road by about two (2) percent, during the AM and PM peak hours of traffic. The traffic movements at the intersection are expected to operate at the same Levels of Service as during the peak hours of traffic without the proposed project. The trips generated by the proposed project are not expected to significantly impact Kahakulani Place, Huaka Place, Wainohia Street, Noe Street, Oe Street, Huaka Street, and Hoalike Street.

The project-generated traffic on Ohukai Road is expected to increase delays on Huku Lii Place traffic. The proposed median refuge lane on Ohukai Road at Huku Lii Place is expected to improve the left-turn movement from Huku Lii Place from LOS "E" to LOS "C". The Project Access Driveway is expected to operate at satisfactory Levels of Service at Ohukai Road, during the peak hours of traffic.

The traffic improvements, recommended herein, are expected to mitigate the traffic impacts, identified in this study. Table 5 summarizes the results of the capacity analysis.

Table 5. Summary of Capacity Analysis

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
Existing AM Peak Hour Traffic	Piilani Hwy & Ohukai Rd	LOS	E	E	B	E	D	A	F	C	A	E	C	A	C
		Delay	69.2	66.1	10.5	68.9	44.6	9.9	93.1	33.5	1.7	74.0	26.4	0.1	34.3
		v/c	0.59	0.48	0.45	0.81	0.07	0.40	0.53	0.73	0.14	0.76	0.77	0.04	0.81 (max.)
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	C	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	10.2	8.1	N/A	22.7	N/A	10.2	N/A	N/A	N/A	4.8
		v/c	N/A	N/A	N/A	0.04	0.03	N/A	0.45	N/A	0.04	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	N/A	A	A
		Delay	7.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.4	N/A	9.4	1.2
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.03	N/A	0.03	N/A
Existing PM Peak Hour Traffic	Piilani Hwy & Ohukai Rd	LOS	F	F	A	F	F	B	F	D	B	F	C	A	D
		Delay	137.6	132.0	7.7	129.0	88.8	12.7	139.3	42.2	11.4	132.9	28.2	4.2	47.3
		v/c	0.67	0.69	0.29	0.86	0.19	0.48	0.62	0.77	0.15	0.83	0.65	0.07	0.86 (max.)
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	C	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	10.1	8.0	N/A	20.9	N/A	10.1	N/A	N/A	N/A	5.4
		v/c	N/A	N/A	N/A	0.05	0.03	N/A	0.47	N/A	0.05	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	N/A	B	A
		Delay	7.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.2	N/A	10.1	0.6
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.01	N/A	0.01	N/A
AM Peak Hour Traffic W/O Project	Piilani Hwy & Ohukai Rd	LOS	E	E	B	F	D	B	F	D	A	F	D	A	D
		Delay	71.9	68.7	14.2	81.9	47.2	10.0	167.2	41.5	2.7	85.2	37.7	0.1	43.6
		v/c	0.65	0.54	0.50	0.90	0.08	0.44	0.88	0.87	0.16	0.86	0.93	0.05	0.93 (max.)
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	D	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	10.6	8.3	N/A	33.9	N/A	10.6	N/A	N/A	N/A	6.7
		v/c	N/A	N/A	N/A	0.05	0.04	N/A	0.62	N/A	0.05	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	N/A	A	A
		Delay	7.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.6	N/A	9.6	1.2
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.04	N/A	0.04	N/A
PM Peak Hour Traffic W/O Project	Piilani Hwy & Ohukai Rd	LOS	F	F	B	F	F	C	F	E	B	F	D	A	E
		Delay	145.5	138.3	10.8	143.5	93.2	27.4	145.5	58.7	12.9	152.7	36.4	5.5	59.0
		v/c	0.73	0.73	0.32	0.94	0.21	0.57	0.67	0.94	0.17	0.94	0.78	0.08	0.94 (max.)
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	D	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	10.5	8.1	N/A	32.1	N/A	10.5	N/A	N/A	N/A	7.9
		v/c	N/A	N/A	N/A	0.07	0.03	N/A	0.65	N/A	0.07	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	N/A	B	A
		Delay	7.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	10.7	N/A	10.7	0.6
		v/c	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.01	N/A	0.01	N/A

Table 5. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
AM Peak Hour Traffic With Project	Piilani Hwy & Ohukai Rd	LOS	E	E	B	F	D	A	F	D	A	F	D	A	Intersection LOS: D
		Delay	72.8	69.8	13.3	91.1	46.7	9.7	171.8	47.3	4.6	94.9	39.6	0.1	Signal Delay: 47.7
		v/c	0.65	0.58	0.48	0.95	0.08	0.44	0.88	0.92	0.20	0.93	0.94	0.05	Maximum v/c Ratio: 0.95
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	E	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	11.3	8.6	N/A	47.4	N/A	11.3	N/A	N/A	N/A	8.3
		v/c	N/A	N/A	N/A	0.06	0.05	N/A	0.72	N/A	0.06	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	N/A	A
		Delay	7.7	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	9.6	N/A	0.9
		v/c	0.01	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.04	N/A	N/A
	Project Access & Ohukai Rd	LOS	N/A	N/A	N/A	A	A	N/A	N/A	B	N/A	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	7.7	0.0	N/A	N/A	11.3	N/A	N/A	N/A	N/A	0.9
		v/c	N/A	N/A	N/A	0.01	-	N/A	N/A	0.05	N/A	N/A	N/A	N/A	N/A
PM Peak Hour Traffic With Project	Piilani Hwy & Ohukai Rd	LOS	F	F	B	F	F	C	F	E	B	F	D	A	Intersection LOS: E
		Delay	146.3	139.3	10.6	147.9	90.7	33.7	146.3	65.6	14.6	163.2	39.8	5.9	64.6
		v/c	0.73	0.74	0.31	0.98	0.22	0.61	0.67	0.97	0.18	0.99	0.80	0.08	Maximum v/c Ratio: 0.99
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	B	A	N/A	E	N/A	B	N/A	N/A	N/A	B
		Delay	N/A	N/A	N/A	10.7	8.2	N/A	45.3	N/A	10.7	N/A	N/A	N/A	9.9
		v/c	N/A	N/A	N/A	0.07	0.03	N/A	0.76	N/A	0.07	N/A	N/A	N/A	N/A
	Ohukai Rd & Wainohia St	LOS	A	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	N/A	A
		Delay	7.7	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	11.5	N/A	0.5
		v/c	0.02	-	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.01	N/A	N/A
	Project Access & Ohukai Rd	LOS	N/A	N/A	N/A	A	A	N/A	N/A	B	N/A	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	7.7	0.0	N/A	N/A	11.6	N/A	N/A	N/A	N/A	2.2
		v/c	N/A	N/A	N/A	0.00	-	N/A	N/A	0.14	N/A	N/A	N/A	N/A	N/A

Table 5. Summary of Capacity Analysis (Cont'd.)

Scenario	Intersection	MOE	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	Intersection
AM Peak Hour Traffic With Project With Improvements	Piilani Hwy & Ohukai Rd	LOS	D	D	B	F	D	A	F	D	A	F	C	A	Intersection LOS: D
		Delay	44.0	41.2	18.4	83.4	38.5	6.9	99.0	39.7	7.1	86.0	29.7	2.5	38.5
		v/c	0.32	0.22	0.29	0.92	0.05	0.35	0.55	0.83	0.19	0.87	0.86	0.04	Maximum v/c Ratio: 0.92
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	A	-	N/A	C	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.6	-	N/A	18.0	N/A	11.3	N/A	N/A	N/A	3.6
		v/c	N/A	N/A	N/A	0.05	-	N/A	0.41	N/A	0.06	N/A	N/A	N/A	N/A
PM Peak Hour Traffic With Project With Improvements	Piilani Hwy & Ohukai Rd	LOS	E	E	C	F	E	C	F	E	B	F	D	B	Intersection LOS: E
		Delay	79.0	77.1	24.3	139.6	74.8	26.9	149.1	64.6	17.7	157.6	38.2	11.0	60.3
		v/c	0.27	0.24	0.15	0.99	0.15	0.49	0.67	0.96	0.18	0.96	0.79	0.08	Maximum v/c Ratio: 0.99
	Huku Lii Pl & Ohukai Rd	LOS	N/A	N/A	N/A	A	-	N/A	C	N/A	B	N/A	N/A	N/A	A
		Delay	N/A	N/A	N/A	8.2	-	N/A	18.3	N/A	10.7	N/A	N/A	N/A	4.4
		v/c	N/A	N/A	N/A	0.03	-	N/A	0.47	N/A	0.07	N/A	N/A	N/A	N/A

Legend

MOE – Measure of Effectiveness
LOS – Level of Service
Delay – Average Delay (seconds/vehicle)
v/c – Volume-to-Capacity Ratio
N/A – Not Applicable

EBL – Eastbound Left-Turn Movement
EBT – Eastbound Through Movement
EBR – Eastbound Right-Turn Movement
WBL – Westbound Left-Turn Movement
WBT – Westbound Through Movement
WBR – Westbound Right-Turn Movement

NBL – Northbound Left-Turn Movement
NBT – Northbound Through Movement
NBR – Northbound Right-Turn Movement
SBL – Southbound Left-Turn Movement
SBT – Southbound Through Movement
SBR – Southbound Right-Turn Movement

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

APPENDIX A

TRAFFIC COUNT DATA

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019

Turning Movement Data

Start Time	Ohukai Rd Eastbound					Ohukai Rd Westbound					Piilani Hwy Northbound					Piilani Hwy Southbound					Int. Total
	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	
6:30 AM	11	11	12	0	34	55	2	38	0	95	5	197	8	1	210	25	266	2	0	293	632
6:45 AM	25	10	7	0	42	40	7	28	0	75	7	232	16	3	255	32	335	3	0	370	742
Hourly Total	36	21	19	0	76	95	9	66	0	170	12	429	24	4	465	57	601	5	0	663	1374
7:00 AM	29	15	12	0	56	38	8	42	0	88	8	223	12	2	243	23	294	8	0	325	712
7:15 AM	35	14	28	0	77	57	2	43	0	102	9	298	24	1	331	37	371	8	0	416	926
7:30 AM	30	22	33	0	85	79	9	41	5	129	5	241	18	5	264	37	372	3	0	412	890
7:45 AM	16	21	34	0	71	65	5	32	0	102	7	287	27	2	321	46	365	11	0	422	916
Hourly Total	110	72	107	0	289	239	24	158	5	421	29	1049	81	10	1159	143	1402	30	0	1575	3444
8:00 AM	19	16	20	0	55	48	4	38	0	90	9	284	32	0	325	54	338	14	0	406	876
8:15 AM	16	22	14	0	52	44	8	39	0	91	12	248	27	3	287	55	294	15	0	364	794
8:30 AM	24	16	12	0	52	32	11	43	0	86	9	297	33	1	339	36	296	11	0	343	820
8:45 AM	17	27	15	2	59	45	9	42	1	96	4	247	25	2	276	54	296	6	0	356	787
Hourly Total	76	81	61	2	218	169	32	162	1	363	34	1076	117	6	1227	199	1224	46	0	1469	3277
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	19	15	18	0	52	49	13	36	0	98	14	347	33	4	394	31	360	18	0	409	953
3:15 PM	11	23	16	0	50	54	16	38	0	108	15	319	45	5	379	33	378	21	0	432	969
3:30 PM	22	21	18	1	61	67	15	63	0	145	16	391	34	1	441	21	349	15	0	385	1032
3:45 PM	9	16	12	0	37	39	11	39	1	89	9	422	30	0	461	34	362	17	0	413	1000
Hourly Total	61	75	64	1	200	209	55	176	1	440	54	1479	142	10	1675	119	1449	71	0	1639	3954
4:00 PM	16	23	12	0	51	69	16	49	0	134	14	374	40	3	428	32	302	18	0	352	965
4:15 PM	22	10	19	0	51	39	15	38	0	92	13	358	36	0	407	40	393	20	0	453	1003
4:30 PM	20	28	18	0	66	55	13	58	0	126	20	358	28	1	406	30	331	14	0	375	973
4:45 PM	25	13	14	0	52	45	13	42	0	100	8	396	34	0	438	37	418	13	0	468	1058
Hourly Total	83	74	63	0	220	208	57	187	0	452	55	1486	138	4	1679	139	1444	65	0	1648	3999
5:00 PM	28	28	18	0	74	56	17	57	0	130	20	275	18	1	313	31	330	16	0	377	894
5:15 PM	16	10	16	0	42	32	11	41	0	84	6	387	29	3	422	24	399	15	0	438	986
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	44	38	34	0	116	88	28	98	0	214	26	662	47	4	735	55	729	31	0	815	1880
6:30 AM	17	7	17	0	41	48	5	37	0	90	3	178	14	1	195	22	294	4	0	320	646
6:45 AM	31	14	10	0	55	34	8	30	0	72	6	223	13	2	242	33	299	5	0	337	706
Hourly Total	48	21	27	0	96	82	13	67	0	162	9	401	27	3	437	55	593	9	0	657	1352
7:00 AM	34	10	14	0	58	39	2	32	1	73	3	269	11	0	283	28	289	5	0	322	736
7:15 AM	32	14	25	0	71	48	5	52	0	105	6	254	16	1	276	30	370	6	0	406	858
7:30 AM	18	18	30	0	66	76	8	37	2	121	7	270	17	2	294	38	372	6	0	416	897
7:45 AM	18	23	27	0	68	57	3	37	0	97	7	269	27	5	303	56	345	8	0	409	877
Hourly Total	102	65	96	0	263	220	18	158	3	396	23	1062	71	8	1156	152	1376	25	0	1553	3368
8:00 AM	15	19	23	0	57	51	9	47	0	107	7	298	31	1	336	49	364	3	0	416	916
8:15 AM	13	12	10	0	35	32	5	41	0	78	6	271	26	2	303	40	371	9	0	420	836
8:30 AM	19	15	20	0	54	35	11	36	0	82	15	287	32	0	334	31	312	7	0	350	820

8:45 AM	15	21	10	0	46	39	7	29	0	75	14	236	15	0	265	44	264	6	0	314	700
Hourly Total	62	67	63	0	192	157	32	153	0	342	42	1092	104	3	1238	164	1311	25	0	1500	3272
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	12	16	19	0	47	35	15	37	0	87	8	327	26	2	361	19	345	20	0	384	879
3:15 PM	16	8	14	0	38	40	12	39	0	91	15	364	35	2	414	30	370	17	2	417	960
3:30 PM	20	19	16	0	55	46	15	52	0	115	9	338	34	5	381	28	397	19	0	444	995
3:45 PM	12	23	14	0	49	45	5	48	0	98	10	397	23	0	430	41	350	15	0	406	983
Hourly Total	60	66	63	0	189	168	47	176	0	391	42	1426	118	9	1586	118	1462	71	2	1651	3817
4:00 PM	24	22	15	0	61	73	15	37	0	125	8	389	41	2	438	32	301	17	0	350	974
4:15 PM	10	18	11	0	39	42	8	46	0	96	14	408	34	1	456	52	384	14	0	450	1041
4:30 PM	16	29	16	1	61	44	11	65	0	120	21	328	29	0	378	37	345	16	0	398	957
4:45 PM	19	18	10	0	47	48	18	37	0	103	10	417	31	1	458	38	402	18	0	458	1066
Hourly Total	69	87	52	1	208	207	52	185	0	444	53	1542	135	4	1730	159	1432	65	0	1656	4038
5:00 PM	22	23	18	1	63	67	14	71	1	152	7	288	28	4	323	42	315	19	0	376	914
5:15 PM	9	16	14	0	39	36	11	40	0	87	12	392	20	1	424	27	428	17	0	472	1022
Grand Total	782	706	681	5	2169	1945	392	1697	11	4034	398	12384	1052	70	13834	1429	13766	479	2	15674	35711
Approach %	36.1	32.5	31.4	-	-	48.2	9.7	42.1	-	-	2.9	89.5	7.6	-	-	9.1	87.8	3.1	-	-	-
Total %	2.2	2.0	1.9	-	6.1	5.4	1.1	4.8	-	11.3	1.1	34.7	2.9	-	38.7	4.0	38.5	1.3	-	43.9	-
Motorcycles	5	13	6	-	24	12	2	11	-	25	0	44	6	-	50	8	55	2	-	65	164
% Motorcycles	0.6	1.8	0.9	-	1.1	0.6	0.5	0.6	-	0.6	0.0	0.4	0.6	-	0.4	0.6	0.4	0.4	-	0.4	0.5
Cars	541	462	512	-	1515	1386	263	1199	-	2848	299	9275	795	-	10369	955	10132	423	-	11510	26242
% Cars	69.2	65.4	75.2	-	69.8	71.3	67.1	70.7	-	70.6	75.1	74.9	75.6	-	75.0	66.8	73.6	88.3	-	73.4	73.5
Light Goods Vehicles	221	215	150	-	586	513	117	444	-	1074	85	2841	238	-	3164	428	3303	45	-	3776	8600
% Light Goods Vehicles	28.3	30.5	22.0	-	27.0	26.4	29.8	26.2	-	26.6	21.4	22.9	22.6	-	22.9	30.0	24.0	9.4	-	24.1	24.1
Buses	6	7	8	-	21	10	4	12	-	26	7	69	2	-	78	6	71	5	-	82	207
% Buses	0.8	1.0	1.2	-	1.0	0.5	1.0	0.7	-	0.6	1.8	0.6	0.2	-	0.6	0.4	0.5	1.0	-	0.5	0.6
Single-Unit Trucks	8	8	3	-	19	20	3	23	-	46	6	122	7	-	135	27	168	4	-	199	399
% Single-Unit Trucks	1.0	1.1	0.4	-	0.9	1.0	0.8	1.4	-	1.1	1.5	1.0	0.7	-	1.0	1.9	1.2	0.8	-	1.3	1.1
Articulated Trucks	0	0	1	-	1	0	0	6	-	6	1	17	0	-	18	5	33	0	-	38	63
% Articulated Trucks	0.0	0.0	0.1	-	0.0	0.0	0.0	0.4	-	0.1	0.3	0.1	0.0	-	0.1	0.3	0.2	0.0	-	0.2	0.2
Bicycles on Road	1	1	1	-	3	4	3	2	-	9	0	16	4	-	20	0	4	0	-	4	36
% Bicycles on Road	0.1	0.1	0.1	-	0.1	0.2	0.8	0.1	-	0.2	0.0	0.1	0.4	-	0.1	0.0	0.0	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	2	-	-	-	-	4	-	-	-	-	16	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	40.0	-	-	-	-	36.4	-	-	-	-	22.9	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	3	-	-	-	-	7	-	-	-	-	54	-	-	-	-	2	-	-
% Pedestrians	-	-	-	60.0	-	-	-	-	63.6	-	-	-	-	77.1	-	-	-	-	100.0	-	-

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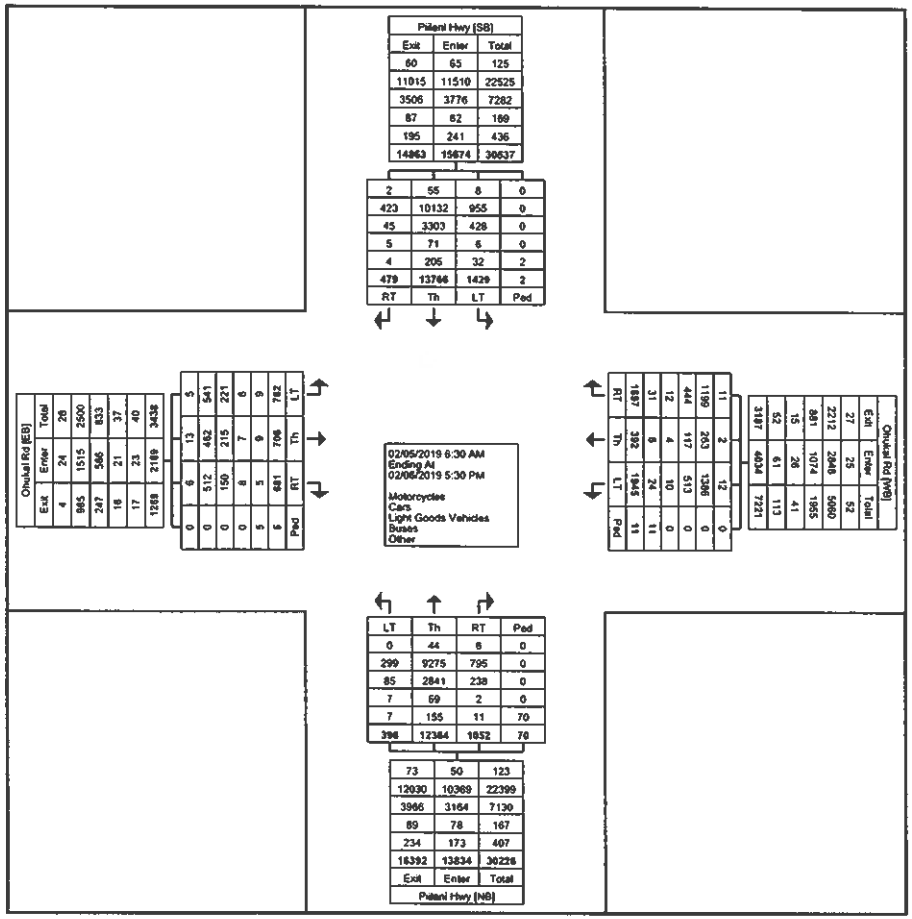
Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019



Turning Movement Data Plot

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Ohukai Rd Eastbound					Ohukai Rd Westbound					Piilani Hwy Northbound					Piilani Hwy Southbound					Int. Total
	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	
7:15 AM	35	14	28	0	77	57	2	43	0	102	9	298	24	1	331	37	371	8	0	416	926
7:30 AM	30	22	33	0	85	79	9	41	5	129	5	241	18	5	264	37	372	3	0	412	890
7:45 AM	16	21	34	0	71	65	5	32	0	102	7	287	27	2	321	46	365	11	0	422	916
8:00 AM	19	16	20	0	55	48	4	38	0	90	9	284	32	0	325	54	338	14	0	406	876
Total	100	73	115	0	288	249	20	154	5	423	30	1110	101	8	1241	174	1446	36	0	1656	3608
Approach %	34.7	25.3	39.9	-	-	58.9	4.7	36.4	-	-	2.4	89.4	8.1	-	-	10.5	87.3	2.2	-	-	-
Total %	2.8	2.0	3.2	-	8.0	6.9	0.6	4.3	-	11.7	0.8	30.8	2.8	-	34.4	4.8	40.1	1.0	-	45.9	-
PHF	0.714	0.830	0.846	-	0.847	0.788	0.556	0.895	-	0.820	0.833	0.931	0.789	-	0.937	0.806	0.972	0.643	-	0.981	0.974
Motorcycles	0	2	3	-	5	0	0	0	-	0	0	3	0	-	3	0	3	0	-	3	11
% Motorcycles	0.0	2.7	2.6	-	1.7	0.0	0.0	0.0	-	0.0	0.0	0.3	0.0	-	0.2	0.0	0.2	0.0	-	0.2	0.3
Cars	75	47	86	-	208	163	13	112	-	288	22	899	72	-	993	122	989	28	-	1139	2628
% Cars	75.0	64.4	74.8	-	72.2	65.5	65.0	72.7	-	68.1	73.3	81.0	71.3	-	80.0	70.1	68.4	77.8	-	68.8	72.8
Light Goods Vehicles	25	21	26	-	72	79	6	38	-	123	8	181	28	-	217	51	413	7	-	471	883
% Light Goods Vehicles	25.0	28.8	22.6	-	25.0	31.7	30.0	24.7	-	29.1	26.7	16.3	27.7	-	17.5	29.3	28.6	19.4	-	28.4	24.5
Buses	0	0	0	-	0	2	0	0	-	2	0	11	0	-	11	0	6	0	-	6	19
% Buses	0.0	0.0	0.0	-	0.0	0.8	0.0	0.0	-	0.5	0.0	1.0	0.0	-	0.9	0.0	0.4	0.0	-	0.4	0.5
Single-Unit Trucks	0	3	0	-	3	4	1	4	-	9	0	12	1	-	13	1	30	1	-	32	57
% Single-Unit Trucks	0.0	4.1	0.0	-	1.0	1.6	5.0	2.6	-	2.1	0.0	1.1	1.0	-	1.0	0.6	2.1	2.8	-	1.9	1.6
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	0	5	0	-	5	6
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.1	0.0	-	0.1	0.0	0.3	0.0	-	0.3	0.2
Bicycles on Road	0	0	0	-	0	1	0	0	-	1	0	3	0	-	3	0	0	0	-	0	4
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.4	0.0	0.0	-	0.2	0.0	0.3	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	4	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	0.0	-	-	-	-	50.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	5	-	-	-	-	4	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	100.0	-	-	-	-	50.0	-	-	-	-	-	-	-

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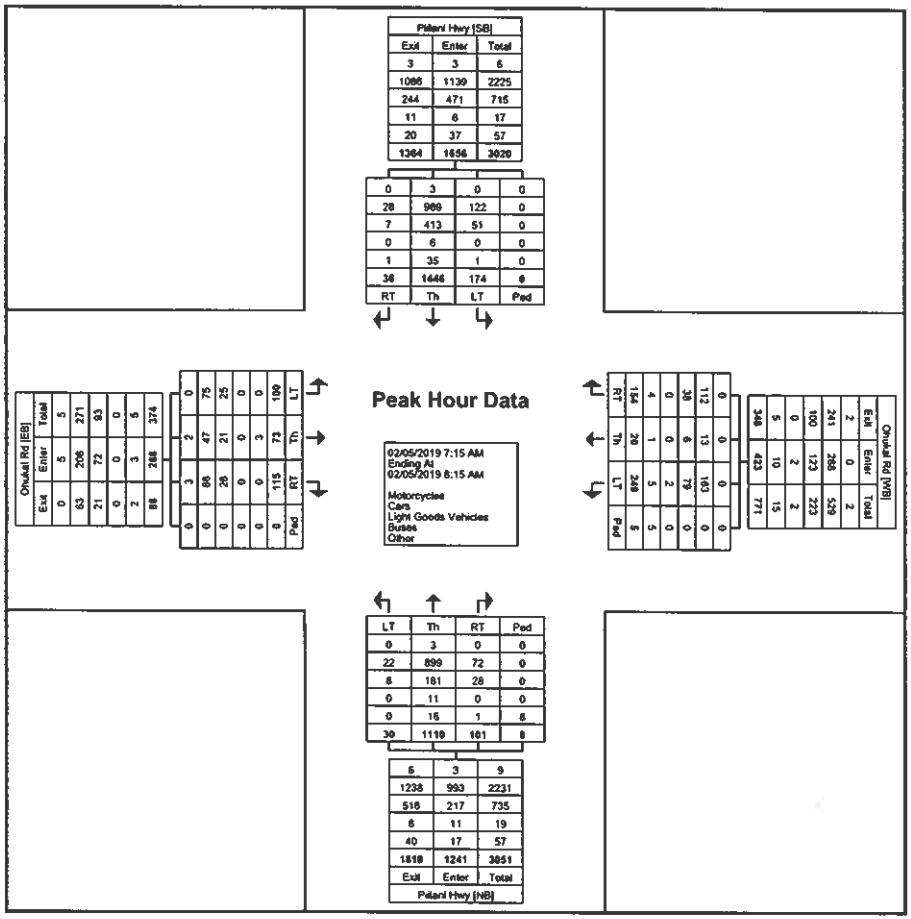
Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019



Turning Movement Peak Hour Data Plot (7:15 AM)

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019

Turning Movement Peak Hour Data (3:30 PM)

Start Time	Ohukai Rd Eastbound					Ohukai Rd Westbound					Piilani Hwy Northbound					Piilani Hwy Southbound					
	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
3:30 PM	22	21	18	1	61	67	15	63	0	145	16	391	34	1	441	21	349	15	0	385	1032
3:45 PM	9	16	12	0	37	39	11	39	1	89	9	422	30	0	461	34	362	17	0	413	1000
4:00 PM	16	23	12	0	51	69	16	49	0	134	14	374	40	3	428	32	302	18	0	352	965
4:15 PM	22	10	19	0	51	39	15	38	0	92	13	358	36	0	407	40	393	20	0	453	1003
Total	69	70	61	1	200	214	57	189	1	460	52	1545	140	4	1737	127	1406	70	0	1603	4000
Approach %	34.5	35.0	30.5	-	-	46.5	12.4	41.1	-	-	3.0	88.9	8.1	-	-	7.9	87.7	4.4	-	-	-
Total %	1.7	1.8	1.5	-	5.0	5.4	1.4	4.7	-	11.5	1.3	38.6	3.5	-	43.4	3.2	35.2	1.8	-	40.1	-
PHF	0.784	0.761	0.803	-	0.820	0.775	0.891	0.750	-	0.793	0.813	0.915	0.875	-	0.942	0.794	0.894	0.875	-	0.885	0.969
Motorcycles	1	3	0	-	4	1	0	3	-	4	0	4	0	-	4	1	5	0	-	6	18
% Motorcycles	1.4	4.3	0.0	-	2.0	0.5	0.0	1.6	-	0.9	0.0	0.3	0.0	-	0.2	0.8	0.4	0.0	-	0.4	0.5
Cars	46	44	47	-	137	162	41	134	-	337	42	1125	112	-	1279	90	1123	64	-	1277	3030
% Cars	66.7	62.9	77.0	-	68.5	75.7	71.9	70.9	-	73.3	80.8	72.8	80.0	-	73.6	70.9	79.9	91.4	-	79.7	75.8
Light Goods Vehicles	21	23	13	-	57	51	13	50	-	114	10	398	28	-	436	33	266	6	-	305	912
% Light Goods Vehicles	30.4	32.9	21.3	-	28.5	23.8	22.8	26.5	-	24.8	19.2	25.8	20.0	-	25.1	26.0	18.9	8.6	-	19.0	22.8
Buses	0	0	1	-	1	0	2	0	-	2	0	2	0	-	2	1	5	0	-	6	11
% Buses	0.0	0.0	1.6	-	0.5	0.0	3.5	0.0	-	0.4	0.0	0.1	0.0	-	0.1	0.8	0.4	0.0	-	0.4	0.3
Single-Unit Trucks	1	0	0	-	1	0	0	2	-	2	0	16	0	-	16	2	6	0	-	8	27
% Single-Unit Trucks	1.4	0.0	0.0	-	0.5	0.0	0.0	1.1	-	0.4	0.0	1.0	0.0	-	0.9	1.6	0.4	0.0	-	0.5	0.7
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	1	0	-	1	0	0	0	-	0	0	1	0	-	1	2
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	1.8	0.0	-	0.2	0.0	0.0	0.0	-	0.0	0.0	0.1	0.0	-	0.1	0.1
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	0.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	4	-	-	-	-	0	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	100.0	-	-	-	-	-	-	-

The Traffic Management Consultant
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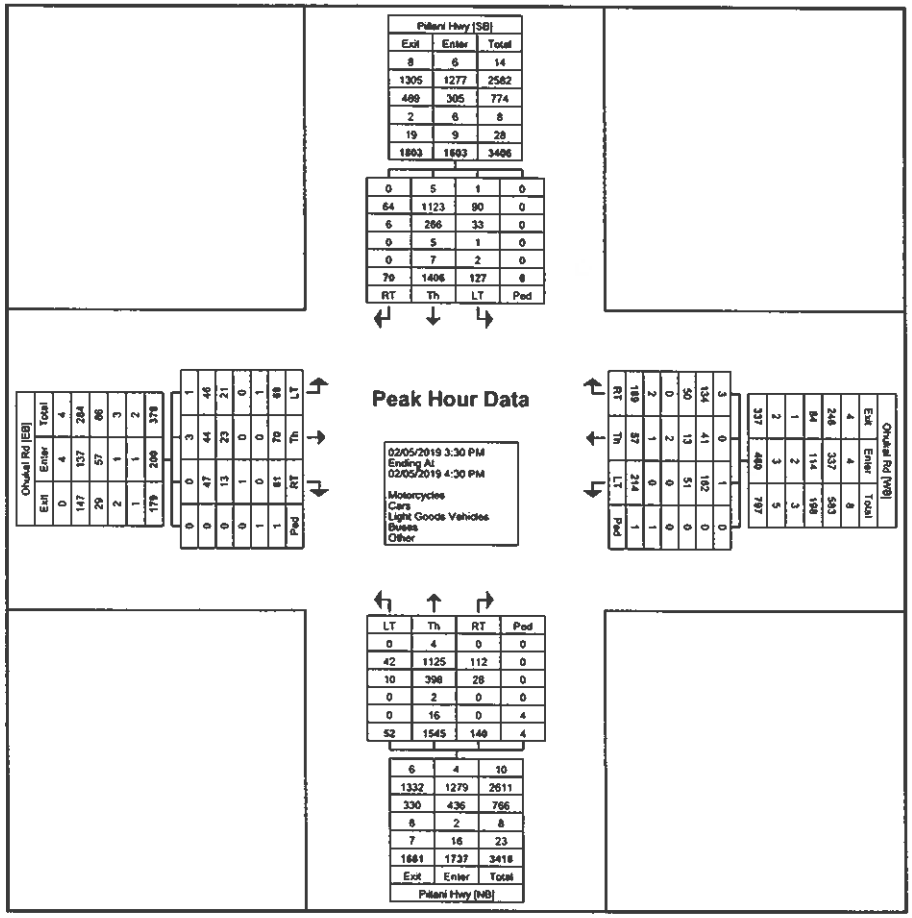
Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019



Turning Movement Peak Hour Data Plot (3:30 PM)

The Traffic Management Consultant
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Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Ohukai Rd Eastbound					Ohukai Rd Westbound					Piilani Hwy Northbound					Piilani Hwy Southbound					
	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Int. Total
7:15 AM	32	14	25	0	71	48	5	52	0	105	6	254	16	1	276	30	370	6	0	406	858
7:30 AM	18	18	30	0	66	76	8	37	2	121	7	270	17	2	294	38	372	6	0	416	897
7:45 AM	18	23	27	0	68	57	3	37	0	97	7	269	27	5	303	56	345	8	0	409	877
8:00 AM	15	19	23	0	57	51	9	47	0	107	7	298	31	1	336	49	364	3	0	416	916
Total	83	74	105	0	262	232	25	173	2	430	27	1091	91	9	1209	173	1451	23	0	1647	3548
Approach %	31.7	28.2	40.1	-	-	54.0	5.8	40.2	-	-	2.2	90.2	7.5	-	-	10.5	88.1	1.4	-	-	-
Total %	2.3	2.1	3.0	-	7.4	6.5	0.7	4.9	-	12.1	0.8	30.7	2.6	-	34.1	4.9	40.9	0.6	-	46.4	-
PHF	0.648	0.804	0.875	-	0.923	0.763	0.694	0.832	-	0.888	0.964	0.915	0.734	-	0.900	0.772	0.975	0.719	-	0.990	0.968
Motorcycles	0	0	1	-	1	0	0	2	-	2	0	5	1	-	6	1	4	0	-	5	14
% Motorcycles	0.0	0.0	1.0	-	0.4	0.0	0.0	1.2	-	0.5	0.0	0.5	1.1	-	0.5	0.6	0.3	0.0	-	0.3	0.4
Cars	66	51	82	-	199	163	15	111	-	289	24	835	73	-	932	118	988	19	-	1125	2545
% Cars	79.5	68.9	78.1	-	76.0	70.3	60.0	64.2	-	67.2	88.9	76.5	80.2	-	77.1	68.2	68.1	82.6	-	68.3	71.7
Light Goods Vehicles	16	22	20	-	58	62	9	53	-	124	2	227	17	-	246	45	426	3	-	474	902
% Light Goods Vehicles	19.3	29.7	19.0	-	22.1	26.7	36.0	30.6	-	28.8	7.4	20.8	18.7	-	20.3	26.0	29.4	13.0	-	28.8	25.4
Buses	0	1	0	-	1	2	0	1	-	3	0	13	0	-	13	1	6	0	-	7	24
% Buses	0.0	1.4	0.0	-	0.4	0.9	0.0	0.6	-	0.7	0.0	1.2	0.0	-	1.1	0.6	0.4	0.0	-	0.4	0.7
Single-Unit Trucks	1	0	1	-	2	4	1	3	-	8	1	7	0	-	8	7	18	1	-	26	44
% Single-Unit Trucks	1.2	0.0	1.0	-	0.8	1.7	4.0	1.7	-	1.9	3.7	0.6	0.0	-	0.7	4.0	1.2	4.3	-	1.6	1.2
Articulated Trucks	0	0	0	-	0	0	0	3	-	3	0	2	0	-	2	1	8	0	-	9	14
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	1.7	-	0.7	0.0	0.2	0.0	-	0.2	0.6	0.6	0.0	-	0.5	0.4
Bicycles on Road	0	0	1	-	1	1	0	0	-	1	0	2	0	-	2	0	1	0	-	1	5
% Bicycles on Road	0.0	0.0	1.0	-	0.4	0.4	0.0	0.0	-	0.2	0.0	0.2	0.0	-	0.2	0.0	0.1	0.0	-	0.1	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	2	-	-	-	-	4	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	100.0	-	-	-	-	44.4	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	5	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	0.0	-	-	-	-	55.6	-	-	-	-	-	-	-

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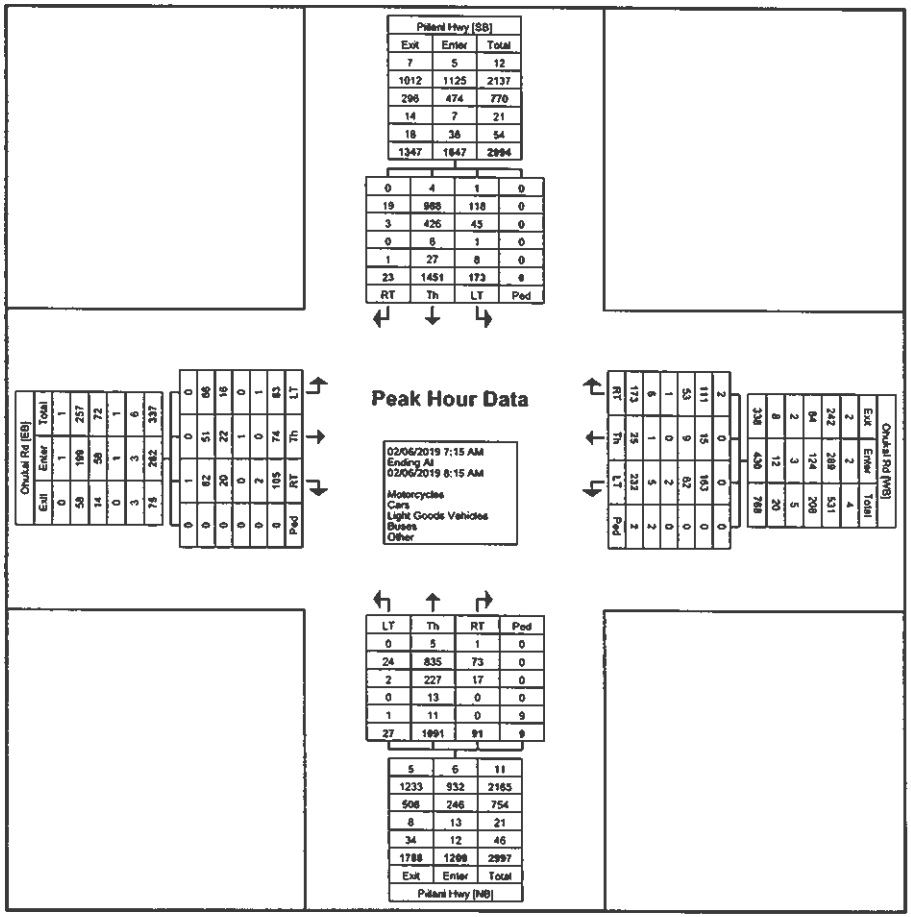
Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019
Page No: 9



Turning Movement Peak Hour Data Plot (7:15 AM)

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Honolulu, Hawaii, United States 96813
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Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019

Turning Movement Peak Hour Data (4:00 PM)

Start Time	Ohukai Rd Eastbound					Ohukai Rd Westbound					Piilani Hwy Northbound					Piilani Hwy Southbound					Int. Total
	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Right-Turn	Peds	App. Total	
4:00 PM	24	22	15	0	61	73	15	37	0	125	8	389	41	2	438	32	301	17	0	350	974
4:15 PM	10	18	11	0	39	42	8	46	0	96	14	408	34	1	456	52	384	14	0	450	1041
4:30 PM	16	29	16	1	61	44	11	65	0	120	21	328	29	0	378	37	345	16	0	398	957
4:45 PM	19	18	10	0	47	48	18	37	0	103	10	417	31	1	458	38	402	18	0	458	1066
Total	69	87	52	1	208	207	52	185	0	444	53	1542	135	4	1730	159	1432	65	0	1656	4038
Approach %	33.2	41.8	25.0	-	-	46.6	11.7	41.7	-	-	3.1	89.1	7.8	-	-	9.6	86.5	3.9	-	-	-
Total %	1.7	2.2	1.3	-	5.2	5.1	1.3	4.6	-	11.0	1.3	38.2	3.3	-	42.8	3.9	35.5	1.6	-	41.0	-
PHF	0.719	0.750	0.813	-	0.852	0.709	0.722	0.712	-	0.888	0.631	0.924	0.823	-	0.944	0.764	0.891	0.903	-	0.904	0.947
Motorcycles	3	0	0	-	3	4	0	0	-	4	0	2	0	-	2	1	10	1	-	12	21
% Motorcycles	4.3	0.0	0.0	-	1.4	1.9	0.0	0.0	-	0.9	0.0	0.1	0.0	-	0.1	0.6	0.7	1.5	-	0.7	0.5
Cars	37	55	43	-	135	152	33	131	-	316	42	1142	97	-	1281	110	1147	60	-	1317	3049
% Cars	53.6	63.2	82.7	-	64.9	73.4	63.5	70.8	-	71.2	79.2	74.1	71.9	-	74.0	69.2	80.1	92.3	-	79.5	75.5
Light Goods Vehicles	26	30	9	-	65	51	19	51	-	121	9	386	37	-	432	47	262	4	-	313	931
% Light Goods Vehicles	37.7	34.5	17.3	-	31.3	24.6	36.5	27.6	-	27.3	17.0	25.0	27.4	-	25.0	29.6	18.3	6.2	-	18.9	23.1
Buses	0	1	0	-	1	0	0	1	-	1	0	3	0	-	3	0	11	0	-	11	16
% Buses	0.0	1.1	0.0	-	0.5	0.0	0.0	0.5	-	0.2	0.0	0.2	0.0	-	0.2	0.0	0.8	0.0	-	0.7	0.4
Single-Unit Trucks	3	1	0	-	4	0	0	1	-	1	2	7	1	-	10	0	2	0	-	2	17
% Single-Unit Trucks	4.3	1.1	0.0	-	1.9	0.0	0.0	0.5	-	0.2	3.8	0.5	0.7	-	0.6	0.0	0.1	0.0	-	0.1	0.4
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	1	0	0	-	1	1
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.6	0.0	0.0	-	0.1	0.0
Bicycles on Road	0	0	0	-	0	0	0	1	-	1	0	2	0	-	2	0	0	0	-	0	3
% Bicycles on Road	0.0	0.0	0.0	-	0.0	0.0	0.0	0.5	-	0.2	0.0	0.1	0.0	-	0.1	0.0	0.0	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	1	-	-	-	-	0	-	-	-	-	1	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	100.0	-	-	-	-	-	-	-	-	-	25.0	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	3	-	-	-	-	0	-	-
% Pedestrians	-	-	-	0.0	-	-	-	-	-	-	-	-	-	75.0	-	-	-	-	-	-	-

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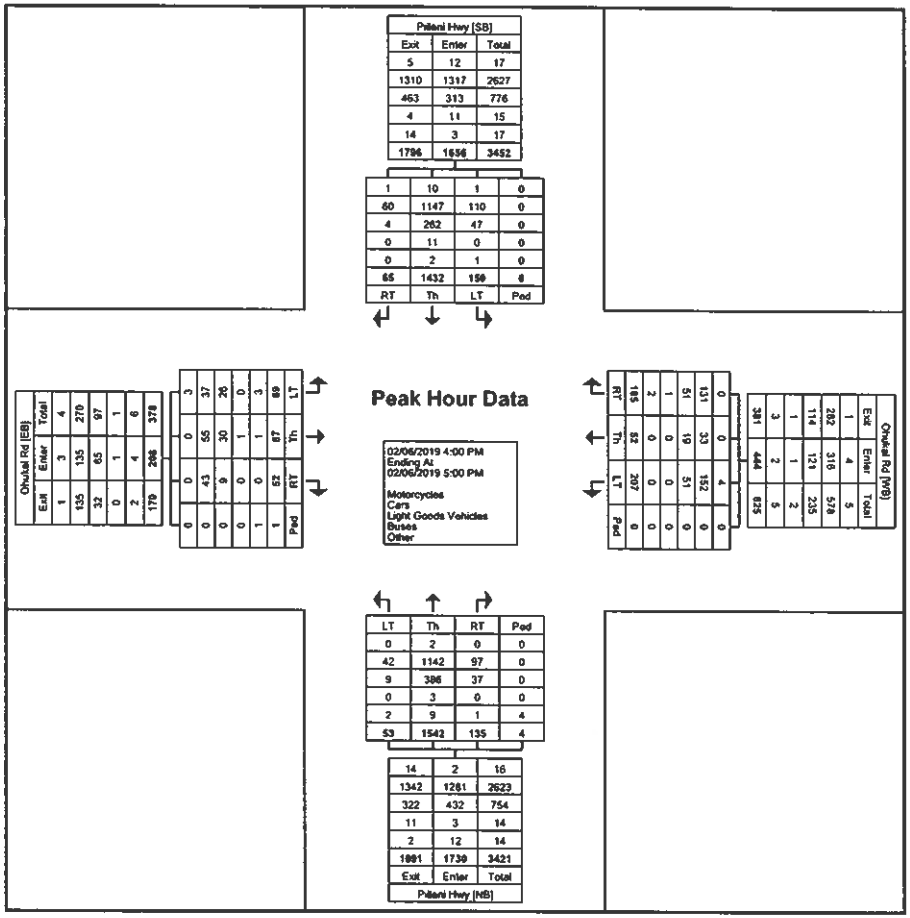
Count Name: Piilani Hwy Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 02/05/2019



Turning Movement Peak Hour Data Plot (4:00 PM)

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Data

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Huki Lii Pl Northbound				Int. Total
	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
6:30 AM	15	7	0	22	6	44	0	50	21	6	4	27	99
6:45 AM	32	15	0	47	4	52	0	56	33	7	2	40	143
Hourly Total	47	22	0	69	10	96	0	106	54	13	6	67	242
7:00 AM	23	6	0	29	7	67	0	74	20	4	0	24	127
7:15 AM	37	13	0	50	10	77	0	87	43	8	1	51	188
7:30 AM	43	25	0	68	12	90	0	102	44	6	7	50	220
7:45 AM	69	31	0	100	12	61	0	73	43	5	0	48	221
Hourly Total	172	75	0	247	41	295	0	336	150	23	8	173	756
8:00 AM	64	24	0	88	6	90	0	96	36	11	0	47	231
8:15 AM	55	26	0	81	9	80	0	89	35	5	1	40	210
8:30 AM	45	17	0	62	8	63	0	71	26	2	1	28	161
8:45 AM	36	39	0	75	5	45	0	50	36	6	0	42	167
Hourly Total	200	106	0	306	28	278	0	306	133	24	2	157	769
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	57	14	0	71	8	55	0	63	46	9	0	55	189
3:15 PM	50	14	0	64	3	61	0	64	40	10	0	50	178
3:30 PM	49	17	0	66	8	47	0	55	45	7	0	52	173
3:45 PM	58	19	0	77	7	59	1	66	52	13	0	65	208
Hourly Total	214	64	0	278	26	222	1	248	183	39	0	222	748
4:00 PM	49	13	0	62	6	71	0	77	47	10	0	57	196
4:15 PM	85	12	0	97	10	72	0	82	39	4	0	43	222
4:30 PM	53	14	0	67	7	63	0	70	43	9	0	52	189
4:45 PM	52	17	0	69	9	47	0	56	36	10	0	46	171
Hourly Total	239	56	0	295	32	253	0	285	165	33	0	198	778
5:00 PM	45	6	0	51	7	72	0	79	55	5	0	60	190
5:15 PM	66	7	0	73	2	45	0	47	37	6	3	43	163
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	111	13	0	124	9	117	0	126	92	11	3	103	353
6:30 AM	17	12	1	29	13	51	0	64	17	3	6	20	113
6:45 AM	20	19	0	39	10	57	0	67	45	5	0	50	156
Hourly Total	37	31	1	68	23	108	0	131	62	8	6	70	269
7:00 AM	42	8	0	50	5	76	0	81	26	4	1	30	161
7:15 AM	40	19	0	59	7	76	0	83	33	3	2	36	178
7:30 AM	27	15	0	42	14	81	0	95	43	7	1	50	187
7:45 AM	43	35	1	78	18	60	0	78	46	3	0	49	205
Hourly Total	152	77	1	229	44	293	0	337	148	17	4	165	731
8:00 AM	70	26	0	96	17	90	0	107	40	11	0	51	254
8:15 AM	44	21	0	65	6	89	0	95	33	9	1	42	202
8:30 AM	39	28	0	67	5	47	0	52	34	4	0	38	157

8:45 AM	29	14	0	43	10	45	0	55	30	2	2	32	130
Hourly Total	182	89	0	271	38	271	0	309	137	26	3	163	743
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	40	21	0	61	4	56	0	60	38	6	1	44	165
3:15 PM	45	15	0	60	6	54	0	60	33	6	1	39	159
3:30 PM	57	12	0	69	2	60	0	62	41	5	0	46	177
3:45 PM	53	20	0	73	9	56	0	65	40	7	0	47	185
Hourly Total	195	68	0	263	21	226	0	247	152	24	2	176	686
4:00 PM	67	9	0	76	8	74	0	82	41	10	0	51	209
4:15 PM	55	8	0	63	13	59	0	72	42	14	0	56	191
4:30 PM	52	14	0	66	8	60	0	68	46	6	1	52	186
4:45 PM	57	18	0	75	5	54	0	59	34	3	0	37	171
Hourly Total	231	49	0	280	34	247	0	281	163	33	1	196	757
5:00 PM	64	10	0	74	6	81	0	87	57	8	0	65	226
5:15 PM	52	4	0	56	5	63	0	68	43	5	0	48	172
Grand Total	1896	664	2	2560	317	2550	1	2867	1539	264	35	1803	7230
Approach %	74.1	25.9	-	-	11.1	88.9	-	-	85.4	14.6	-	-	-
Total %	26.2	9.2	-	35.4	4.4	35.3	-	39.7	21.3	3.7	-	24.9	-
Motorcycles	14	5	-	19	6	19	-	25	12	1	-	13	57
% Motorcycles	0.7	0.8	-	0.7	1.9	0.7	-	0.9	0.8	0.4	-	0.7	0.8
Cars	1320	512	-	1832	202	1841	-	2043	978	163	-	1141	5016
% Cars	69.6	77.1	-	71.6	63.7	72.2	-	71.3	63.5	61.7	-	63.3	69.4
Light Goods Vehicles	527	142	-	669	104	630	-	734	526	92	-	618	2021
% Light Goods Vehicles	27.8	21.4	-	26.1	32.8	24.7	-	25.6	34.2	34.8	-	34.3	28.0
Buses	13	0	-	13	0	21	-	21	1	2	-	3	37
% Buses	0.7	0.0	-	0.5	0.0	0.8	-	0.7	0.1	0.8	-	0.2	0.5
Single-Unit Trucks	12	4	-	16	4	23	-	27	21	5	-	26	69
% Single-Unit Trucks	0.6	0.6	-	0.6	1.3	0.9	-	0.9	1.4	1.9	-	1.4	1.0
Articulated Trucks	8	0	-	8	1	8	-	9	1	0	-	1	18
% Articulated Trucks	0.4	0.0	-	0.3	0.3	0.3	-	0.3	0.1	0.0	-	0.1	0.2
Bicycles on Road	2	1	-	3	0	8	-	8	0	1	-	1	12
% Bicycles on Road	0.1	0.2	-	0.1	0.0	0.3	-	0.3	0.0	0.4	-	0.1	0.2
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	0.0	-	-	-	2.9	-	-
Pedestrians	-	-	2	-	-	-	1	-	-	-	34	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	97.1	-	-

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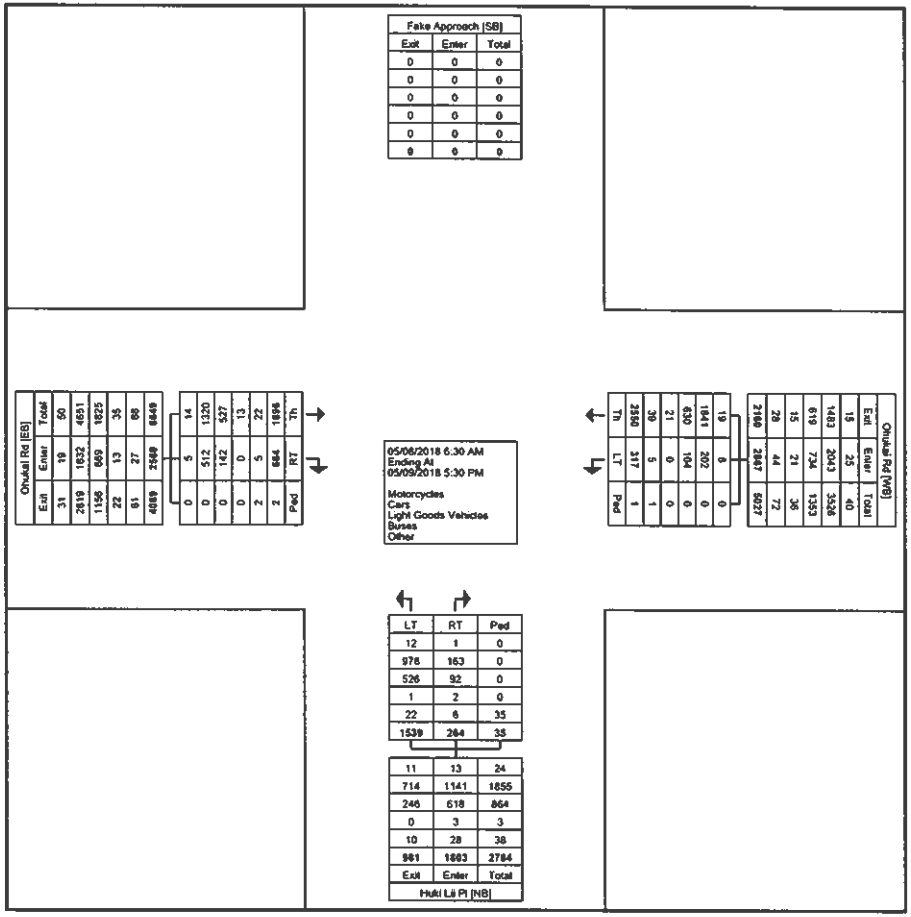
Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018
Page No: 3



Turning Movement Data Plot

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Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Huki Lii Pl Northbound				Int. Total
	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
7:30 AM	43	25	0	68	12	90	0	102	44	6	7	50	220
7:45 AM	69	31	0	100	12	61	0	73	43	5	0	48	221
8:00 AM	64	24	0	88	6	90	0	96	36	11	0	47	231
8:15 AM	55	26	0	81	9	80	0	89	35	5	1	40	210
Total	231	106	0	337	39	321	0	360	158	27	8	185	882
Approach %	68.5	31.5	-	-	10.8	89.2	-	-	85.4	14.6	-	-	-
Total %	26.2	12.0	-	38.2	4.4	36.4	-	40.8	17.9	3.1	-	21.0	-
PHF	0.837	0.855	-	0.843	0.813	0.892	-	0.882	0.898	0.614	-	0.925	0.955
Motorcycles	0	0	-	0	0	0	-	0	1	0	-	1	1
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.6	0.0	-	0.5	0.1
Cars	158	82	-	240	24	226	-	250	83	17	-	100	590
% Cars	68.4	77.4	-	71.2	61.5	70.4	-	69.4	52.5	63.0	-	54.1	66.9
Light Goods Vehicles	71	24	-	95	15	87	-	102	72	10	-	82	279
% Light Goods Vehicles	30.7	22.6	-	28.2	38.5	27.1	-	28.3	45.6	37.0	-	44.3	31.6
Buses	1	0	-	1	0	1	-	1	0	0	-	0	2
% Buses	0.4	0.0	-	0.3	0.0	0.3	-	0.3	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	1	0	-	1	0	4	-	4	2	0	-	2	7
% Single-Unit Trucks	0.4	0.0	-	0.3	0.0	1.2	-	1.1	1.3	0.0	-	1.1	0.8
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	-	0	0	3	-	3	0	0	-	0	3
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.9	-	0.8	0.0	0.0	-	0.0	0.3
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	0	-	-	-	0	-	-	-	8	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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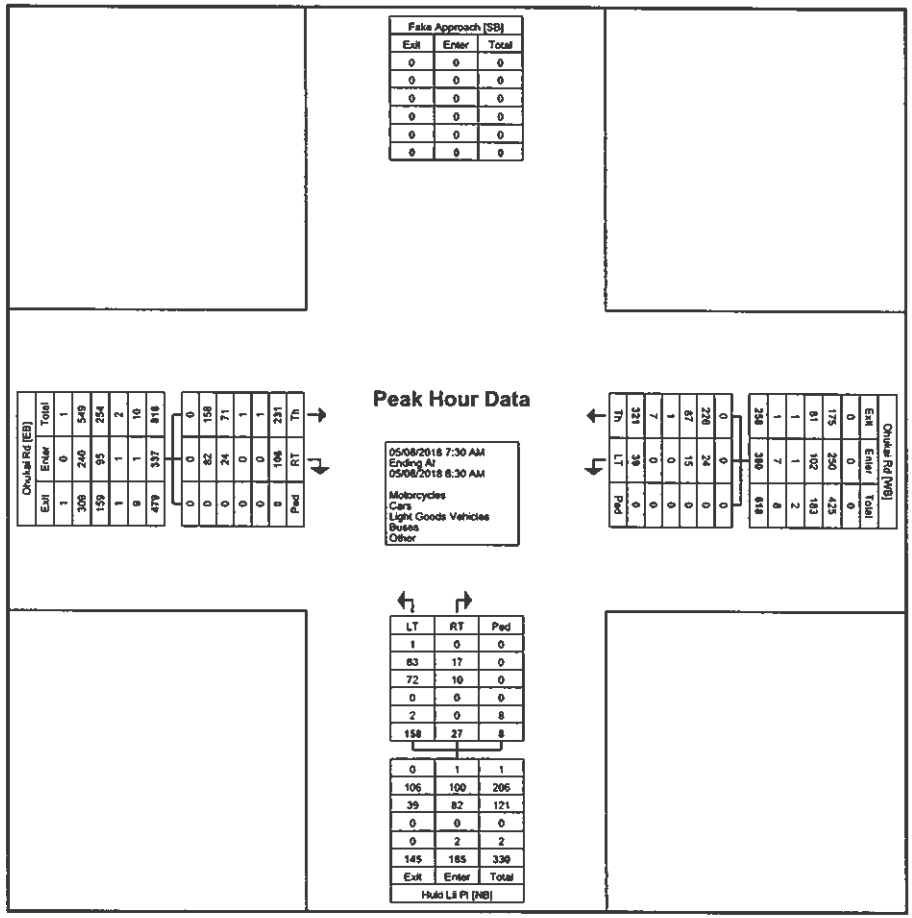
Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018



Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Hukl Lii Pl Northbound				Int. Total
	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
3:45 PM	58	19	0	77	7	59	1	66	52	13	0	65	208
4:00 PM	49	13	0	62	6	71	0	77	47	10	0	57	196
4:15 PM	85	12	0	97	10	72	0	82	39	4	0	43	222
4:30 PM	53	14	0	67	7	63	0	70	43	9	0	52	189
Total	245	58	0	303	30	265	1	295	181	36	0	217	815
Approach %	80.9	19.1	-	-	10.2	89.8	-	-	83.4	16.6	-	-	-
Total %	30.1	7.1	-	37.2	3.7	32.5	-	36.2	22.2	4.4	-	26.6	-
PHF	0.721	0.763	-	0.781	0.750	0.920	-	0.899	0.870	0.692	-	0.835	0.918
Motorcycles	3	1	-	4	2	4	-	6	0	0	-	0	10
% Motorcycles	1.2	1.7	-	1.3	6.7	1.5	-	2.0	0.0	0.0	-	0.0	1.2
Cars	194	50	-	244	23	194	-	217	133	27	-	160	621
% Cars	79.2	86.2	-	80.5	76.7	73.2	-	73.6	73.5	75.0	-	73.7	76.2
Light Goods Vehicles	47	7	-	54	5	65	-	70	47	8	-	55	179
% Light Goods Vehicles	19.2	12.1	-	17.8	16.7	24.5	-	23.7	26.0	22.2	-	25.3	22.0
Buses	0	0	-	0	0	0	-	0	1	0	-	1	1
% Buses	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.6	0.0	-	0.5	0.1
Single-Unit Trucks	0	0	-	0	0	2	-	2	0	0	-	0	2
% Single-Unit Trucks	0.0	0.0	-	0.0	0.0	0.8	-	0.7	0.0	0.0	-	0.0	0.2
Articulated Trucks	1	0	-	1	0	0	-	0	0	0	-	0	1
% Articulated Trucks	0.4	0.0	-	0.3	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.1
Bicycles on Road	0	0	-	0	0	0	-	0	0	1	-	1	1
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	2.8	-	0.5	0.1
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	0.0	-	-	-	-	-	-
Pedestrians	-	-	0	-	-	-	1	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	100.0	-	-	-	-	-	-

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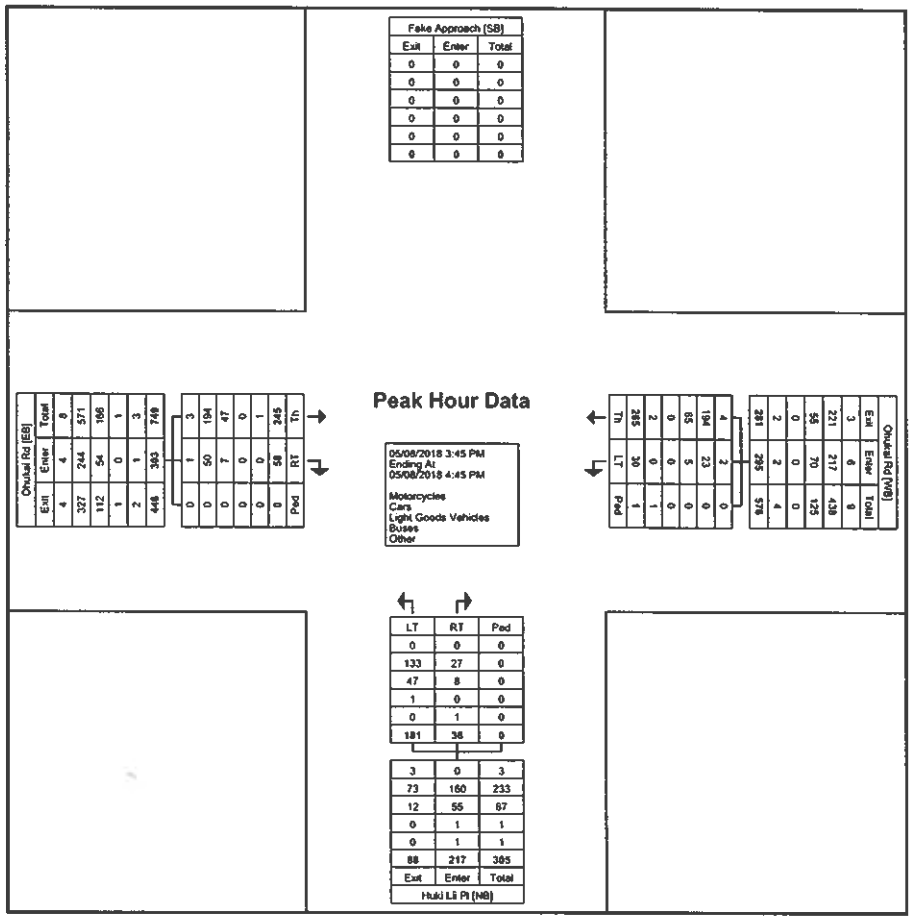
Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018
Page No: 7



Turning Movement Peak Hour Data Plot (3:45 PM)

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Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Huki Lii Pl Northbound				Int. Total
	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
7:30 AM	27	15	0	42	14	81	0	95	43	7	1	50	187
7:45 AM	43	35	1	78	18	60	0	78	46	3	0	49	205
8:00 AM	70	26	0	96	17	90	0	107	40	11	0	51	254
8:15 AM	44	21	0	65	6	89	0	95	33	9	1	42	202
Total	184	97	1	281	55	320	0	375	162	30	2	192	848
Approach %	65.5	34.5	-	-	14.7	85.3	-	-	84.4	15.6	-	-	-
Total %	21.7	11.4	-	33.1	6.5	37.7	-	44.2	19.1	3.5	-	22.6	-
PHF	0.657	0.693	-	0.732	0.764	0.889	-	0.876	0.880	0.682	-	0.941	0.835
Motorcycles	3	0	-	3	0	1	-	1	2	0	-	2	6
% Motorcycles	1.6	0.0	-	1.1	0.0	0.3	-	0.3	1.2	0.0	-	1.0	0.7
Cars	127	75	-	202	31	227	-	258	90	20	-	110	570
% Cars	69.0	77.3	-	71.9	56.4	70.9	-	68.8	55.6	66.7	-	57.3	67.2
Light Goods Vehicles	51	21	-	72	21	81	-	102	64	8	-	72	246
% Light Goods Vehicles	27.7	21.6	-	25.6	38.2	25.3	-	27.2	39.5	26.7	-	37.5	29.0
Buses	1	0	-	1	0	1	-	1	0	0	-	0	2
% Buses	0.5	0.0	-	0.4	0.0	0.3	-	0.3	0.0	0.0	-	0.0	0.2
Single-Unit Trucks	0	0	-	0	2	5	-	7	5	2	-	7	14
% Single-Unit Trucks	0.0	0.0	-	0.0	3.6	1.6	-	1.9	3.1	6.7	-	3.6	1.7
Articulated Trucks	1	0	-	1	1	3	-	4	1	0	-	1	6
% Articulated Trucks	0.5	0.0	-	0.4	1.8	0.9	-	1.1	0.6	0.0	-	0.5	0.7
Bicycles on Road	1	1	-	2	0	2	-	2	0	0	-	0	4
% Bicycles on Road	0.5	1.0	-	0.7	0.0	0.6	-	0.5	0.0	0.0	-	0.0	0.5
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	1	-	-	-	0	-	-	-	2	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	100.0	-	-

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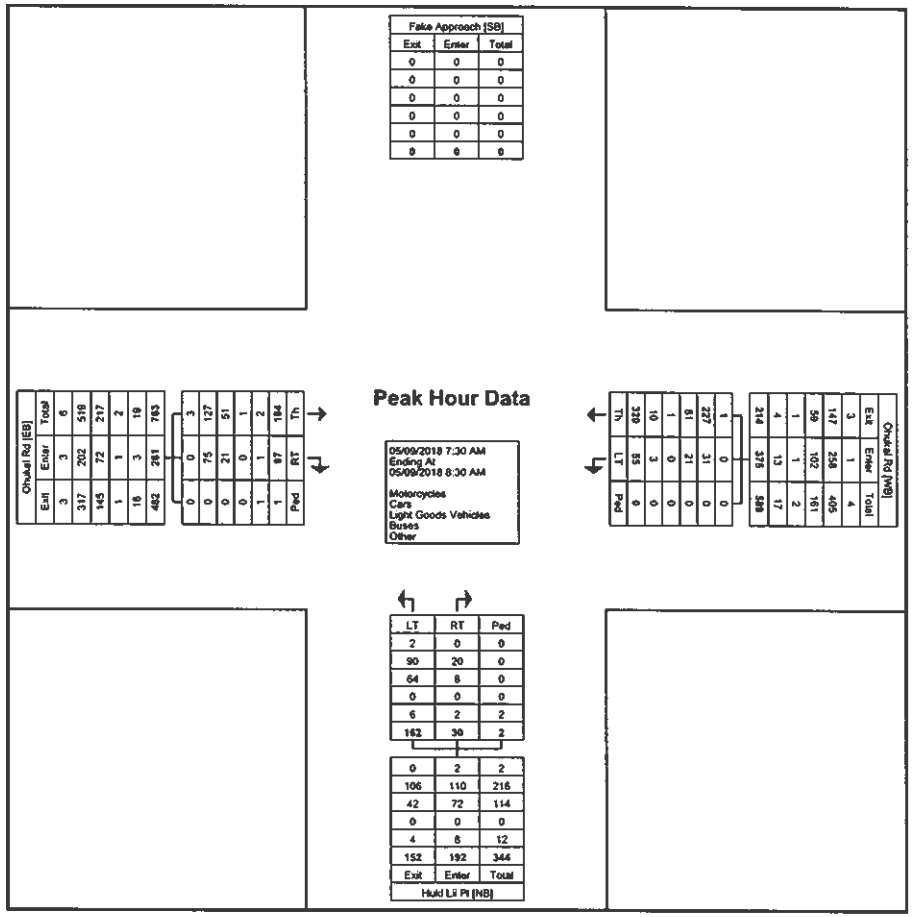
Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018



Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Huki Lii Pl Northbound				Int. Total
	Thru	Right-Turn	Peds	App. Total	Left-Turn	Thru	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
4:15 PM	55	8	0	63	13	59	0	72	42	14	0	56	191
4:30 PM	52	14	0	66	8	60	0	68	46	6	1	52	186
4:45 PM	57	18	0	75	5	54	0	59	34	3	0	37	171
5:00 PM	64	10	0	74	6	81	0	87	57	8	0	65	226
Total	228	50	0	278	32	254	0	286	179	31	1	210	774
Approach %	82.0	18.0	-	-	11.2	88.8	-	-	85.2	14.8	-	-	-
Total %	29.5	6.5	-	35.9	4.1	32.8	-	37.0	23.1	4.0	-	27.1	-
PHF	0.891	0.694	-	0.927	0.615	0.784	-	0.822	0.785	0.554	-	0.808	0.856
Motorcycles	1	0	-	1	2	5	-	7	4	0	-	4	12
% Motorcycles	0.4	0.0	-	0.4	6.3	2.0	-	2.4	2.2	0.0	-	1.9	1.6
Cars	160	42	-	202	20	190	-	210	130	22	-	152	564
% Cars	70.2	84.0	-	72.7	62.5	74.8	-	73.4	72.6	71.0	-	72.4	72.9
Light Goods Vehicles	60	8	-	68	9	57	-	66	43	9	-	52	186
% Light Goods Vehicles	26.3	16.0	-	24.5	28.1	22.4	-	23.1	24.0	29.0	-	24.8	24.0
Buses	0	0	-	0	0	0	-	0	0	0	-	0	0
% Buses	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Single-Unit Trucks	4	0	-	4	1	1	-	2	2	0	-	2	8
% Single-Unit Trucks	1.8	0.0	-	1.4	3.1	0.4	-	0.7	1.1	0.0	-	1.0	1.0
Articulated Trucks	3	0	-	3	0	0	-	0	0	0	-	0	3
% Articulated Trucks	1.3	0.0	-	1.1	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.4
Bicycles on Road	0	0	-	0	0	1	-	1	0	0	-	0	1
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.4	-	0.3	0.0	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	0	-	-	-	0	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	100.0	-	-

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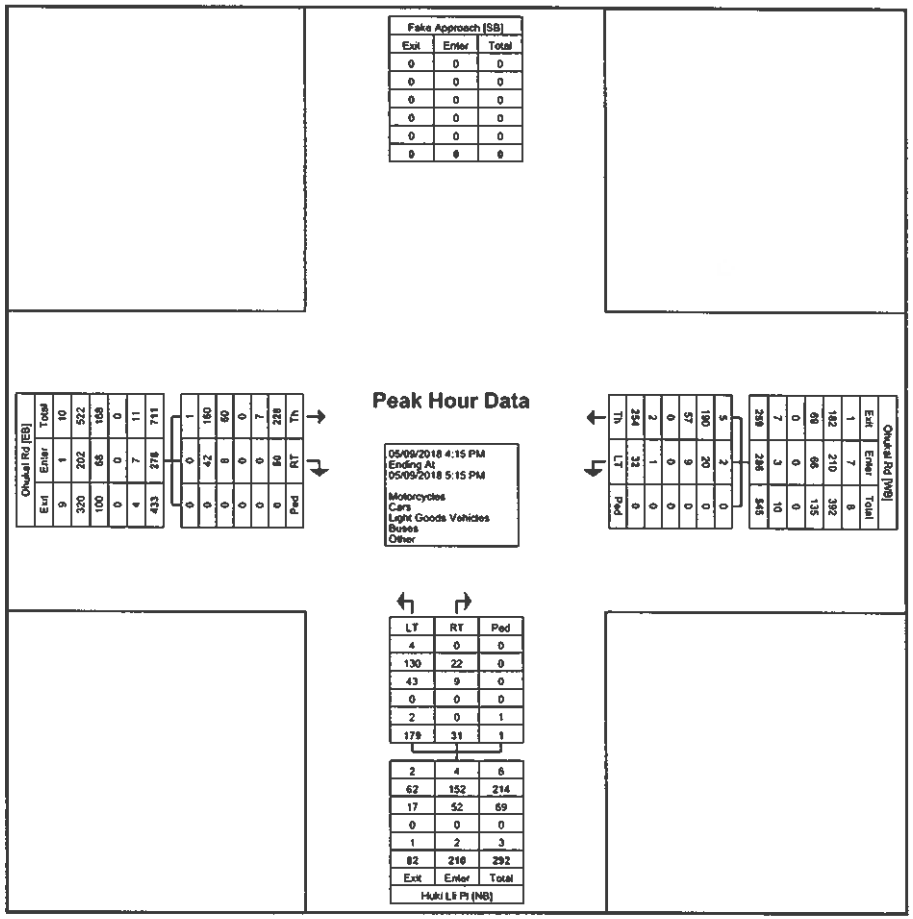
Count Name: Huku Lii Pl Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018



Turning Movement Peak Hour Data Plot (4:15 PM)

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Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018

Turning Movement Data

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Wainoha St Southbound				Int. Total
	Left-Turn	Thru	Peds	App. Total	Thru	Right-Turn	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
6:30 AM	0	13	0	13	27	0	0	27	1	5	0	6	46
6:45 AM	1	22	0	23	33	1	0	34	0	2	0	2	59
Hourly Total	1	35	0	36	60	1	0	61	1	7	0	8	105
7:00 AM	1	12	0	13	32	0	0	32	1	6	0	7	52
7:15 AM	6	15	3	21	47	0	0	47	0	10	5	10	78
7:30 AM	3	16	0	19	52	1	0	53	0	8	1	8	80
7:45 AM	5	30	0	35	35	1	1	36	0	7	0	7	78
Hourly Total	15	73	3	88	166	2	1	168	1	31	6	32	288
8:00 AM	0	35	0	35	39	0	0	39	1	2	0	3	77
8:15 AM	3	24	0	27	34	0	0	34	0	2	0	2	63
8:30 AM	4	16	1	20	30	0	0	30	0	7	1	7	57
8:45 AM	0	21	0	21	24	0	0	24	0	5	0	5	50
Hourly Total	7	96	1	103	127	0	0	127	1	16	1	17	247
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	5	34	0	39	21	0	0	21	2	5	0	7	67
3:15 PM	5	27	0	32	23	0	0	23	1	3	0	4	59
3:30 PM	7	37	1	44	23	2	0	25	0	5	0	5	74
3:45 PM	4	41	0	45	32	0	0	32	1	2	0	3	80
Hourly Total	21	139	1	160	99	2	0	101	4	15	0	19	280
4:00 PM	2	40	1	42	22	1	0	23	1	0	1	1	66
4:15 PM	6	52	2	58	30	1	0	31	0	0	0	0	89
4:30 PM	2	35	2	37	35	0	0	35	2	0	1	2	74
4:45 PM	4	44	0	48	25	0	0	25	0	0	0	0	73
Hourly Total	14	171	5	185	112	2	0	114	3	0	2	3	302
5:00 PM	4	34	0	38	20	0	0	20	0	6	0	6	64
5:15 PM	8	30	0	38	25	0	0	25	1	2	1	3	66
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
Hourly Total	12	64	0	76	45	0	0	45	1	8	1	9	130
6:30 AM	2	13	0	15	38	0	0	38	1	6	2	7	60
6:45 AM	0	10	0	10	45	0	0	45	0	2	0	2	57
Hourly Total	2	23	0	25	83	0	0	83	1	8	2	9	117
7:00 AM	4	19	0	23	33	1	0	34	0	6	0	6	63
7:15 AM	4	15	1	19	43	1	0	44	0	11	5	11	74
7:30 AM	2	22	1	24	48	1	0	49	2	6	0	8	81
7:45 AM	2	20	0	22	36	0	0	36	1	5	1	6	64
Hourly Total	12	76	2	88	160	3	0	163	3	28	6	31	282
8:00 AM	5	26	0	31	51	0	0	51	1	0	1	1	83
8:15 AM	1	14	0	15	29	0	0	29	0	3	0	3	47
8:30 AM	2	15	1	17	22	0	0	22	0	7	0	7	46

8:45 AM	0	17	1	17	24	0	0	24	0	3	0	3	44
Hourly Total	8	72	2	80	126	0	0	126	1	13	1	14	220
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-
3:00 PM	2	21	1	23	18	1	0	19	0	4	1	4	46
3:15 PM	6	27	1	33	26	1	0	27	0	3	1	3	63
3:30 PM	4	40	1	44	20	1	0	21	0	2	0	2	67
3:45 PM	1	39	0	40	23	0	0	23	0	4	0	4	67
Hourly Total	13	127	3	140	87	3	0	90	0	13	2	13	243
4:00 PM	8	41	0	49	31	0	0	31	0	2	0	2	82
4:15 PM	7	45	1	52	33	0	0	33	1	3	0	4	89
4:30 PM	3	30	0	33	32	0	0	32	0	5	0	5	70
4:45 PM	5	34	0	39	30	0	0	30	1	1	0	2	71
Hourly Total	23	150	1	173	126	0	0	126	2	11	0	13	312
5:00 PM	0	37	1	37	21	0	0	21	0	0	0	0	58
5:15 PM	4	33	0	37	29	0	0	29	1	2	0	3	69
Grand Total	132	1096	19	1228	1241	13	1	1254	19	152	21	171	2653
Approach %	10.7	89.3	-	-	99.0	1.0	-	-	11.1	88.9	-	-	-
Total %	5.0	41.3	-	46.3	46.8	0.5	-	47.3	0.7	5.7	-	6.4	-
Motorcycles	0	16	-	16	17	0	-	17	1	1	-	2	35
% Motorcycles	0.0	1.5	-	1.3	1.4	0.0	-	1.4	5.3	0.7	-	1.2	1.3
Cars	103	721	-	824	851	7	-	858	12	122	-	134	1816
% Cars	78.0	65.8	-	67.1	68.6	53.8	-	68.4	63.2	80.3	-	78.4	68.5
Light Goods Vehicles	28	319	-	347	331	6	-	337	4	28	-	32	716
% Light Goods Vehicles	21.2	29.1	-	28.3	26.7	46.2	-	26.9	21.1	18.4	-	18.7	27.0
Buses	1	12	-	13	15	0	-	15	2	0	-	2	30
% Buses	0.8	1.1	-	1.1	1.2	0.0	-	1.2	10.5	0.0	-	1.2	1.1
Single-Unit Trucks	0	19	-	19	19	0	-	19	0	1	-	1	39
% Single-Unit Trucks	0.0	1.7	-	1.5	1.5	0.0	-	1.5	0.0	0.7	-	0.6	1.5
Articulated Trucks	0	5	-	5	5	0	-	5	0	0	-	0	10
% Articulated Trucks	0.0	0.5	-	0.4	0.4	0.0	-	0.4	0.0	0.0	-	0.0	0.4
Bicycles on Road	0	4	-	4	3	0	-	3	0	0	-	0	7
% Bicycles on Road	0.0	0.4	-	0.3	0.2	0.0	-	0.2	0.0	0.0	-	0.0	0.3
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	0.0	-	-	-	0.0	-	-
Pedestrians	-	-	19	-	-	-	1	-	-	-	21	-	-
% Pedestrians	-	-	100.0	-	-	-	100.0	-	-	-	100.0	-	-

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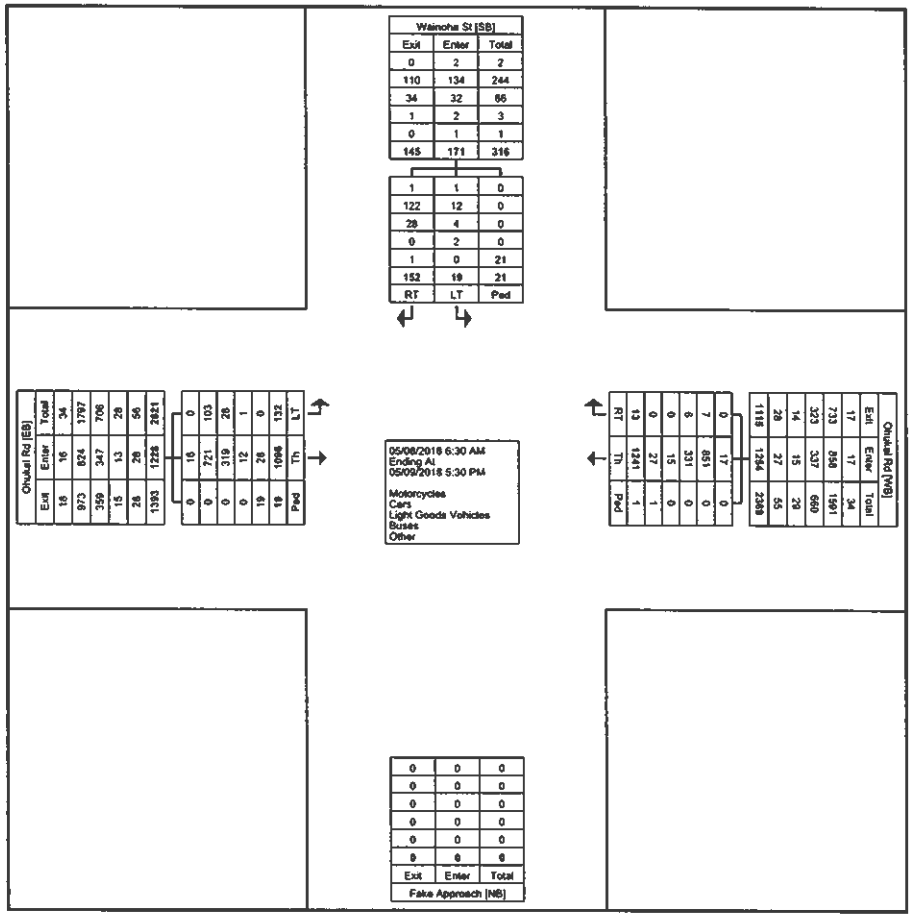
Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018



Turning Movement Data Plot

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Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Wainoha St Southbound				Int. Total
	Left-Turn	Thru	Peds	App. Total	Thru	Right-Turn	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
7:30 AM	3	16	0	19	52	1	0	53	0	8	1	8	80
7:45 AM	5	30	0	35	35	1	1	36	0	7	0	7	78
8:00 AM	0	35	0	35	39	0	0	39	1	2	0	3	77
8:15 AM	3	24	0	27	34	0	0	34	0	2	0	2	63
Total	11	105	0	116	160	2	1	162	1	19	1	20	298
Approach %	9.5	90.5	-	-	98.8	1.2	-	-	5.0	95.0	-	-	-
Total %	3.7	35.2	-	38.9	53.7	0.7	-	54.4	0.3	6.4	-	6.7	-
PHF	0.550	0.750	-	0.829	0.769	0.500	-	0.764	0.250	0.594	-	0.625	0.931
Motorcycles	0	0	-	0	0	0	-	0	0	1	-	1	1
% Motorcycles	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	5.3	-	5.0	0.3
Cars	8	70	-	78	124	1	-	125	1	16	-	17	220
% Cars	72.7	66.7	-	67.2	77.5	50.0	-	77.2	100.0	84.2	-	85.0	73.8
Light Goods Vehicles	3	33	-	36	32	1	-	33	0	2	-	2	71
% Light Goods Vehicles	27.3	31.4	-	31.0	20.0	50.0	-	20.4	0.0	10.5	-	10.0	23.8
Buses	0	1	-	1	1	0	-	1	0	0	-	0	2
% Buses	0.0	1.0	-	0.9	0.6	0.0	-	0.6	0.0	0.0	-	0.0	0.7
Single-Unit Trucks	0	1	-	1	2	0	-	2	0	0	-	0	3
% Single-Unit Trucks	0.0	1.0	-	0.9	1.3	0.0	-	1.2	0.0	0.0	-	0.0	1.0
Articulated Trucks	0	0	-	0	0	0	-	0	0	0	-	0	0
% Articulated Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	-	0	1	0	-	1	0	0	-	0	1
% Bicycles on Road	0.0	0.0	-	0.0	0.6	0.0	-	0.6	0.0	0.0	-	0.0	0.3
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	0.0	-	-	-	0.0	-	-
Pedestrians	-	-	0	-	-	-	1	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	100.0	-	-	-	100.0	-	-

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Wainohia St [SB]

Exit	Enter	Total
0	1	1
9	17	26
4	2	6
0	0	0
0	0	0
13	20	33

RT	LT	Ped
1	0	0
16	1	0
2	0	0
0	0	0
0	0	1
19	1	1

Ohukai Rd [EB]

Exit	Enter	Total
1	0	1
140	78	218
34	36	70
1	1	2
3	1	4
179	116	295

LT	Th	Ped
0	0	0
8	70	0
3	33	0
0	1	0
0	1	0
11	105	0

Peak Hour Data

05/08/2018 7:30 AM
Ending At
05/08/2018 8:30 AM

Motorcycles
Cars
Light Goods Vehicles
Buses
Other

Ohukai Rd [WB]

Exit	Enter	Total
0	0	0
71	125	196
33	33	66
1	1	2
1	3	4
106	162	268

RT	Th	Ped
0	0	0
1	124	0
1	32	0
0	1	0
0	3	1
2	160	1

Fake Approach [NB]

Exit	Enter	Total
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0

Turning Movement Peak Hour Data Plot (7:30 AM)

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Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (3:45 PM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Wainoha St Southbound				Int. Total
	Left-Turn	Thru	Peds	App. Total	Thru	Right-Turn	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
3:45 PM	4	41	0	45	32	0	0	32	1	2	0	3	80
4:00 PM	2	40	1	42	22	1	0	23	1	0	1	1	66
4:15 PM	6	52	2	58	30	1	0	31	0	0	0	0	89
4:30 PM	2	35	2	37	35	0	0	35	2	0	1	2	74
Total	14	168	5	182	119	2	0	121	4	2	2	6	309
Approach %	7.7	92.3	-	-	98.3	1.7	-	-	66.7	33.3	-	-	-
Total %	4.5	54.4	-	58.9	38.5	0.6	-	39.2	1.3	0.6	-	1.9	-
PHF	0.583	0.808	-	0.784	0.850	0.500	-	0.864	0.500	0.250	-	0.500	0.868
Motorcycles	0	4	-	4	5	0	-	5	0	0	-	0	9
% Motorcycles	0.0	2.4	-	2.2	4.2	0.0	-	4.1	0.0	0.0	-	0.0	2.9
Cars	11	124	-	135	82	1	-	83	3	1	-	4	222
% Cars	78.6	73.8	-	74.2	68.9	50.0	-	68.6	75.0	50.0	-	66.7	71.8
Light Goods Vehicles	3	39	-	42	32	1	-	33	1	1	-	2	77
% Light Goods Vehicles	21.4	23.2	-	23.1	26.9	50.0	-	27.3	25.0	50.0	-	33.3	24.9
Buses	0	0	-	0	0	0	-	0	0	0	-	0	0
% Buses	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Single-Unit Trucks	0	0	-	0	0	0	-	0	0	0	-	0	0
% Single-Unit Trucks	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Articulated Trucks	0	1	-	1	0	0	-	0	0	0	-	0	1
% Articulated Trucks	0.0	0.6	-	0.5	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	0	-	0	0	0	-	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	5	-	-	-	0	-	-	-	2	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	100.0	-	-

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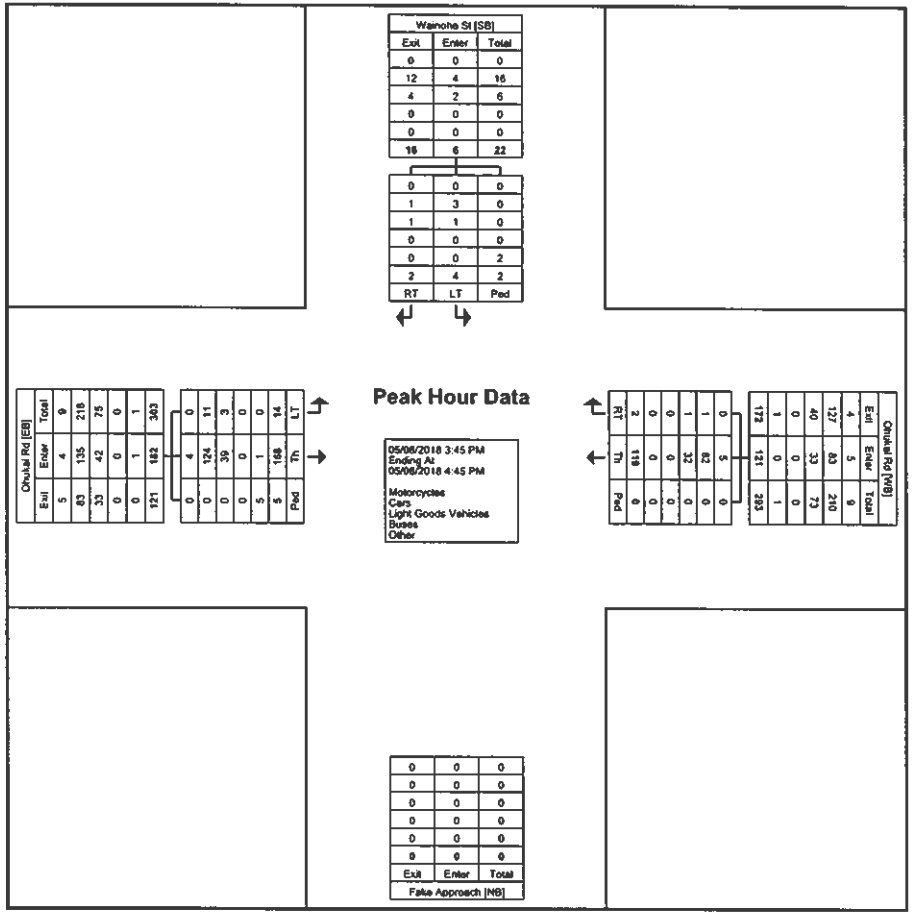
Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018
Page No: 7



Turning Movement Peak Hour Data Plot (3:45 PM)

The Traffic Management Consultant
1188 Bishop Street, Suite 1907

Honolulu, Hawaii, United States 96813
808-536-0223 tmchawaii@aol.com

Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Wainoha St Southbound				Int. Total
	Left-Turn	Thru	Peds	App. Total	Thru	Right-Turn	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
7:30 AM	2	22	1	24	48	1	0	49	2	6	0	8	81
7:45 AM	2	20	0	22	36	0	0	36	1	5	1	6	64
8:00 AM	5	26	0	31	51	0	0	51	1	0	1	1	83
8:15 AM	1	14	0	15	29	0	0	29	0	3	0	3	47
Total	10	82	1	92	164	1	0	165	4	14	2	18	275
Approach %	10.9	89.1	-	-	99.4	0.6	-	-	22.2	77.8	-	-	-
Total %	3.6	29.8	-	33.5	59.6	0.4	-	60.0	1.5	5.1	-	6.5	-
PHF	0.500	0.788	-	0.742	0.804	0.250	-	0.809	0.500	0.583	-	0.563	0.828
Motorcycles	0	1	-	1	2	0	-	2	0	0	-	0	3
% Motorcycles	0.0	1.2	-	1.1	1.2	0.0	-	1.2	0.0	0.0	-	0.0	1.1
Cars	8	52	-	60	112	0	-	112	3	10	-	13	185
% Cars	80.0	63.4	-	65.2	68.3	0.0	-	67.9	75.0	71.4	-	72.2	67.3
Light Goods Vehicles	1	26	-	27	42	1	-	43	1	4	-	5	75
% Light Goods Vehicles	10.0	31.7	-	29.3	25.6	100.0	-	26.1	25.0	28.6	-	27.8	27.3
Buses	1	1	-	2	0	0	-	0	0	0	-	0	2
% Buses	10.0	1.2	-	2.2	0.0	0.0	-	0.0	0.0	0.0	-	0.0	0.7
Single-Unit Trucks	0	1	-	1	2	0	-	2	0	0	-	0	3
% Single-Unit Trucks	0.0	1.2	-	1.1	1.2	0.0	-	1.2	0.0	0.0	-	0.0	1.1
Articulated Trucks	0	1	-	1	4	0	-	4	0	0	-	0	5
% Articulated Trucks	0.0	1.2	-	1.1	2.4	0.0	-	2.4	0.0	0.0	-	0.0	1.8
Bicycles on Road	0	0	-	0	2	0	-	2	0	0	-	0	2
% Bicycles on Road	0.0	0.0	-	0.0	1.2	0.0	-	1.2	0.0	0.0	-	0.0	0.7
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	1	-	-	-	0	-	-	-	2	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	100.0	-	-

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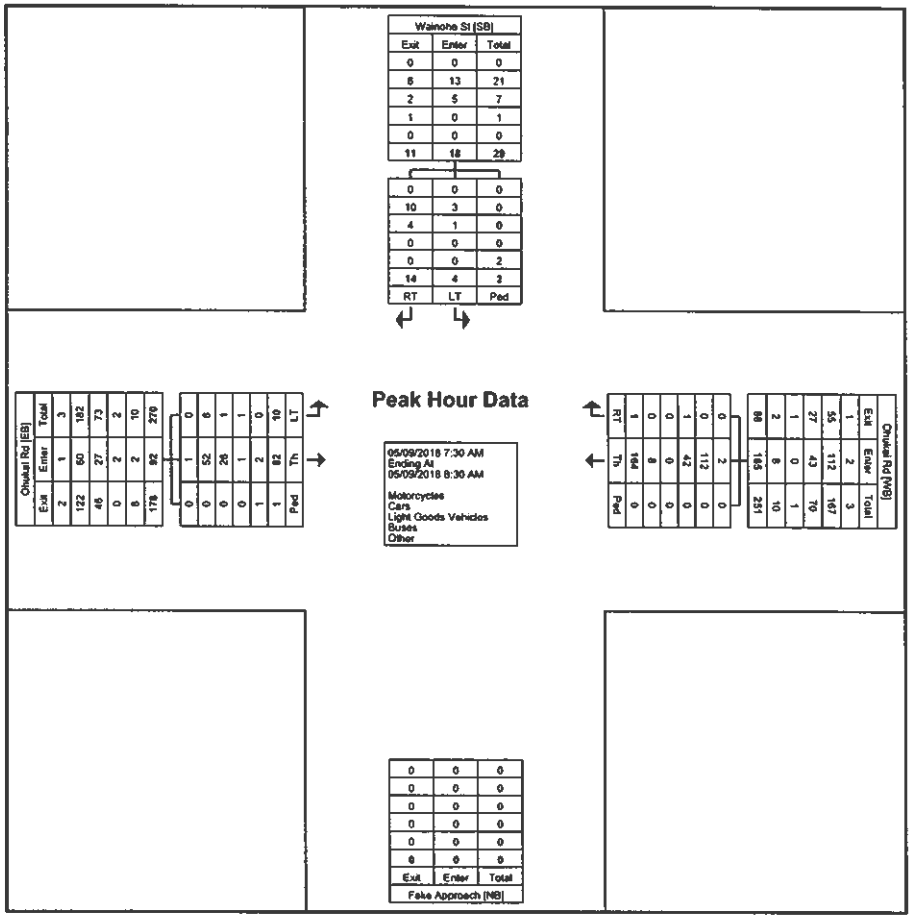
Start Date: 05/08/2018



Turning Movement Peak Hour Data Plot (7:30 AM)

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808-536-0223 tmchawaii@aol.com

Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai Light Industrial Park
Start Date: 05/08/2018

Turning Movement Peak Hour Data (4:15 PM)

Start Time	Ohukai Rd Eastbound				Ohukai Rd Westbound				Wainoha St Southbound				Int. Total
	Left-Turn	Thru	Peds	App. Total	Thru	Right-Turn	Peds	App. Total	Left-Turn	Right-Turn	Peds	App. Total	
4:15 PM	7	45	1	52	33	0	0	33	1	3	0	4	89
4:30 PM	3	30	0	33	32	0	0	32	0	5	0	5	70
4:45 PM	5	34	0	39	30	0	0	30	1	1	0	2	71
5:00 PM	0	37	1	37	21	0	0	21	0	0	0	0	58
Total	15	146	2	161	116	0	0	116	2	9	0	11	288
Approach %	9.3	90.7	-	-	100.0	0.0	-	-	18.2	81.8	-	-	-
Total %	5.2	50.7	-	55.9	40.3	0.0	-	40.3	0.7	3.1	-	3.8	-
PHF	0.536	0.811	-	0.774	0.879	0.000	-	0.879	0.500	0.450	-	0.550	0.809
Motorcycles	0	1	-	1	4	0	-	4	1	0	-	1	6
% Motorcycles	0.0	0.7	-	0.6	3.4	-	-	3.4	50.0	0.0	-	9.1	2.1
Cars	13	96	-	109	79	0	-	79	1	9	-	10	198
% Cars	86.7	65.8	-	67.7	68.1	-	-	68.1	50.0	100.0	-	90.9	68.8
Light Goods Vehicles	2	42	-	44	29	0	-	29	0	0	-	0	73
% Light Goods Vehicles	13.3	28.8	-	27.3	25.0	-	-	25.0	0.0	0.0	-	0.0	25.3
Buses	0	0	-	0	0	0	-	0	0	0	-	0	0
% Buses	0.0	0.0	-	0.0	0.0	-	-	0.0	0.0	0.0	-	0.0	0.0
Single-Unit Trucks	0	5	-	5	4	0	-	4	0	0	-	0	9
% Single-Unit Trucks	0.0	3.4	-	3.1	3.4	-	-	3.4	0.0	0.0	-	0.0	3.1
Articulated Trucks	0	1	-	1	0	0	-	0	0	0	-	0	1
% Articulated Trucks	0.0	0.7	-	0.6	0.0	-	-	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	1	-	1	0	0	-	0	0	0	-	0	1
% Bicycles on Road	0.0	0.7	-	0.6	0.0	-	-	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Crosswalk	-	-	0	-	-	-	0	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	0.0	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	2	-	-	-	0	-	-	-	0	-	-
% Pedestrians	-	-	100.0	-	-	-	-	-	-	-	-	-	-

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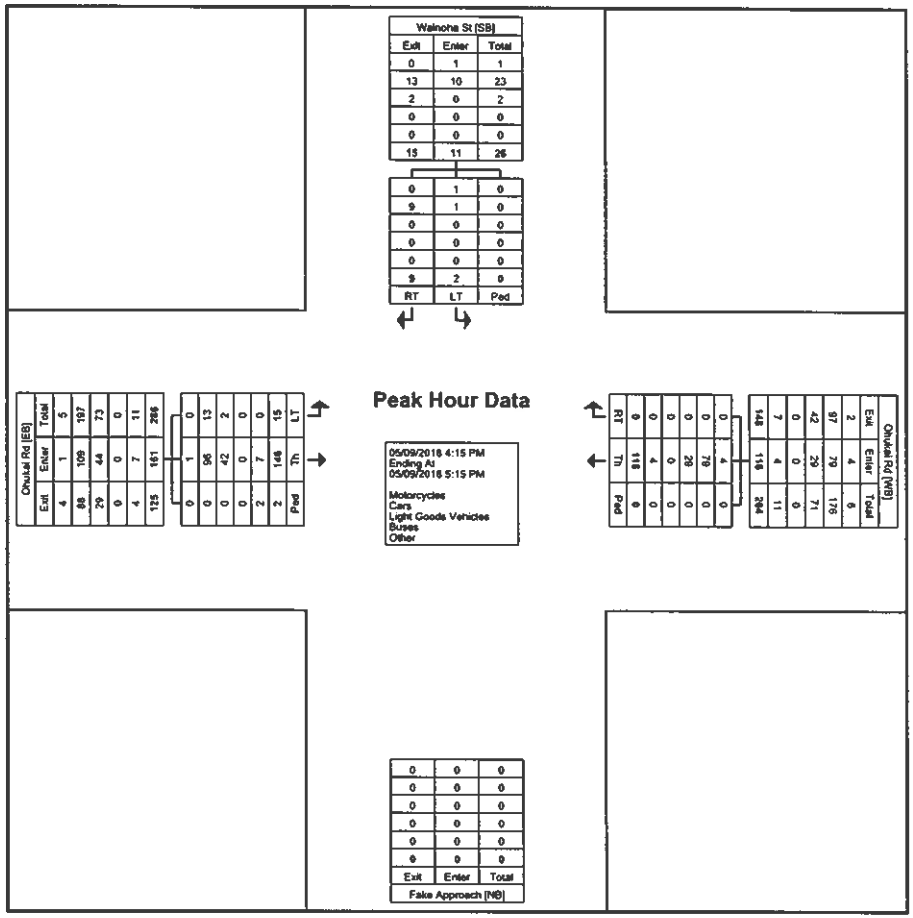
Count Name: Wainohia St Ohukai Rd
Site Code: Ohukai LIght Industrial Park
Start Date: 05/08/2018
Page No: 11



Turning Movement Peak Hour Data Plot (4:15 PM)

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

EXISTING TRAFFIC CONDITIONS

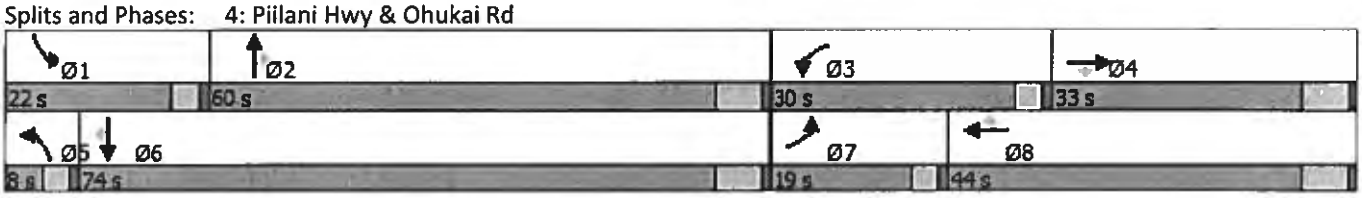
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	100	73	115	249	20	154	30	1110	101	174	1446	36
Future Volume (vph)	100	73	115	249	20	154	30	1110	101	174	1446	36
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1827	1615	1770	1810	1568	1805	3539	1599	1787	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1805	1827	1575	1749	1810	1568	1805	3539	1532	1779	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			159			143			113
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			8	8					5	5		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	4%	0%	2%	5%	3%	0%	2%	1%	1%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	103	75	119	257	21	159	31	1144	104	179	1491	37
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	19.0	33.0	33.0	30.0	44.0	44.0	8.0	60.0	60.0	22.0	74.0	74.0
Total Split (%)	13.1%	22.8%	22.8%	20.7%	30.3%	30.3%	5.5%	41.4%	41.4%	15.2%	51.0%	51.0%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	12.0	10.6	10.6	22.4	21.0	21.0	4.0	54.7	54.7	16.3	68.8	68.8
Actuated g/C Ratio	0.10	0.09	0.09	0.18	0.17	0.17	0.03	0.44	0.44	0.13	0.55	0.55
v/c Ratio	0.59	0.48	0.45	0.81	0.07	0.40	0.53	0.73	0.14	0.76	0.77	0.04
Control Delay	69.2	66.1	10.5	68.9	44.6	9.9	93.1	33.5	1.7	74.0	26.4	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	69.2	66.1	10.5	68.9	44.6	9.9	93.1	33.5	1.7	74.0	26.4	0.1
LOS	E	E	B	E	D	A	F	C	A	E	C	A
Approach Delay		44.9			46.3			32.3			30.8	
Approach LOS		D			D			C			C	
Queue Length 50th (ft)	82	60	0	202	15	0	26	413	0	142	502	0
Queue Length 95th (ft)	147	112	39	#325	39	60	#78	540	15	#257	661	0
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	219	399	456	372	557	592	58	1559	755	260	1944	920
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.47	0.19	0.26	0.69	0.04	0.27	0.53	0.73	0.14	0.69	0.77	0.04

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 124.1
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 34.3 Intersection LOS: C
Intersection Capacity Utilization 78.5% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd



Intersection						
Int Delay, s/veh	4.8					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	231	106	39	321	158	27
Future Vol, veh/h	231	106	39	321	158	27
Conflicting Peds, #/hr	0	8	8	0	8	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	2	1	0
Mvmt Flow	243	112	41	338	166	28

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	363	0	735	315
Stage 1	-	-	-	-	307	-
Stage 2	-	-	-	-	428	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1207	-	388	730
Stage 1	-	-	-	-	748	-
Stage 2	-	-	-	-	660	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1199	-	367	720
Mov Cap-2 Maneuver	-	-	-	-	367	-
Stage 1	-	-	-	-	744	-
Stage 2	-	-	-	-	628	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.9	20.9
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	367	720	1199	-	-	-
HCM Lane V/C Ratio	0.453	0.039	0.034	-	-	-
HCM Control Delay (s)	22.7	10.2	8.1	0	-	-
HCM Lane LOS	C	B	A	A	-	-
HCM 95th %tile Q(veh)	2.3	0.1	0.1	-	-	-

Intersection						
Int Delay, s/veh	1.2					

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	96	173	2	1	27
Future Vol, veh/h	14	96	173	2	1	27
Conflicting Peds, #/hr	6	0	0	6	6	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	14	98	177	2	1	28

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	185	0	-	0	316	190
Stage 1	-	-	-	-	184	-
Stage 2	-	-	-	-	132	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1402	-	-	-	681	857
Stage 1	-	-	-	-	852	-
Stage 2	-	-	-	-	899	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1394	-	-	-	666	847
Mov Cap-2 Maneuver	-	-	-	-	666	-
Stage 1	-	-	-	-	838	-
Stage 2	-	-	-	-	894	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.4
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1394	-	-	-	839
HCM Lane V/C Ratio	0.01	-	-	-	0.034
HCM Control Delay (s)	7.6	-	-	-	9.4
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

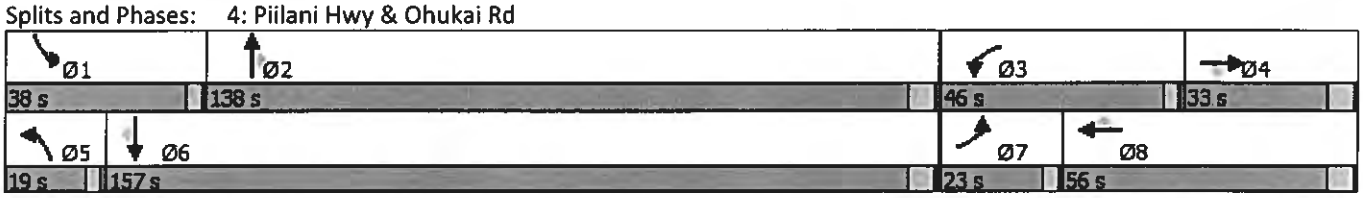
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	69	87	52	207	52	185	53	1542	135	159	1432	65
Future Volume (vph)	69	87	52	207	52	185	53	1542	135	159	1432	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1736	1863	1615	1805	1900	1599	1736	3574	1599	1787	3574	1615
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1736	1863	1578	1787	1900	1599	1734	3574	1599	1787	3574	1570
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			81			195			81			64
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			4	4			1					1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	4%	2%	0%	0%	0%	1%	4%	1%	1%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	73	92	55	218	55	195	56	1623	142	167	1507	68
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	23.0	33.0	33.0	46.0	56.0	56.0	19.0	138.0	138.0	38.0	157.0	157.0
Total Split (%)	9.0%	12.9%	12.9%	18.0%	22.0%	22.0%	7.5%	54.1%	54.1%	14.9%	61.6%	61.6%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	14.7	16.9	16.9	32.8	35.0	35.0	12.2	137.3	137.3	26.5	151.5	151.5
Actuated g/C Ratio	0.06	0.07	0.07	0.14	0.15	0.15	0.05	0.59	0.59	0.11	0.65	0.65
v/c Ratio	0.67	0.69	0.29	0.86	0.19	0.48	0.62	0.77	0.15	0.83	0.65	0.07
Control Delay	137.6	132.0	7.7	129.0	88.8	12.7	139.3	42.2	11.4	132.9	28.2	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.6	132.0	7.7	129.0	88.8	12.7	139.3	42.2	11.4	132.9	28.2	4.2
LOS	F	F	A	F	F	B	F	D	B	F	C	A
Approach Delay		102.8			75.8			42.8			37.3	
Approach LOS		F			E			D			D	
Queue Length 50th (ft)	113	142	0	336	76	0	87	996	40	258	738	2
Queue Length 95th (ft)	191	228	16	467	132	87	158	1330	98	373	975	29
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	141	216	254	325	408	496	111	2100	973	261	2319	1041
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.43	0.22	0.67	0.13	0.39	0.50	0.77	0.15	0.64	0.65	0.07

Intersection Summary

Area Type: Other
Cycle Length: 255
Actuated Cycle Length: 233.5
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 47.3 Intersection LOS: D
Intersection Capacity Utilization 82.9% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 4: Piilani Hwy & Ohukai Rd



Intersection	
Int Delay, s/veh	5.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	245	58	30	265	181	36
Future Vol, veh/h	245	58	30	265	181	36
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	266	63	33	288	197	39

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	329	0	652	298
Stage 1	-	-	-	-	298	-
Stage 2	-	-	-	-	354	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1242	-	434	746
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	713	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1242	-	420	746
Mov Cap-2 Maneuver	-	-	-	-	420	-
Stage 1	-	-	-	-	755	-
Stage 2	-	-	-	-	690	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.8	19.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	420	746	1242	-	-	-
HCM Lane V/C Ratio	0.468	0.052	0.026	-	-	-
HCM Control Delay (s)	20.9	10.1	8	0	-	-
HCM Lane LOS	C	B	A	A	-	-
HCM 95th %tile Q(veh)	2.4	0.2	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	14	168	119	2	4	2
Future Vol, veh/h	14	168	119	2	4	2
Conflicting Peds, #/hr	2	0	0	2	2	7
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	16	193	137	2	5	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	141	0	-	0	367	147
Stage 1	-	-	-	-	140	-
Stage 2	-	-	-	-	227	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1455	-	-	-	637	905
Stage 1	-	-	-	-	892	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1452	-	-	-	627	897
Mov Cap-2 Maneuver	-	-	-	-	627	-
Stage 1	-	-	-	-	880	-
Stage 2	-	-	-	-	813	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1452	-	-	-	697
HCM Lane V/C Ratio	0.011	-	-	-	0.01
HCM Control Delay (s)	7.5	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

APPENDIX C

CAPACITY ANALYSIS WORKSHEETS

2024 PEAK HOUR TRAFFIC WITHOUT PROJECT

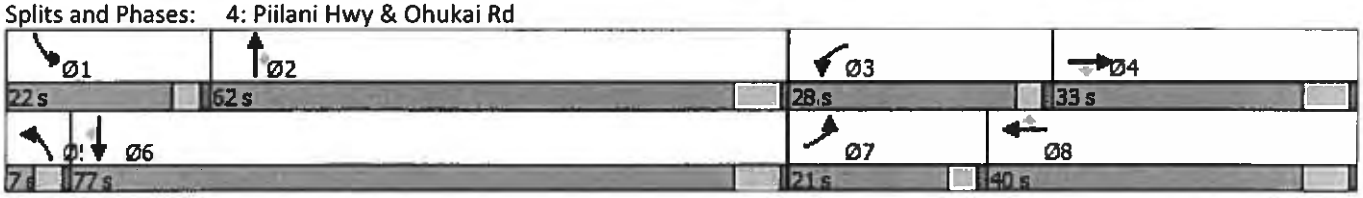
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	84	132	286	23	179	35	1297	116	207	1740	42
Future Volume (vph)	117	84	132	286	23	179	35	1297	116	207	1740	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1827	1615	1770	1810	1568	1805	3539	1599	1787	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1805	1827	1575	1749	1810	1568	1805	3539	1532	1781	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			185			143			113
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			8	8					5	5		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	4%	0%	2%	5%	3%	0%	2%	1%	1%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	87	136	295	24	185	36	1337	120	213	1794	43
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	21.0	33.0	33.0	28.0	40.0	40.0	7.0	62.0	62.0	22.0	77.0	77.0
Total Split (%)	14.5%	22.8%	22.8%	19.3%	27.6%	27.6%	4.8%	42.8%	42.8%	15.2%	53.1%	53.1%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	13.5	11.5	11.5	24.0	22.1	22.1	3.0	56.0	56.0	18.0	71.1	71.1
Actuated g/C Ratio	0.10	0.09	0.09	0.19	0.17	0.17	0.02	0.43	0.43	0.14	0.55	0.55
v/c Ratio	0.65	0.54	0.50	0.90	0.08	0.44	0.88	0.87	0.16	0.86	0.93	0.05
Control Delay	71.9	68.7	14.2	81.9	47.2	10.0	167.2	41.5	2.7	85.2	37.7	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.9	68.7	14.2	81.9	47.2	10.0	167.2	41.5	2.7	85.2	37.7	0.1
LOS	E	E	B	F	D	B	F	D	A	F	D	A
Approach Delay		48.3			53.9			41.4			41.9	
Approach LOS		D			D			D			D	
Queue Length 50th (ft)	99	71	0	245	17	0	31	530	0	177	705	0
Queue Length 95th (ft)	168	127	56	#431	44	67	#104	#677	25	#331	#961	0
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	236	380	441	328	475	548	41	1530	743	248	1921	910
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.51	0.23	0.31	0.90	0.05	0.34	0.88	0.87	0.16	0.86	0.93	0.05

Intersection Summary

Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 129.6
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 43.6 Intersection LOS: D
Intersection Capacity Utilization 89.4% ICU Level of Service E
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd



Intersection	
Int Delay, s/veh	6.7

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	273	125	46	369	182	32
Future Vol, veh/h	273	125	46	369	182	32
Conflicting Peds, #/hr	0	8	8	0	8	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #0		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	2	1	0
Mvmt Flow	287	132	48	388	192	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	427	0	853	369
Stage 1	-	-	-	-	361	-
Stage 2	-	-	-	-	492	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1143	-	331	681
Stage 1	-	-	-	-	707	-
Stage 2	-	-	-	-	617	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1136	-	309	672
Mov Cap-2 Maneuver	-	-	-	-	309	-
Stage 1	-	-	-	-	703	-
Stage 2	-	-	-	-	579	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.9	30.4
HCM LOS			D

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	309	672	1136	-	-	-
HCM Lane V/C Ratio	0.62	0.05	0.043	-	-	-
HCM Control Delay (s)	33.9	10.6	8.3	0	-	-
HCM Lane LOS	D	B	A	A	-	-
HCM 95th %tile Q(veh)	3.9	0.2	0.1	-	-	-

Intersection	
Int Delay, s/veh	1.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	110	199	2	1	32
Future Vol, veh/h	17	110	199	2	1	32
Conflicting Peds, #/hr	6	0	0	6	6	6
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	17	112	203	2	1	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	211	0	-	0	362	216
Stage 1	-	-	-	-	210	-
Stage 2	-	-	-	-	152	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1372	-	-	-	641	829
Stage 1	-	-	-	-	830	-
Stage 2	-	-	-	-	881	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1364	-	-	-	626	820
Mov Cap-2 Maneuver	-	-	-	-	626	-
Stage 1	-	-	-	-	815	-
Stage 2	-	-	-	-	876	-

Approach	EB	WB	SB
HCM Control Delay, s	1	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1364	-	-	-	812
HCM Lane V/C Ratio	0.013	-	-	-	0.041
HCM Control Delay (s)	7.7	-	-	-	9.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	100	60	238	60	219	61	1843	155	186	1687	76
Future Volume (vph)	82	100	60	238	60	219	61	1843	155	186	1687	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1736	1863	1615	1805	1900	1599	1736	3574	1599	1787	3574	1615
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1736	1863	1578	1787	1900	1599	1734	3574	1599	1787	3574	1570
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			81			183			81			64
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			4	4			1					1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	4%	2%	0%	0%	0%	1%	4%	1%	1%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	105	63	251	63	231	64	1940	163	196	1776	80
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	25.0	33.0	33.0	41.0	49.0	49.0	21.0	148.0	148.0	33.0	160.0	160.0
Total Split (%)	9.8%	12.9%	12.9%	16.1%	19.2%	19.2%	8.2%	58.0%	58.0%	12.9%	62.7%	62.7%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	16.8	19.2	19.2	36.3	38.7	38.7	13.8	142.1	142.1	28.8	157.1	157.1
Actuated g/C Ratio	0.07	0.08	0.08	0.15	0.16	0.16	0.06	0.58	0.58	0.12	0.64	0.64
v/c Ratio	0.73	0.73	0.32	0.94	0.21	0.57	0.67	0.94	0.17	0.94	0.78	0.08
Control Delay	145.5	138.3	10.8	143.5	93.2	27.4	145.5	58.7	12.9	152.7	36.4	5.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	145.5	138.3	10.8	143.5	93.2	27.4	145.5	58.7	12.9	152.7	36.4	5.5
LOS	F	F	B	F	F	C	F	E	B	F	D	A
Approach Delay		109.1			88.5			57.8			46.3	
Approach LOS		F			F			E			D	
Queue Length 50th (ft)	141	172	0	413	92	70	105	1538	60	324	1091	10
Queue Length 95th (ft)	220	253	31	#635	153	183	176	1747	113	#532	1295	39
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	148	204	245	271	331	430	119	2061	956	210	2279	1024
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.51	0.26	0.93	0.19	0.54	0.54	0.94	0.17	0.93	0.78	0.08

Intersection Summary

Area Type: Other
Cycle Length: 255
Actuated Cycle Length: 246.4
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 59.0 Intersection LOS: E
Intersection Capacity Utilization 94.4% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd

Intersection						
Int Delay, s/veh	7.9					

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	289	67	35	313	214	42
Future Vol, veh/h	289	67	35	313	214	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	314	73	38	340	233	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	387	0	767	351
Stage 1	-	-	-	-	351	-
Stage 2	-	-	-	-	416	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1183	-	372	697
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	668	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1183	-	357	697
Mov Cap-2 Maneuver	-	-	-	-	357	-
Stage 1	-	-	-	-	715	-
Stage 2	-	-	-	-	641	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.8	28.6
HCM LOS			D

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	357	697	1183	-	-	-
HCM Lane V/C Ratio	0.652	0.065	0.032	-	-	-
HCM Control Delay (s)	32.1	10.5	8.1	0	-	-
HCM Lane LOS	D	B	A	A	-	-
HCM 95th %tile Q(veh)	4.4	0.2	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	193	137	2	5	2
Future Vol, veh/h	17	193	137	2	5	2
Conflicting Peds, #/hr	2	0	0	2	2	7
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	20	222	157	2	6	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	161	0	-	0	424	167
Stage 1	-	-	-	-	160	-
Stage 2	-	-	-	-	264	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1430	-	-	-	591	882
Stage 1	-	-	-	-	874	-
Stage 2	-	-	-	-	785	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1427	-	-	-	580	874
Mov Cap-2 Maneuver	-	-	-	-	580	-
Stage 1	-	-	-	-	860	-
Stage 2	-	-	-	-	783	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	10.7
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1427	-	-	-	642
HCM Lane V/C Ratio	0.014	-	-	-	0.013
HCM Control Delay (s)	7.6	-	-	-	10.7
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

APPENDIX D

CAPACITY ANALYSIS WORKSHEETS

2024 PEAK HOUR TRAFFIC WITH PROJECT

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	101	132	298	24	186	35	1297	139	247	1740	42
Future Volume (vph)	117	101	132	298	24	186	35	1297	139	247	1740	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1827	1615	1770	1810	1568	1805	3539	1599	1787	3505	1568
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1805	1827	1575	1750	1810	1568	1805	3539	1532	1781	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			143			192			143			113
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			8	8					5	5		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	4%	0%	2%	5%	3%	0%	2%	1%	1%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	104	136	307	25	192	36	1337	143	255	1794	43
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	21.0	33.0	33.0	28.0	40.0	40.0	7.0	60.0	60.0	24.0	77.0	77.0
Total Split (%)	14.5%	22.8%	22.8%	19.3%	27.6%	27.6%	4.8%	41.4%	41.4%	16.6%	53.1%	53.1%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	13.5	12.7	12.7	24.0	23.2	23.2	3.0	54.0	54.0	20.0	71.0	71.0
Actuated g/C Ratio	0.10	0.10	0.10	0.18	0.18	0.18	0.02	0.41	0.41	0.15	0.54	0.54
v/c Ratio	0.65	0.58	0.48	0.95	0.08	0.44	0.88	0.92	0.20	0.93	0.94	0.05
Control Delay	72.8	69.8	13.3	91.1	46.7	9.7	171.8	47.3	4.6	94.9	39.6	0.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.8	69.8	13.3	91.1	46.7	9.7	171.8	47.3	4.6	94.9	39.6	0.1
LOS	E	E	B	F	D	A	F	D	A	F	D	A
Approach Delay		49.6			59.2			46.2			45.6	
Approach LOS		D			E			D			D	
Queue Length 50th (ft)	100	86	0	260	18	0	31	555	0	216	721	0
Queue Length 95th (ft)	169	147	56	#464	45	67	#106	#748	43	#401	#983	0
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	234	377	438	324	470	549	41	1461	716	273	1903	903
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.28	0.31	0.95	0.05	0.35	0.88	0.92	0.20	0.93	0.94	0.05

Intersection Summary

Area Type: Other

Cycle Length: 145

Actuated Cycle Length: 130.8

Natural Cycle: 150

Control Type: Actuated-Uncoordinated

Maximum v/c Ratio: 0.95

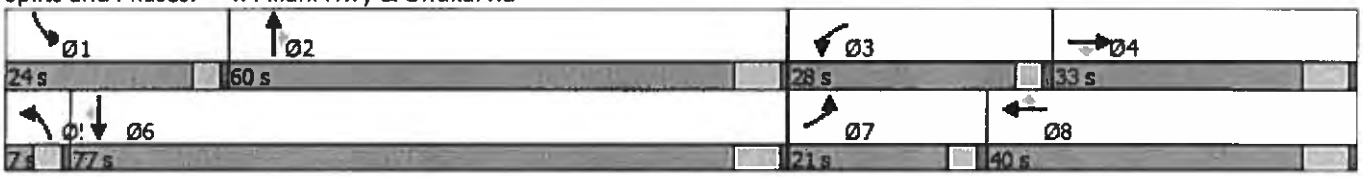
Intersection Signal Delay: 47.7 Intersection LOS: D

Intersection Capacity Utilization 90.1% ICU Level of Service E

Analysis Period (min) 15

\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd



Intersection	
Int Delay, s/veh	8.3

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↑↑			↑	↰	↱
Traffic Vol, veh/h	353	125	46	389	182	32
Future Vol, veh/h	353	125	46	389	182	32
Conflicting Peds, #/hr	0	8	8	0	8	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #0		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	2	1	0
Mvmt Flow	372	132	48	409	192	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	512	0	959	454
Stage 1	-	-	-	-	446	-
Stage 2	-	-	-	-	513	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1064	-	286	610
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1057	-	265	602
Mov Cap-2 Maneuver	-	-	-	-	265	-
Stage 1	-	-	-	-	643	-
Stage 2	-	-	-	-	563	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.9	42
HCM LOS			E

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	265	602	1057	-	-	-
HCM Lane V/C Ratio	0.723	0.056	0.046	-	-	-
HCM Control Delay (s)	47.4	11.3	8.6	0	-	-
HCM Lane LOS	E	B	A	A	-	-
HCM 95th %tile Q(veh)	5	0.2	0.1	-	-	-

Intersection	
Int Delay, s/veh	1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	190	219	2	1	32
Future Vol, veh/h	17	190	219	2	1	32
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	98	98	98	98	98	98
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	17	194	223	2	1	33

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	225	0	-	0	452	224
Stage 1	-	-	-	-	224	-
Stage 2	-	-	-	-	228	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1356	-	-	-	569	820
Stage 1	-	-	-	-	818	-
Stage 2	-	-	-	-	815	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1356	-	-	-	562	820
Mov Cap-2 Maneuver	-	-	-	-	562	-
Stage 1	-	-	-	-	807	-
Stage 2	-	-	-	-	815	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	9.6
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1356	-	-	-	809
HCM Lane V/C Ratio	0.013	-	-	-	0.042
HCM Control Delay (s)	7.7	-	-	-	9.6
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	0.1

Intersection	
Int Delay, s/veh	0.9

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	112	80	8	201	28	1
Future Vol, veh/h	112	80	8	201	28	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #0		-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	3	2	2	4	2	2
Mvmt Flow	122	87	9	218	30	1

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	209	0	402	166
Stage 1	-	-	-	-	166	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1362	-	604	878
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1362	-	599	878
Mov Cap-2 Maneuver	-	-	-	-	599	-
Stage 1	-	-	-	-	863	-
Stage 2	-	-	-	-	797	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.3	11.3
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	606	-	-	1362	-
HCM Lane V/C Ratio	0.052	-	-	0.006	-
HCM Control Delay (s)	11.3	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.2	-	-	0	-

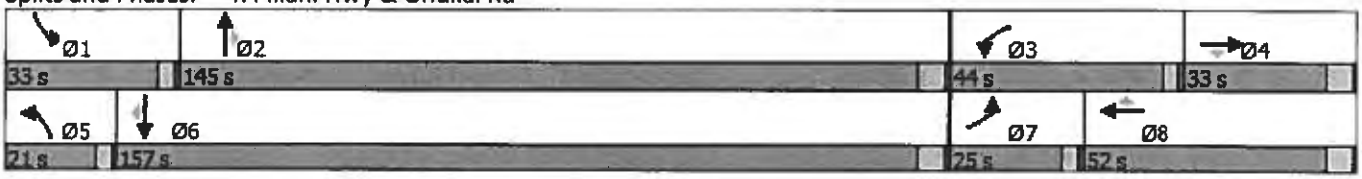
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	105	60	272	69	249	61	1843	163	196	1687	76
Future Volume (vph)	82	105	60	272	69	249	61	1843	163	196	1687	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	12	12	12	12
Grade (%)		0%			0%			0%			0%	
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1736	1863	1615	1805	1900	1599	1736	3574	1599	1787	3574	1615
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1736	1863	1578	1787	1900	1599	1734	3574	1599	1787	3574	1570
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			81			185			81			64
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			4	4			1					1
Confl. Bikes (#/hr)												
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Growth Factor	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Heavy Vehicles (%)	4%	2%	0%	0%	0%	1%	4%	1%	1%	1%	1%	0%
Bus Blockages (#/hr)	0	0	0	0	0	0	0	0	0	0	0	0
Parking (#/hr)												
Mid-Block Traffic (%)		0%			0%			0%			0%	
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	111	63	286	73	262	64	1940	172	206	1776	80
Turn Type	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases			4			8			2			6
Detector Phase	7	4	4	3	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	7.0	33.0	33.0	7.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	25.0	33.0	33.0	44.0	52.0	52.0	21.0	145.0	145.0	33.0	157.0	157.0
Total Split (%)	9.8%	12.9%	12.9%	17.3%	20.4%	20.4%	8.2%	56.9%	56.9%	12.9%	61.6%	61.6%
Yellow Time (s)	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	16.9	20.0	20.0	40.0	43.1	43.1	13.8	139.1	139.1	29.0	154.2	154.2
Actuated g/C Ratio	0.07	0.08	0.08	0.16	0.17	0.17	0.06	0.56	0.56	0.12	0.62	0.62
v/c Ratio	0.73	0.74	0.31	0.98	0.22	0.61	0.67	0.97	0.18	0.99	0.80	0.08
Control Delay	146.3	139.3	10.6	147.9	90.7	33.7	146.3	65.6	14.6	163.2	39.8	5.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	146.3	139.3	10.6	147.9	90.7	33.7	146.3	65.6	14.6	163.2	39.8	5.9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
LOS	F	F	B	F	F	C	F	E	B	F	D	A
Approach Delay		110.4			93.0			63.9			50.9	
Approach LOS		F			F			E			D	
Queue Length 50th (ft)	141	182	0	477	105	118	105	1599	69	345	1143	10
Queue Length 95th (ft)	221	266	31	#734	169	240	175	#1866	127	#573	1346	41
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250
Base Capacity (vph)	146	202	243	291	352	447	118	2003	931	208	2222	1000
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.55	0.26	0.98	0.21	0.59	0.54	0.97	0.18	0.99	0.80	0.08

Intersection Summary

Area Type: Other
Cycle Length: 255
Actuated Cycle Length: 248.1
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 64.6 Intersection LOS: E
Intersection Capacity Utilization 96.9% ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd



Intersection	
Int Delay, s/veh	9.9

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	312	67	35	386	214	42
Future Vol, veh/h	312	67	35	386	214	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	25
Veh in Median Storage, #0	-	-	0	0	-	
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	339	73	38	420	233	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	412	0	872	376
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	496	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1158	-	322	675
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	614	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1158	-	308	675
Mov Cap-2 Maneuver	-	-	-	-	308	-
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	588	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.7	39.6
HCM LOS			E

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	308	675	1158	-	-	-
HCM Lane V/C Ratio	0.755	0.068	0.033	-	-	-
HCM Control Delay (s)	45.3	10.7	8.2	0	-	-
HCM Lane LOS	E	B	A	A	-	-
HCM 95th %tile Q(veh)	5.7	0.2	0.1	-	-	-

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	17	216	210	2	5	2
Future Vol, veh/h	17	216	210	2	5	2
Conflicting Peds, #/hr	2	0	0	2	2	7
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	40	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	87	87	87	87	87	87
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	20	248	241	2	6	2

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	245	0	-	0	534	251
Stage 1	-	-	-	-	244	-
Stage 2	-	-	-	-	290	-
Critical Hdwy	4.1	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.2	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1333	-	-	-	510	793
Stage 1	-	-	-	-	801	-
Stage 2	-	-	-	-	764	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1330	-	-	-	500	786
Mov Cap-2 Maneuver	-	-	-	-	500	-
Stage 1	-	-	-	-	787	-
Stage 2	-	-	-	-	762	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	11.5
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1330	-	-	-	558
HCM Lane V/C Ratio	0.015	-	-	-	0.014
HCM Control Delay (s)	7.7	-	-	-	11.5
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0

Intersection	
Int Delay, s/veh	2.2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	198	23	1	139	73	12
Future Vol, veh/h	198	23	1	139	73	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	1	2	2
Mvmt Flow	215	25	1	151	79	13

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	240	0	381	228
Stage 1	-	-	-	-	228	-
Stage 2	-	-	-	-	153	-
Critical Hdwy	-	-	4.12	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.218	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1327	-	621	811
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	875	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1327	-	620	811
Mov Cap-2 Maneuver	-	-	-	-	620	-
Stage 1	-	-	-	-	810	-
Stage 2	-	-	-	-	874	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11.6
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	641	-	-	1327	-
HCM Lane V/C Ratio	0.144	-	-	0.001	-
HCM Control Delay (s)	11.6	-	-	7.7	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0.5	-	-	0	-

TRAFFIC ASSESSMENT REPORT

FOR THE PROPOSED

OHUKAI LIGHT INDUSTRIAL PARK

KIHEI, MAUI, HAWAII

TAX MAP KEY: (2) 3-9-001:PORTION 034

APPENDIX E

CAPACITY ANALYSIS WORKSHEETS

2024 PEAK HOUR TRAFFIC WITH PROJECT

WITH IMPROVEMENTS

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	117	101	132	298	24	186	35	1297	139	247	1740	42
Future Volume (vph)	117	101	132	298	24	186	35	1297	139	247	1740	42
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	240		300	270		250
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1805	1827	1615	1770	1810	1568	1805	3539	1599	1787	3505	1568
Flt Permitted	0.741			0.683			0.950			0.950		
Satd. Flow (perm)	1408	1827	1575	1258	1810	1568	1805	3539	1532	1781	3505	1568
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			83			192			116			53
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			8	8					5	5		
Peak Hour Factor	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Heavy Vehicles (%)	0%	4%	0%	2%	5%	3%	0%	2%	1%	1%	3%	3%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	121	104	136	307	25	192	36	1337	143	255	1794	43
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	33.0	33.0	33.0	13.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	47.0	47.0	47.0	47.0	47.0	47.0	9.0	69.0	69.0	29.0	89.0	89.0
Total Split (%)	32.4%	32.4%	32.4%	32.4%	32.4%	32.4%	6.2%	47.6%	47.6%	20.0%	61.4%	61.4%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	36.9	36.9	36.9	36.9	36.9	36.9	5.0	63.7	63.7	22.8	83.5	83.5
Actuated g/C Ratio	0.26	0.26	0.26	0.26	0.26	0.26	0.04	0.46	0.46	0.16	0.60	0.60
v/c Ratio	0.32	0.22	0.29	0.92	0.05	0.35	0.55	0.83	0.19	0.87	0.86	0.04
Control Delay	44.0	41.2	18.4	83.4	38.5	6.9	99.0	39.7	7.1	86.0	29.7	2.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	44.0	41.2	18.4	83.4	38.5	6.9	99.0	39.7	7.1	86.0	29.7	2.5
LOS	D	D	B	F	D	A	F	D	A	F	C	A
Approach Delay		33.6			53.2			38.1			36.0	
Approach LOS		C			D			D			D	
Queue Length 50th (ft)	90	75	37	276	17	0	34	596	15	235	753	0
Queue Length 95th (ft)	150	127	95	#447	42	60	#90	701	57	#378	877	14
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300	240		300	270		250

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	415	539	523	371	533	598	65	1616	762	321	2098	960
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.19	0.26	0.83	0.05	0.32	0.55	0.83	0.19	0.79	0.86	0.04

Intersection Summary
Area Type: Other
Cycle Length: 145
Actuated Cycle Length: 139.5
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 38.5 Intersection LOS: D
Intersection Capacity Utilization 91.8% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd

Intersection	
Int Delay, s/veh	3.6

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	353	125	46	389	182	32
Future Vol, veh/h	353	125	46	389	182	32
Conflicting Peds, #/hr	0	8	8	0	8	8
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	50	-	0	25
Veh in Median Storage, #0	-	-	0		2	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	1	0	0	2	1	0
Mvmt Flow	372	132	48	409	192	34

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	512	0	959	454
Stage 1	-	-	-	-	446	-
Stage 2	-	-	-	-	513	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1064	-	286	610
Stage 1	-	-	-	-	647	-
Stage 2	-	-	-	-	603	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1057	-	269	602
Mov Cap-2 Maneuver	-	-	-	-	466	-
Stage 1	-	-	-	-	643	-
Stage 2	-	-	-	-	572	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.9	17
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	466	602	1057	-	-	-
HCM Lane V/C Ratio	0.411	0.056	0.046	-	-	-
HCM Control Delay (s)	18	11.3	8.6	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	2	0.2	0.1	-	-	-

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	82	105	60	272	69	249	61	1843	163	196	1687	76
Future Volume (vph)	82	105	60	272	69	249	61	1843	163	196	1687	76
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	50		50	200		300	0		0	0		0
Storage Lanes	1		1	1		1	1		1	1		1
Taper Length (ft)	100			100			100			100		
Satd. Flow (prot)	1736	1863	1615	1805	1900	1599	1736	3574	1599	1787	3574	1615
Flt Permitted	0.687			0.616			0.950			0.950		
Satd. Flow (perm)	1255	1863	1578	1160	1900	1599	1734	3574	1599	1787	3574	1570
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			47			181			60			35
Link Speed (mph)		25			25			35			35	
Link Distance (ft)		958			574			680			620	
Travel Time (s)		26.1			15.7			13.2			12.1	
Confl. Peds. (#/hr)			4	4			1					1
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	4%	2%	0%	0%	0%	1%	4%	1%	1%	1%	1%	0%
Shared Lane Traffic (%)												
Lane Group Flow (vph)	86	111	63	286	73	262	64	1940	172	206	1776	80
Turn Type	Perm	NA	Perm	Perm	NA	Perm	Prot	NA	Perm	Prot	NA	Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Detector Phase	4	4	4	8	8	8	5	2	2	1	6	6
Switch Phase												
Minimum Initial (s)	7.0	7.0	7.0	7.0	7.0	7.0	3.0	7.0	7.0	3.0	7.0	7.0
Minimum Split (s)	33.0	33.0	33.0	13.0	13.0	13.0	7.0	24.0	24.0	7.0	24.0	24.0
Total Split (s)	71.0	71.0	71.0	71.0	71.0	71.0	21.0	149.0	149.0	35.0	163.0	163.0
Total Split (%)	27.8%	27.8%	27.8%	27.8%	27.8%	27.8%	8.2%	58.4%	58.4%	13.7%	63.9%	63.9%
Yellow Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	3.0	5.0	5.0	3.0	5.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0
Lead/Lag							Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?							Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	None	Max	Max	None	Max	Max
Act Effct Green (s)	63.5	63.5	63.5	63.5	63.5	63.5	14.0	143.0	143.0	30.5	159.6	159.6
Actuated g/C Ratio	0.25	0.25	0.25	0.25	0.25	0.25	0.06	0.57	0.57	0.12	0.63	0.63
v/c Ratio	0.27	0.24	0.15	0.99	0.15	0.49	0.67	0.96	0.18	0.96	0.79	0.08
Control Delay	79.0	77.1	24.3	139.6	74.8	26.9	149.1	64.6	17.7	157.6	38.2	11.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	79.0	77.1	24.3	139.6	74.8	26.9	149.1	64.6	17.7	157.6	38.2	11.0
LOS	E	E	C	F	E	C	F	E	B	F	D	B
Approach Delay		64.9			84.4			63.4			49.1	
Approach LOS		E			F			E			D	
Queue Length 50th (ft)	118	151	21	485	97	115	108	1644	90	352	1157	29
Queue Length 95th (ft)	184	221	72	#712	154	223	175	1742	141	#549	1263	59
Internal Link Dist (ft)		878			494			600			540	
Turn Bay Length (ft)	50		50	200		300						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Base Capacity (vph)	322	478	440	297	488	545	116	2020	930	219	2253	1003
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.27	0.23	0.14	0.96	0.15	0.48	0.55	0.96	0.18	0.94	0.79	0.08

Intersection Summary

Area Type: Other
Cycle Length: 255
Actuated Cycle Length: 253
Natural Cycle: 130
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.99
Intersection Signal Delay: 60.3 Intersection LOS: E
Intersection Capacity Utilization 96.9% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 4: Piilani Hwy & Ohukai Rd

Intersection	
Int Delay, s/veh	4.4

Movement	SET	SER	NWL	NWT	NEL	NER
Lane Configurations						
Traffic Vol, veh/h	312	67	35	386	214	42
Future Vol, veh/h	312	67	35	386	214	42
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	100	-	0	25
Veh in Median Storage, #0	-	-	0	2	-	
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	0	0	0	1	1	0
Mvmt Flow	339	73	38	420	233	46

Major/Minor	Major1		Major2		Minor1	
Conflicting Flow All	0	0	412	0	872	376
Stage 1	-	-	-	-	376	-
Stage 2	-	-	-	-	496	-
Critical Hdwy	-	-	4.1	-	6.41	6.2
Critical Hdwy Stg 1	-	-	-	-	5.41	-
Critical Hdwy Stg 2	-	-	-	-	5.41	-
Follow-up Hdwy	-	-	2.2	-	3.509	3.3
Pot Cap-1 Maneuver	-	-	1158	-	322	675
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	614	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1158	-	311	675
Mov Cap-2 Maneuver	-	-	-	-	500	-
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	594	-

Approach	SE	NW	NE
HCM Control Delay, s	0	0.7	17.1
HCM LOS			C

Minor Lane/Major Mvmt	NELn1	NELn2	NWL	NWT	SET	SER
Capacity (veh/h)	500	675	1158	-	-	-
HCM Lane V/C Ratio	0.465	0.068	0.033	-	-	-
HCM Control Delay (s)	18.3	10.7	8.2	-	-	-
HCM Lane LOS	C	B	A	-	-	-
HCM 95th %tile Q(veh)	2.4	0.2	0.1	-	-	-