**Bernard P. Carvalho, Jr.**
Mayor

**Nadine K. Nakamura**
Managing Director

**Kanani Fu**
Housing Director

FILE COPY

MAY 08 2016

**KAUA'I COUNTY HOUSING AGENCY**
County of Kaua'i, State of Hawai'i
Pi'ikoi Building 4444 Rice Street Suite 330 Līhu'e Hawai'i 96766
TEL (808) 241-4444 FAX (808) 241-5118

April 25, 2016

Mr. Scott Glenn, Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

Dear Mr. Glenn:

With this letter, the Kaua'i County Housing Agency hereby transmits the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI) for the proposed Lima Ola Workforce Housing Development situated at TMK (4) 2-1-1:54, in 'Ele'ele on the island of Kaua'i for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact the County of Kaua'i Housing Director, Kanani Fu at (808) 241-4444.

Sincerely,

Kanani Fu
Housing Director
Kaua'i County Housing Agency

RECEIVED
'16 APR 27 A10:23
OFC. OF ENVIRONMENTAL QUALITY CONTROL

EQUAL HOUSING OPPORTUNITY
*An Equal Opportunity Employer*

# AGENCY
# PUBLICATION FORM

| | |
|---|---|
| Project Name: | **Lima Ola Work Force Housing Development** |
| Project Short Name: | N/A |
| HRS §343-5 Trigger(s): | Use of County Lands |
| Island(s): | Kauai |
| Judicial District(s): | |
| TMK(s): | (4) 2-1-001:054 |
| Permit(s)/Approval(s): | NPDES Construction Permit; Grading Permit; Grubbing Permit; Stockpiling permit; Building Permit; Road Permit; Electrical Permit, Plumbing Permit. |
| Proposing/Determining Agency: | County of Kauai Housing Agency |
| *Contact Name, Email, Telephone, Address* | Kanani Fu, Kananifu@kauai.gov, (808) 241-4444<br>4444 Rice Street, Suite 330<br>Līhuʻe, Kauaʻi, Hawaiʻi 96766 |
| Accepting Authority: | N/A |
| *Contact Name, Email, Telephone, Address* | N/A |
| Consultant: | Community Planning and Engineering, Inc. |
| *Contact Name, Email, Telephone, Address* | Frank Camacho, FCamacho@cpe-hawaii.com, (808) 531-4252, Ext. 1040 |

| **Status (select one)** | **Submittal Requirements** |
|---|---|
| _X__ DEA-AFNSI | Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice. |
| ____ FEA-FONSI | Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice. |
| ____ FEA-EISPN | Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice. |
| ____ Act 172-12 EISPN ("Direct to EIS") | Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice. |
| ____ DEIS | Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice. |
| ____ FEIS | Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice. |
| ____ FEIS Acceptance Determination | The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice. |
| FEIS Statutory Acceptance | Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions. |
| ____ Supplemental EIS | The accepting authority simultaneously transmits its notice to both the proposing agency and the |

| | |
|---|---|
| Determination | OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is or is not required; no EA is required and no comment period ensues upon publication in the Notice. |
| ____ Withdrawal | Identify the specific document(s) to withdraw and explain in the project summary section. |
| ____ Other | Contact the OEQC if your action is not one of the above items. |

**Project Summary**
Provide a description of the proposed action and purpose and need in 200 words or less.

The purpose of the proposed project is to satisfy the need for affordable housing on the island of Kauai. The Kauai County Housing Agency mission is to provide the much needed affordable housing to families on Kauai, as the population of Kauai residents is increasing. Facilitating affordable housing opportunities for Kauai residents is one of the county's top priorities. In order to address a housing shortage in the county, the Kauai County Council helped to pass a resolution in 2004 to acquire land for affordable housing. The proposed project site was acquired as a suitable location to provide the needed affordable housing to Kauai residents.

The County of Kauai Housing Agency is proposing to build an affordable housing project. The proposed project would include approximately 550 residential units (single family, multi-family and senior resident units) at final buildout. The project would be designed with roadways, green sustainable energy efficiency features, a community center/park, vegetated drainage swales, landscaped areas, a water storage tank, and bike and pedestrian paths. The proposed development would be located directly mauka of the intersection of Halewili Road and Kaumualii Highway in the town of Eleele on the west side of Kauai.

*Draft*

**ENVIRONMENTAL ASSESSMENT**

April 2016

# Lima Ola Work Force Housing Development

*'Ele'ele, Kaua'i, Hawai'i*

Community Planning and Engineering, Inc.

# DRAFT
# ENVIRONMENTAL ASSESSMENT

**Lima Ola Workforce Housing Development**
**‘Ele‘ele, Kaua‘i, Hawai‘i**

**Prepared by:**
Community Planning and Engineering, Inc.
1286 Queen Emma Street
Honolulu, Hawai‘i 96813

**Prepared for:**
County of Kaua‘i Housing Agency
4444 Rice Street, Suite 330
Līhu‘e , Kaua‘i, Hawai‘i 96766

**Applicant:**

County of Kaua‘i

4444 Rice Street, Suite 330

Līhu‘e , Kaua‘i, Hawai‘i 96766

**Approving Agency:**

County of Kaua‘i Housing Agency

4444 Rice Street, Suite 330

Līhu‘e , Kaua‘i, Hawai‘i 96766

April 2016

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Appendix F: Environmental Noise Assessment Report
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Appendix G-2: Archaeological Inventory Study
Appendix H: Environmental Assessment for HUD-funded Proposals

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## ACRONYMS AND ABBREVIATIONS

| | |
|---|---|
| % | percent |
| < | less than |
| A&B | Alexander and Baldwin |
| AIS | Archaeological Inventory Survey |
| ALISH | Agricultural Land of Importance to the State of Hawai‘i |
| AMI | area median income |
| BEA | United States Bureau of Economic Analysis |
| bgs | below ground surface |
| BMP | Best Management Practice |
| CAA | Clean Air Act |
| CDP | Census Designated Place |
| CEQ | Council on Environmental Quality |
| CERCLA | Comprehensive Environmental Response, Compensation, and Liability Act |
| CFR | Code of Federal Regulations |
| CH4 | methane |
| CIA | Cultural Impact Assessment |
| Cl | chloride |
| CO | carbon monoxide |
| CO2 | carbon dioxide |
| CWA | Clean Water Act |
| CZM | Coastal Zone Management |
| CZO | Comprehensive Zoning Ordinance |
| DAR | State of Hawai‘i Division of Aquatic Resources |
| dB | decibels |
| dBA | A-weighted decibels |
| DFW | State of Hawai‘i Division of Forestry and Wildlife |
| DLNR | State of Hawai‘i Department of Land and Natural Resources |
| DNL | day-night sound level |
| DOE | State of Hawai‘i Department of Education |
| DOH | State of Hawai‘i Department of Health |
| DOW | State of Kaua‘i Department of Water |
| EA | Environmental Assessment |
| EO | Executive Order |
| EPA | United States Environmental Protection Agency |
| ESA | Endangered Species Act |
| FEMA | Federal Emergency Management Agency |
| FONSI | Finding of No Significant Impact |
| GHG | greenhouse gas |
| gpm | gallons per minute |
| HAR | Hawai‘i Administrative Rules |
| HDOT | State of Hawai‘i Department of Transportation |
| HRS | Hawai‘i Revised Statutes |
| HT | Hawaiian Telcom |

| | |
|---|---|
| HUD | United States Department of Housing and Urban Development |
| IAL | Important Agricultural Land |
| KIUC | Kaua‘i Island Utility Cooperative |
| kW | kilowatt |
| L | liter |
| LOS | level of service |
| LUC | Land Use Commission |
| mg | milligram |
| MgB | Makaweli silty clay loam, 0 to 6 percent slopes |
| MgC | Makaweli silty clay loam, 6 to 12 percent slopes |
| mgd | million gallons per day |
| mph | miles per hour |
| msl | mean sea level |
| NAAQS | National Ambient Air Quality Standards |
| NEPA | National Environmental Policy Act |
| NHPA | National Historic Preservation Act |
| NMFS | National Marine Fisheries Service |
| No. | Number |
| NO | nitric oxide |
| NO2 | nitric dioxide |
| NOx | nitric oxides |
| NOAA | National Oceanic and Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| NRCS | Natural Resources Conservation Service |
| NRHP | National Register of Historic Places |
| NWIS | National Water Information System |
| O3 | ozone |
| OEQC | State of Hawai‘i Office of Environmental Quality Control |
| OSHA | United States Occupational Safety and Health Administration |
| OTWC | Oceanic Time Warner Cable |
| Pb | lead |
| PM | particulate matter |
| PM2.5 | particulate matter less than or equal to 2.5 microns in diameter |
| PM10 | particulate matter less than or equal to 10 microns in diameter |
| PUC | State of Hawai‘i Public Utilities Commission |
| PVC | polyvinyl chloride |
| RCRA | Resource Conservation and Recovery Act |
| SCS | Scientific Consultant Services, Inc. |
| SHPD | State Historic Preservation Division |
| SIP | State Implementation Plan |
| SO2 | sulfur dioxide |
| SWCA | SWCA Environmental Consultants |
| TCP | Traffic Control Plan |
| TMK | tax map key |
| U.S. | United States |
| U.S.C. | United States Code |

| | |
|---|---|
| USFWS | United States Fish and Wildlife Service |
| USGS | United States Geological Survey |
| VOC | volatile organic compound |
| WWTP | Wastewater Treatment Plant |

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# 1 INTRODUCTION

## 1.1 INTRODUCTION

This Environmental Assessment (EA) is prepared pursuant to Chapter 343, Hawai‘i Revised Statutes (HRS) and associated Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR), as well as the National Environmental Protection Act (NEPA) (40 Code of Federal Regulations [CFR] Parts 1500-1508) and 24 CFR Part 58; *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*. The environmental trigger initiating HRS 343 includes the use of County lands and funds. The environmental trigger initiating NEPA and 24 CFR Part 58 includes potential funding through the United States Department of Housing and Urban Development (HUD) programs. The intent of this document is to ensure that systematic consideration is given to the environmental, social, and economic consequences of the Proposed Action. The Proposed Action is the development of an affordable housing project located in the town of ‘Ele‘ele on the island of Kaua‘i.

## 1.2 PROJECT INFORMATION

| | |
|---|---|
| **Project Name:** | Draft EA<br>Lima Ola Work Force Housing Development<br>‘Ele‘ele, Kaua‘i, Hawai‘i |
| **Applicant:** | County of Kaua‘i<br>4444 Rice Street, Suite 330<br>Līhu‘e, Kaua‘i, Hawai‘i 96766<br>Contact: Kanani Fu-Housing Director<br>(808) 241-4444 |
| **Agent:** | Community Planning and Engineering, Inc.<br>1286 Queen Emma Street<br>Honolulu, Hawai‘i 96813<br>Contact: Frank Camacho, Project Manager<br>(808) 531-4252 ext. 1040 |
| **Approving Agency:** | County of Kaua‘i Housing Agency<br>4444 Rice Street, Suite 330<br>Līhu‘e, Kaua‘i, Hawai‘i 96766 |
| **Project Location:** | ‘Ele‘ele, Kaua‘i, Hawai‘i |
| **Tax Map Key (TMK):** | (4) 2-1-001:054 |
| **Land Area:** | Approximately 75 acres |
| **State Land Use District:** | Agricultural |
| **County Zoning Designation:** | Agricultural |

# 2 PROJECT DESCRIPTION

## 2.1 SCOPE AND AUTHORITY

This EA is being conducted in accordance with Hawai‘i Revised Statues (HRS) Chapter 343 and associated Title 11, Chapter 200, HAR, as well as the National Environmental Protection Act (NEPA) (40 Code of Federal Regulations (CFR) Parts 1500-1508) and 24 CFR Part 58; *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*. This EA evaluates the potential environmental, social, and economic impacts associated with the development of an affordable housing project in the town of ‘Ele‘ele on the island of Kaua‘i. The proposed improvements include:

- site work and grading;
- utility and infrastructure development;
- construction of residential housing units; and
- 1 (one) 500,000 gallon water storage tank

Environmental permits that would be required for the Proposed Action include a National Pollutant Discharge Elimination System (NPDES) permit during the construction period. This EA is being prepared as part of the HRS Chapter 201H application process. The details of the HRS Chapter 201H process are discussed in Section 3 and Section 5.2.1 of this EA.

## 2.2 PROJECT LOCATION

The project site is located on the west side of the island of Kaua‘i approximately seven miles southeast of Waimea town, and directly northeast of ‘Ele‘ele town (Figure 1). The project site is located directly *mauka* (landward) of the intersection of Halewili Road and Kamuali‘i Highway, and includes approximately 75 acres of land within TMK (4) 2-1-001:054 (Figure 2).

## 2.3 OVERVIEW OF ALTERNATIVES

### 2.3.1 NO ACTION ALTERNATIVE

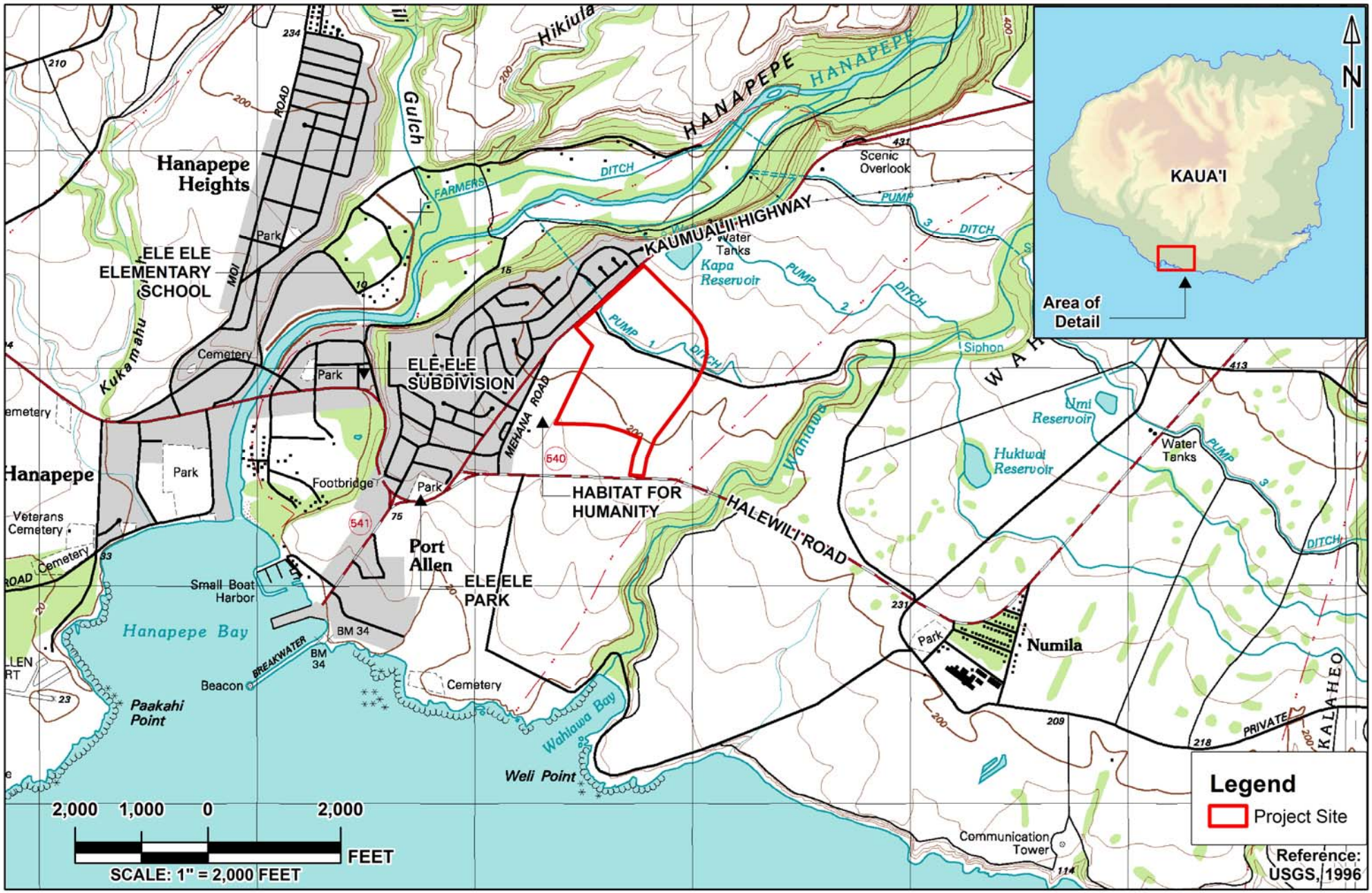
Under the No Action Alternative, the proposed affordable housing development would not be constructed. There would be no disturbance to the existing environment within the project site under the No Action Alternative; however, the County of Kaua‘i would not have use of land to provide affordable housing needed by Kaua‘i residents. There would be cumulative adverse socioeconomic impacts under the No Action Alternative, since the housing needs of Kaua‘i’s growing resident population would continue to increase without the necessary affordable housing stock in the county.

### 2.3.2 THE PROPOSED ACTION

The Proposed Action is the development of the Lima Ola subdivision; a County of Kaua‘i affordable workforce housing project that would provide the growing county population much needed affordable housing. Lima Ola would include approximately 550 residential units (single family, multi-family and senior resident units) designed with green sustainable energy efficiency features, a community center/park, vegetated drainage swales, landscaped areas, a water storage tank, and bike and pedestrian paths. The Proposed Action would be located directly mauka of the intersection of Halewili Road and Kaumuali‘i Highway in the town of ‘Ele‘ele on the west side of Kaua’i (Figure 1 and Figure 2).

***Conceptual aerial view of the proposed Lima Ola community; adjacent to ‘Ele‘ele subdivision.***

***Proposed Lima Ola community with a neighborhood park, vegetated green swales and pedestrian/bike paths.***




Community Planning and Engineering, Inc.

**DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT**

**PROJECT LOCATION MAP**
**'ELE'ELE, KAUA'I, HAWAI'I**

**FIGURE 1**

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PDF - Q:\Kauai\County Affordable Housing Lima Ola\PDF
Path - Q:\Kauai\County Affordable Housing Lima Ola\Photoshop\RevConceptMasterPlan_20140715.psd

| LAND AREA SUMMARY | | Acreage | Units |
|---|---|---|---|
| **Housing** | | | |
| Single Family *(Typical lot size: 5,000 - 7,000 SF.)* | ± | 18.0 | 120 - 135 |
| Multi Family | ± | 32.9 | 375 - 435 |
| Elderly | ± | 3.6 | 35 - 50 |
| Community Center / Park | ± | 2.8 | |
| Special Landscape Treatment | | --- | |
| Water Storage Tank | ± | 1.0 | |
| Open Space / Common Area (Detention Basin, Pedestrian Corridor) | ± | 1.4 | |
| Vegetated Swale | | (Acreage Included in Roadway) | |
| Bike/Pedestrian Path | | (Acreage Included in Roadway) | |
| **Roads** | | | |
| County Major Perimeter Road - Mauka section (56' ROW) | ± | 0.8 | |
| Loop Collector Road (56' ROW) | ± | 6.4 | |
| Entry Road - Mauka and Makai (56' ROW) | ± | 0.7 | |
| Mahea Road (56' ROW) | ± | 1.2 | |
| Minor Road (46' ROW) | ± | 2.7 | |
| Future Road Reserve | ± | 3.5 | |
| **TOTAL:** | ± | **75.0** | **530 - 620** |
| | | *ac.* | *units* |

Conceptual Master Plan

# LIMA OLA

DRAFT 07/15/14

County of Kaua'i
Island of Kaua'i

North

Linear Scale (in feet)
0 100 200 400

PBR HAWAII & ASSOCIATES, INC.

Source: Project boundaries provided by Community Planning & Engineering (2014-01-07); Original master plan provided by Kimura International and RM Towill Corporation (March 2012); Google Earth Pro (2014).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

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## 2.4 PURPOSE AND NEED FOR ACTION

The purpose of the Proposed Action is to satisfy the need for affordable housing on the island of Kaua‘i. The Kaua‘i County Housing Agency mission is to provide the much needed affordable housing to families on Kaua‘i, as the population of Kaua‘i residents is increasing. Facilitating affordable housing opportunities for Kaua‘i residents is one of the county’s top priorities. Following a rapid increase in housing prices in Kaua‘i County in the mid-2000s, a shortage of affordable housing for Kaua‘i residents was pervasive; island-wide. In order to address this housing shortage, the Kaua‘i County Council helped to pass a resolution in 2004 to acquire land for affordable housing. The proposed project site was acquired as a suitable location to provide the needed affordable housing to Kaua‘i residents (County of Kaua‘i Housing Agency, 2012) (Appendix A).

## 2.5 REGULATORY FRAMEWORK

The EA is a requirement under Chapter 343 HRS due to the use of county land, as well as the environmental review requirements under HRS Chapter 201H. This EA has been prepared in accordance with HRS 343, and its implementing regulations, including Title 11, Chapter 200 of the HAR. This EA also complies with NEPA (40 CFR 1500-1508), as well as 24 CFR Part 58; *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*. Compliance with NEPA and 24 CFR Part 58 area needed since HUD funding may be sought for the proposed project. A separate *Environmental Assessment for HUD-Funded Proposals* is included as Appendix H of this EA in compliance with 24 CFR Part 58. In addressing environmental considerations, the following relevant regulations that establish standards and provide guidance on environmental and natural resource management and planning are discussed throughout subsequent sections of this EA:

- Chapter 343 HRS;
- Chapter 226 HRS;
- 40 CFR Parts 1500-1508
- 24 CFR, Part 58
- Chapter 201H HRS;
- Chapter 6E HRS;
- Chapter 205 HRS;
- Title 11, Chapter 200 HAR;
- County of Kaua‘i General Plan (Amended November 2000);
- Coastal Zone Management (CZM) Act;
- Kaua‘i County Comprehensive Zoning Ordinance;

- The Clean Air Act (CAA);
- The Clean Water Act (CWA);
- The Endangered Species Act (ESA);
- Executive Order (EO) 12898 (*Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*); and
- EO 13045 (*Protection of Children from Environmental Health Risks and Safety Risks*).

## 2.6 PUBLIC AND AGENCY CONSULTATION

This environmental review includes public involvement and agency consultation, as required by HRS 343, 201H, NEPA and 24 CFR Part 58. Public participation will include an opportunity for public review and comment on this EA. Availability of this EA will be announced using local media, including but not limited to the State of Hawai‘i Office of Environmental Quality Control (OEQC) Environmental Notice. Agency and public consultation has taken place throughout the duration of the project. Consultation correspondence is included in Appendix B of this EA.

# 3 HRS 201-H EXEMPTIONS TO EXPEDITE PROCESSING OF AFFORDABLE HOUSING DEVELOPMENT

## 3.1 INTRODUCTION/PURPOSE

HRS Section 201H-38, was enacted into law to provide a process whereby an affordable housing project may be granted exemptions from statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning and construction standards that do not negatively affect the health and safety of the general public. The Kaua‘i County Housing Agency administers this law for the County of Kaua‘i.

Typical exemptions may include but are not limited to General Plan, Development Plan, and Zoning District designations, zoning district and subdivision requirements (e.g., undergrounding of utilities, parking requirements, lot size, street design), relief from park dedication requirements, and various fees.

Affordable housing projects are eligible if more than half (51 percent) of the units are made affordable to income target groups established by County rules, based on guidelines provided by the U.S. Department of Housing and Urban Development (HUD). The target groups are defined as a percentage (e.g., 80-140 percent) of the median income for Kaua'i as determined by HUD. Additional requirements apply, and a project and developer must be determined as eligible by the Housing Agency for 201H consideration (County of Kaua‘i, 2015).

## 3.2 EXEMPTION LIST

The following are the proposed exemptions from the Kaua‘i County Code (KCC) under HRS Section 201H-38 for the proposed affordable housing development:

A. EXEMPTION FROM TITLE IV, KCC, CHAPTER 7, THE GENERAL PLAN FOR THE COUNTY OF KAUA‘I

1. An exemption from Chapter 7, Article 3, Section 7.3.1, KCC, General Plan, shall be granted to permit the project to proceed without obtaining an amendment of the General Plan.

B. EXEMPTION FROM TITLE IV, KCC, CHAPTER 8, COMPREHENSIVE ZONING ORDINANCE

1. An exemption from Chapter 8, Article 3, Section 8-3.4 (5), KCC, Uses and Structures in Residential Districts That Require a Use Permit. An exemption would be sought for a Use Permit that would be required for the proposed community center.

2. An exemption from Chapter 8, Article 3, Section 8-3.6, KCC, Development Standards for Residential Structures Which Involve the Subdivision of Land, shall be granted.

For single family detached dwellings, the following zoning standards shall apply to the proposed lots:

Minimum Lot Size: 4,500 square feet
Setback (Rear): Minimum of 5 feet

Setback (Front): Minimum of 10 feet
Minimum Lot Width: 35 feet
Pole Section of Flag Lot Width: Minimum of 10 feet
Pole Section of Flag Lot Length: Maximum of 150 feet

For single family attached dwellings, the following zoning standards shall apply to the proposed lots:

Minimum Lot Size: 1,800 square feet
Setback (Rear): Minimum of 5 feet
Setback (Front): Minimum of 10 feet
Minimum Lot Width: 20 feet
Minimum Lot Length: The average lot length shall not exceed seven (7) times its width.

For multiple-family attached dwellings, the unit density shall adhere to R-20 zoning standards. R-20 zoning is defined in KCC, Section 8.3.2 of the Comprehensive Zoning Ordinance as a maximum density of 20 units per acre of land. The multiple-family attached dwellings shall adhere to the following zoning standards:

Minimum Lot Area: 8,000 square feet
Setback (Rear): Minimum of 5 feet
Setback (Front): Minimum of 10 feet
Minimum Lot Width: 60 feet
Minimum Lot Length: The average length of any lot shall not exceed five (5) times its average width.

3. An exemption from Chapter 8, Article 3, Section 8-3.7, KCC, Standards of Development Applicable to all Residential Development, shall be granted to permit a minimum of one (1) off-street parking space for each bedroom of a non-elderly housing multi-family attached dwelling unit.

4. An exemption from Chapter 8, Article 7, Section 8-7.1, KCC, Agricultural Districts, to permit the development and use of the parcels for single-family and multi-family residential purposes, including supporting infrastructure requirements.

## C. EXEMPTION FROM TITLE IV, KCC, CHAPTER 9, SUBDIVISION ORDINANCE

1. An exemption from Chapter 9, Article 3, Section 9.2.3(e)(3), KCC, Streets, shall be granted to exempt the project from curbs, gutters and sidewalks on all proposed streets within or abutting the subdivision.

Vegetated swales and pedestrian walkways would be constructed in place of curbs and gutters. The vegetated swales would biofilter stormwater, which would drain into

subsurface culverts. The culverts would drain into an onsite detention basin, which would allow stormwater to percolate into the underlying aquifer.

2. An exemption from Chapter 9, Article 3, Section 9-2.8(d)(1) KCC, Land Area Requirement to be Dedicated in Perpetuity, shall be granted to exempt the project from the requirement to provide a minimum ratio of one-and-three-fourths (1.75) acres of land for park and playground purposes for each one thousand (1,000) persons or fraction thereof. A 3.1 acre park that would include a community center would be included in the proposed subdivision.

3. An exemption from Chapter 9, Article 3, Section Section 9-3.2(b) KCC, filing fees for Preliminary Subdivision Map Approval and Section 9-3.7(c) KCC, Construction Inspection fee shall be granted for the proposed subdivision.

4. An exemption from Ordnance 946, Section 4 (6) KCC, Blocks shall be granted exempt from the maximum 450 and fifty (450) block length in Residential Districts.

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# 4 ENVIRONMENTAL SETTING AND POTENTIAL IMPACTS

## 4.1 INTRODUCTION

The environmental, social, and economic setting of the project site and the probable impacts of the No Action Alternative and the Proposed Action are described in this section of the EA. Impacts are evaluated as to whether they constitute a "significant effect" on a particular environmental setting. Impacts are described as having No Impact, Significant Adverse Impact, or Beneficial Impact to the environment. The terms "impact" and "effect" are used synonymously in this EA. Impacts may apply to the full range of natural, aesthetic, historic, cultural, and economic resources. The following subsections define key terms used throughout Section 3.

### 4.1.1 REGULATORY SETTING

Impacts to the affected environment from the proposed alternatives were assessed based on procedures outlined in State regulations HRS 343, HAR Title 11, Chapter 200, as well as Federal regulations included in NEPA (40 CFR 1500-1508) and 24 CFR Part 58; *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*.

### 4.1.2 SIGNIFICANCE CRITERIA

A "significant effect" is defined by HRS Chapter 343 as "the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the state's environmental policies or long-term environmental goals as established by law, or adversely affect the economic welfare, social welfare, or cultural practices of the community and state" (State of Hawai‘i, 2008). HAR 11-200-12 B offers the following guidance for determining environmental impact significance:

"In determining whether an action may have a significant effect on the environment, the agency shall consider every phase of a proposed action, the expected consequences, both primary and secondary, and the cumulative as well as the short-term and long-term effects of the action. In most instances, an action shall be determined to have a significant effect on the environment if it:

1. involves an irrevocable commitment to loss or destruction of any natural or cultural resource;
2. curtails the range of beneficial uses of the environment;
3. conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344 HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;
4. substantially affects the economic welfare, social welfare, and cultural practices of the community or state;
5. substantially affects public health;
6. involves substantial secondary impacts, such as population changes or effects on public facilities;

7. involves a substantial degradation of environmental quality;
8. is individually limited but cumulatively has considerable effect upon the environment or involves a commitment for larger actions;
9. substantially affects a rare, threatened, or endangered species, or its habitat;
10. detrimentally affects air or water quality or ambient noise levels;
11. affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;
12. substantially affects scenic vistas and viewplanes identified in county or state plans or studies; or
13. requires substantial energy consumption (HAR §11-200-12 B).

### 4.1.3 DIRECT VERSUS INDIRECT IMPACTS

Definitions and examples of "direct" and "indirect" impacts as used in this document are as follows:

"Primary impact" or "primary effect" or "direct impact" or "direct effect" means effects which are caused by the action and occur at the same time and place (HAR §11-200-2). For direct impacts to occur, a resource must be present in the particular project site.

"Secondary impact" or "secondary effect" or "indirect impact" or "indirect effect" means effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems (HAR §11-200-2).

### 4.1.4 BENEFICIAL VERSUS ADVERSE IMPACTS

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

CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508, Section 1502.13) also include the following guidance relating to impact analysis.

*Impact Analysis*

**Direct Impacts**: are caused by the action and occur at the same time and place.

**Indirect Impacts**: are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect impacts may include growth inducing impacts and other impacts related to induced changes in the pattern of land use, population density or growth rate, and related effects on air, water and other natural systems, including ecosystems.

Impacts include ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, social, or health, whether direct, indirect, or cumulative. Impacts may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect will be beneficial (40 CFR 1508.8).

*Significance of Environmental Impacts*

According to CEQ regulations 40 CFR 1500-1508, the determination of a significant impact is a function of both context and intensity.

**Context**: This means that the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance would usually depend upon the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant.

**Intensity**: This refers to the severity of impact. Responsible officials must bear in mind that more than one agency may make decisions about partial aspects of a major action.

To determine significance, the severity of the impact must be examined in terms of the type, quality and sensitivity of the resource involved; the location of the proposed project; the duration of the effect (short or long-term) and other consideration of context. Significance of the impact will vary with the setting of the proposed action and the surrounding area (including residential, industrial, commercial, and natural sites).

### 4.1.5 CUMULATIVE IMPACTS

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

In accordance with NEPA and the CEQ memorandum of "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis," a discussion of cumulative impacts resulting from projects which are proposed, under construction, recently completed, or anticipated to be implemented in the near future is included in this EA.

## 4.2 PHYSICAL ENVIRONMENT

### 4.2.1 GEOLOGICAL RESOURCES

**Definition of Resources**

Geological resources typically consist of surface and subsurface materials and their inherent properties. Principal geologic factors affecting the ability to support structural development are seismic properties (*i.e.*, potential for subsurface shifting, faulting, or crustal disturbance), soil stability, and topography.

The term *soil*, in general, refers to unconsolidated materials overlying bedrock or other parent material. Soils play a critical role in both the natural and human environment. Soil structure, elasticity, strength, shrink-swell potential, and erodibility all determine the ability for the ground to support man-made structures and facilities. Soils typically are described in terms of their complex type, slope, physical characteristics, and relative compatibility or constraining properties with regard to particular construction activities and types of land use.

Topography is the change in elevation over the surface of a land area. An area's topography is influenced by many factors, including human activity, underlying geologic material, seismic activity, climatic conditions, and erosion. A discussion of topography typically encompasses a description of surface elevations, slope, and distinct physiographic features (*e.g.*, mountains), and their influence on human activities.

Natural geologic hazards include earthquakes and tsunamis. Earthquakes typically result from release of energy from the earth's crust and manifest themselves by shaking and sometimes displacement of the ground which can result in property damage. Earthquakes can also trigger landslides as well as volcanic activity. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. A tsunami is a series of water waves caused by the displacement of a large volume of a body of water. Tsunamis are characterized by high speeds (up to 560 miles per hour [mph]), long wave lengths (up to 120 miles), and long periods between successive wave crests (up to several hours). Tsunamis have the potential to inundate the coastline, causing severe property damage and/or loss of life. The tsunami evacuation zone is a guideline, developed by the Kaua'i Civil Defense Agency, to provide the minimum safe evacuation distance.

**Regulatory Setting**

Kaua'i Ordinance Number (No.) 808 Sediment and Erosion Control describes proper procedures necessary for grading, soil erosion, and sediment control during earthwork activities. All work, including excavation and fill work, shall be in accordance with current construction standards and all applicable local, state, and federal regulations.

#### 4.2.1.1 EXISTING CONDITIONS

*Geology*

The Hawaiian Archipelago is a chain of seamounts and islands in the North Pacific extending 1,616 miles west by northwest from the largest island, Hawaiʻi. Igneous rocks are the dominant rock type and consist of basaltic flows, caldera and dike complexes, and pyroclastics. The island of Kauaʻi consists of a single shield volcano, which has a volume of about 1,007 cubic miles and rises 3.17 miles above the surrounding sea floor. Kauaʻi is circular in shape and encompasses an area of approximately 550 square miles. Lava flows of the Kōloa Series, which underlie the project site, cover about half the surface of the eastern part of Kauaʻi; they form the entire floor of the Līhuʻe basin except for two small kīpukas (exposed mounds or depressions left uncovered by a lava flow) of Waimea Canyon Series volcanics (Macdonald et al., 1983).

*Topography and Soils*

The project site slopes gently in the makai (seaward) direction from north to south. The project site ranges in elevation from approximately 275 to 175 feet above mean sea level (msl), and has an average slope of four percent (4 %) grade (County of Kauaʻi Housing Agency, 2012; Kimura International, 2010). The project site, currently used for agriculture, is bound by Kaumualiʻi Highway to the northwest and west, Halewili Road to the south, and agricultural lands to the east and northeast.

The Soil Survey of the Islands of Kauaʻi, Oʻahu, Maui, Molokaʻi, and Lanaʻi, State of Hawaiʻi (Foote et al., 1972) presents details on the soils present on the island of Kauaʻi. The predominate soil type at the project site includes Makaweli silty clay loam, 0 to 6% slopes (MgB). This soil is a dusky-red to dark reddish-brown, friable silty clay loam or stony silty clay loam surfaced layer with a dusky-red, friable silt loam and silty clay loam subsoil. MgB has moderate permeability, slow runoff and a slight erosion hazard. A small portion of the project site includes Makaweli silty clay loam, 6-12% slopes (MgC). This soil type is similar to MgB, except it has medium runoff potential and its erosion hazard is moderate (Figure 3).

*Earthquakes*

In Hawaiʻi, earthquakes are generally linked to volcanic activity and occur thousands of times annually; the vast majority of which are at a very small magnitude. According to the Hawaiʻi Seismic Zone Assignments (United States Geological Survey, 2001), Kauaʻi lies in a seismic zone designated as Zone 1; indicating that ground accelerations of 7.5% of the acceleration due to gravity are likely to occur at a probability of 10% in a 50 year exposure time (USGS, 2001).

*Tsunamis*

Located in the middle of the Pacific Ocean, Hawaiʻi is susceptible to tsunamis from earthquakes generated throughout the Pacific. The project site is located outside of the tsunami evacuation zone (State of Hawaiʻi, 2016).

**Approach to Analysis**

Determination of the significance of potential impacts to geological and soil resources is based on: 1) the importance of the resource (*i.e.*, commercial, ecological, and/or scientific); 2) the proportion of the resource that would be affected relative to its occurrence in the region; and 3) the susceptibility to deleterious effects on the resource due to the Proposed Action. Impacts to geological and soil resources are significant if the physical structure, chemical composition, or visual aesthetic character are adversely affected over a relatively large area.

### 4.2.1.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

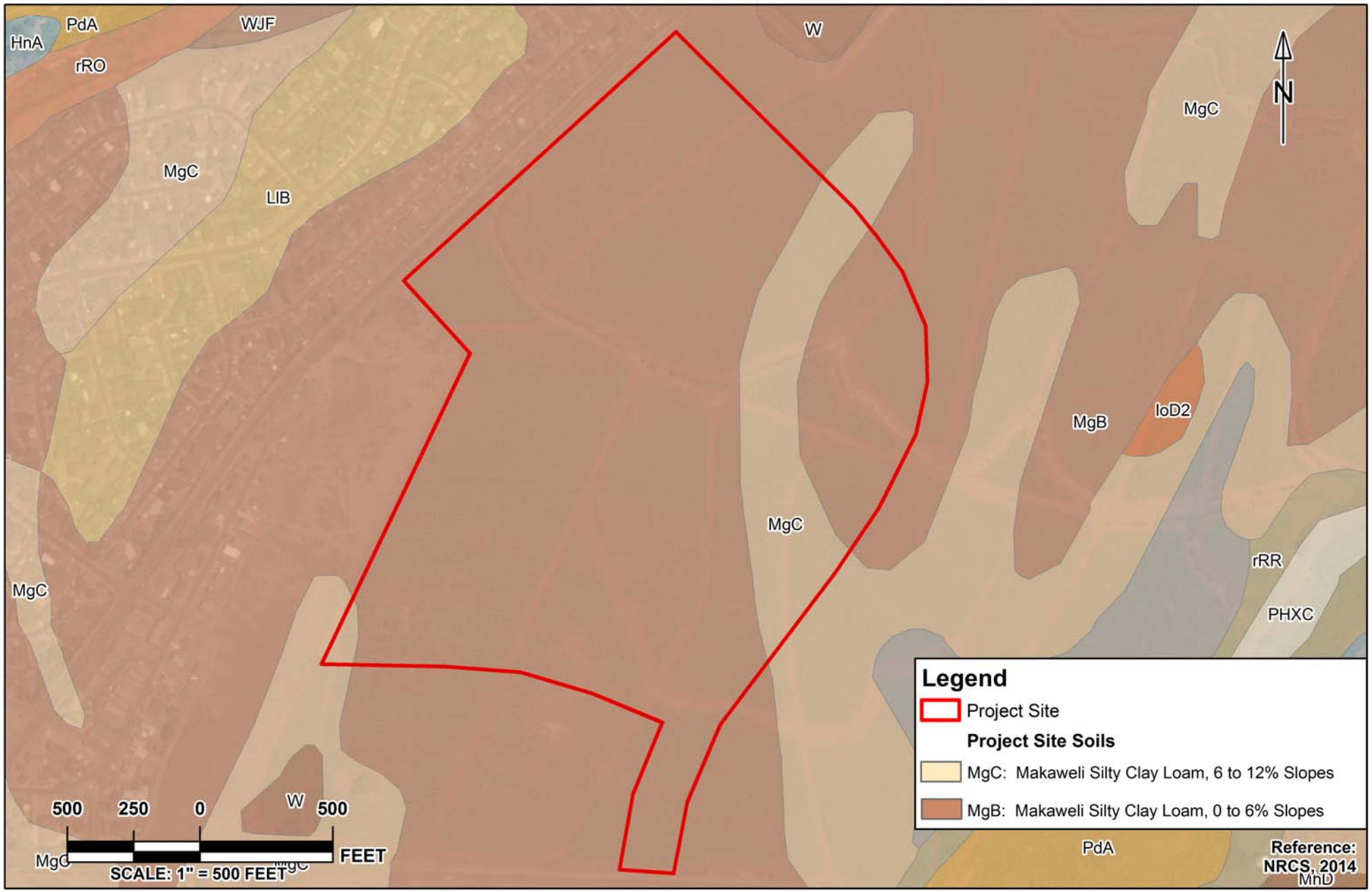
Under the No Action Alternative, no construction or change in ground surface is expected. No significant impacts to geological resources, topography, soils, or susceptibility to natural hazards are expected to result from the No Action Alternative.

**Proposed Action**

The Proposed Action would involve ground disturbing activities during the construction period, including grading and subsurface utility and infrastructure installation. However, it is not anticipated that the proposed development would significantly alter the existing topography or affect geological conditions. Therefore, there would be no significant impacts to topography or geology under the Proposed Action.

The Proposed Action could potentially have short-term less than significant impacts on soils during construction activities associated with the grading, site work, and utility and infrastructure development. Soils would be temporarily excavated and stockpiled onsite during the construction period. Exposed soils are susceptible to erosion, especially if it rains heavily during site work periods. Wind erosion may also cause some unavoidable soil loss, but the greater concern is silt runoff.

Adverse impacts to soils would be minimized or avoided as a result of both temporary and permanent erosion and sedimentation control measures that shall be implemented during grading and trenching, and during the construction of the site drainage system, housing units, and roads. Control measures may include silt fences around the work area during construction. Proposed work shall comply with state erosion control standards, as well as the Construction Best Management Practices (BMPs) for Sediment and Erosion Control for the County of Kaua‘i (County of Kaua‘i, 2004). Soil impacts are anticipated to be short-term, and with the implementation of the BMP control measures to avoid impacts to the surrounding areas, no significant impacts are anticipated.

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**DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT**

**SOILS MAP**
**'ELE'ELE, KAUA'I, HAWAI'I**

**FIGURE 3**

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### 4.2.2 FIRE HAZARDS

#### 4.2.2.1 EXISTING CONDITIONS

Currently, there is a moderate to high fire risk at the project site due to the presence of extensive foliage at the project site. The first station to respond in case of a fire at the project site would be the Hanapēpē Fire Station located approximately 1.3 miles west of the project site. The secondary response station would be the Kalaheo Fire Station located approximately 3.2 miles northeast from the project site.

#### 4.2.2.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

No significant impacts are expected under the No Action Alternative. Existing potential fire hazards posed by the current conditions would remain the same.

**Proposed Action**

No significant impacts are expected under the Proposed Action. Construction activities for the Proposed Action could create a small fire hazard during the initial ground clearing activities due to the interaction of earth moving equipment with site foliage. These potential impacts would be mitigated through the implementation of construction practices for fire safety in accordance with state and county guidelines. Once the vegetation is cleared, potential fire hazard impacts would be further reduced at the project site. The construction fire safety practices include proper practices and fire hazard awareness for contractors at the work site. Daily equipment inspections would be conducted and all vehicles and equipment brought on site would be in proper working condition. All vehicles and equipment would be mounted with appropriately rated fire extinguishers, and additional fire extinguishers would also be available at the project site. All on-site workers would be aware of the locations and operation of fire extinguishers. On-site workers would also be aware of the flammability properties of the chemicals they are working with and their proper storage requirements, and important safety information such as emergency contact numbers, proper emergency evacuation procedures, and designated smoking areas (if smoking is permitted on site). Implementation of these mitigation measures would reduce the potential impact of fire hazard to less than significant at the work site. The planned neighborhood would need to be designed to assure adequate fire lanes/routes are established in order for the Kaua‘i County Fire Department to access all areas of the planned development.

### 4.2.3 BIOLOGICAL RESOURCES

**Definition of Resources**

Biological resources include native or naturalized plants and animals and the habitats in which they occur. Sensitive biological resources are defined as those plants and animal species listed as threatened or endangered, or proposed as such, by the United States Fish and Wildlife Service

(USFWS), the National Marine Fisheries Service (NMFS), the State of Hawai‘i Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DFW), or the State of Hawai‘i Division of Aquatic Resources (DAR).

**Regulatory Setting**

The ESA was created in order to protect and recover imperiled species and the ecosystems upon which they depend. The ESA grants USFWS primary responsibility for terrestrial and freshwater organisms and the NMFS primary responsibility for marine wildlife.

The Migratory Bird Treaty Act, implemented 1918, prohibited the hunting, killing, capturing, possession, sale, transportation, and exportation of birds, feathers, eggs and nests (16 United States Code [U.S.C.] 703). This treaty applies to bird species that are native to the United States (U.S.) or its territories, and is applicable in Mexico, Japan, and Russia.

### 4.2.3.1 EXISTING CONDITIONS

*Biological Resource Assessment*

A terrestrial flora and fauna survey was conducted by SWCA Environmental Consultants (SWCA) on September 25-26, 2013 (SWCA, 2013) to document the existing biological resources that may be impacted by the Proposed Action. The survey was conducted within the project site where construction activities are anticipated to take place. The following is a summary of the findings of the survey; the complete Biological Survey is included as Appendix C.

*Flora*

No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed within the surveyed area, and no designated critical plant habitat occurs within the area. The vegetation observed within the project site is disturbed from previous and current land use activities, thus the vegetation types and species identified are not considered to be unique to the site. Of the 66 plant species observed at the project site, only two species; ‘uhaloa (*Waltheria indica*) and moa (*Psilotum nudum*) are native to the Hawaiian Islands.

*Fauna*

Thirteen (13) bird species were documented during the survey. These species are typically found in agricultural areas, and included one migrant shorebird species: the Pacific golden plover (*Pluvialis fulva*), which was primarily observed on roads. Although no owls were seen or heard during the survey, the native Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) and the introduced barn owl (*Tyto alba*) could use the project site for hunting and roosting.

Seabirds, particularly the endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell’s shearwater (*Puffinus auricularis newelli*), may fly over the project site at night while traveling to and from their upland nesting sites to the ocean. Both species nest inland in the mountainous interior of Kaua‘i. Although no suitable nesting sites are present at the

project site, the current manager of the project site stated that on occasion, Newell's shearwaters have been heard calling at night while flying over the project site.

Six bat detectors were deployed in order to detect the presence of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*). Four of the six detectors detected multiple bat calls at the project site. Therefore, the Hawaiian hoary bat is present at the project site.

**Approach to Analysis**

Determination of the significance of potential impacts to biological resources is based on 1) the importance (*i.e.*, legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) and the sensitivity of the resource to proposed activities; and 4) the duration of ecological ramifications. Impacts to biological resources are significant if species or habitats of concern are adversely affected over relatively large areas, or if disturbances cause reductions in population size or distribution. Potential physical impacts such as habitat loss, noise, and impacts to water quality were evaluated to assess potential impacts to biological resources resulting from the Proposed Action.

### 4.2.3.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

There would be no impact to biological resources from the No Action Alternative since use at the project site would remain unchanged and no flora or fauna species would be affected. Any adverse effects to threatened or endangered species present at the project site from the current agricultural use (*e.g.*, noise and vibration from vehicles and machinery) would continue.

**Proposed Action**

Construction activities planned for the Proposed Action may impact the Hawaiian hoary bat, which was detected at the project site, as well as the Hawaiian petrel and the Newell's shearwater, which were not observed at the project site during the survey, but may be present periodically. It is not anticipated that the Pacific golden plover would be significantly impacted since suitable foraging habitats at nearby grassy areas exist. Correspondence with the USFWS indicated that various protected Hawaiian bird species may traverse the project site, however the project site does not include designated critical habitat for any protected species (Appendix B). The following control measures should be implemented at the project site to minimize or avoid possible impacts to biological resources:

To prevent direct impacts to the Hawaiian hoary bat, the following control measures are recommended:

- No trees taller than 15 feet within the project site should be trimmed or removed between June 1 and September 15 when non-volant juvenile bats (bats that cannot fly) may be roosting in the trees.

- Any fences that are erected as part of the Proposed Action should have a barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. For existing fences at the project site, the top strand of barbed wire should be removed or replaced with barbless wire.

The following control measures are recommended to avoid and minimize light attraction of the endangered Hawaiian petrel and threatened Newell's shearwater to the project site:

- Construction activity should be restricted to daylight hours as much as practicable during the seabird breeding season (April through November) to avoid the use of nighttime lighting that could be an attraction to seabirds.
- All outdoor lights should be shielded to prevent upward radiation at the housing development. This has been shown to reduce the potential for seabird attraction.
- Outside lights that are not needed for security and safety should be turned off from dusk through dawn during the fledgling fallout period (September 15–December 15).

The USFWS recommended that construction activities be coordinated closely with their agency during construction in order to avoid creating standing water and other attractive nuisances, such as standing water that could attract the following protected Hawaiian Waterbirds to unsafe construction conditions: the Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), Hawaiian moorhen (*Gallinula chloropus sanvicensis*), Hawaiian coot (*Fulica alai*) and the Hawaiian Duck (*Anas wyvilliana*). The USFWS also identified the following protected bird species that could access the project site: the Hawaiian goose (*Branta sandvicensis*), Hawaiian hoary bat, Hawaiian petrel, Newell's shearwater and the band-rumped storm-petrel (*Oceanodroma castro*). The USFWS also recommended that a qualified biologist survey the project area prior to construction, and after a delay of at least 3 days in construction for the presence of Hawaiian goose nests. If a nest is discovered, work should cease immediately and the USFWS should be contacted for further guidance. With these control measures in place, impacts to biological resources from the Proposed Action would be reduced to a level of insignificance.

### 4.2.4 WATER RESOURCES

**Definition of Resources**

Water resources analyzed encompass surface water, groundwater, floodplains, and wetlands. Surface water resources include lakes, rivers, and streams, and are important for a variety of reasons including ecological, economic, recreational, aesthetic, and human health. Groundwater comprises subsurface water resources and is an essential resource in many areas as it is used for potable water, agricultural irrigation, and industrial applications. Floodplains are belts of low, level ground present on one or both sides of a stream channel and are subject to either periodic or infrequent inundation by floodwater. Wetlands are defined as: *"Those areas that are inundated or saturated by surface or ground water (hydrology) at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation (hydrophytes) typically adapted for life in saturated soil conditions (hydric soils). Wetlands generally include swamps, marshes, bogs, and similar areas"* (40 CFR 232.2(r)).

**Regulatory Setting**

Section 402 of the CWA specifically requires the U.S. Environmental Protection Agency (EPA), and authorized state governments, to develop and implement the NPDES program. HRS 342D-50(a) states that: "No person, including any public body, shall discharge any water pollutant into state waters, or cause or allow any water pollutant to enter state waters except in compliance with this chapter, rules adopted pursuant to this chapter, or a permit or variance issued by the director." HAR Chapter 11-55 (Water Pollution Control), defines the NPDES permit program for the State of Hawai'i, which is required for point source pollutant and stormwater discharges.

### 4.2.4.1 EXISTING CONDITIONS

*Groundwater*

The northwestern potion of the project site is located in the Hanapēpē aquifer system of the Waimea aquifer sector and the southern portion of the project site is located in the Kōloa aquifer system of the Līhu'e aquifer sector (Figure 4). The Hanapēpē aquifer system includes an upper and lower aquifer, classified as 20304111 (21111)/20304122 (21113), with a slash between the two identification codes to denote relative vertical occurrence. The upper aquifer is classified as basal (i.e., fresh water in contact with seawater), unconfined, and having a flank-type lithology. Further, this aquifer has a potential use for development, a drinking water utility, a fresh salinity (i.e., less than [<] 250 milligrams [mg] chloride [Cl]/liter [L]), is irreplaceable, and has a high vulnerability of contamination. The lower aquifer is classified as basal, confined, and has a dike-type lithology. This aquifer also is designated as having a potential use for development, a drinking water utility, a fresh salinity (i.e., <250 mg Cl/L), is irreplaceable, and has a low vulnerability to contamination (Mink and Lau, 1992).

In the Kōloa aquifer system, an upper and lower aquifer also underlie the project site, classified as 20101111 (21111)/20101122 (21113). The upper aquifer is classified as basal, unconfined, and having a flank type lithology. Further, the status code designates that this aquifer has potential use for development, a drinking water utility, of a fresh salinity, is irreplaceable, and has a high vulnerability for contamination. The lower aquifer is classified as basal, confined, and having a dike-type lithology. Additionally, this aquifer has a potential use for development, a drinking water utility, is of a fresh salinity, is irreplaceable, and has a low vulnerability to contamination (Mink and Lau, 1992).

*Surface Water*

No permanent surface water bodies are found at the project site; the nearest surface water body is the Kapa reservoir, located approximately 75 feet north, and 20 feet higher in elevation of the project site border. A man-made irrigation ditch (Pump No. 1 Ditch), that was previously used for agricultural purposes is located at the project site. Wahiawa Stream is located approximately 1,000 feet east of the project site, at its nearest extent. Hanapēpē River is located approximately 1,000 feet northwest of the project site. Both the Hanapēpē River and Wahiawa Stream flow into the Pacific Ocean, which is located approximately 0.5 miles south of the project site.

*Water Quality*

No surface water quality measurements have been reported by the United States Geological Survey (USGS) National Water Information System (NWIS) (USGS, 2016a); likely due to the lack of surface water resources at the project site. During high intensity storm events, however, it is possible that sheet flow through the Pump No. 1 Ditch may introduce suspended and dissolved solids into the receiving Wahiawa Stream, thus adversely affecting water quality.

*Floodplains*

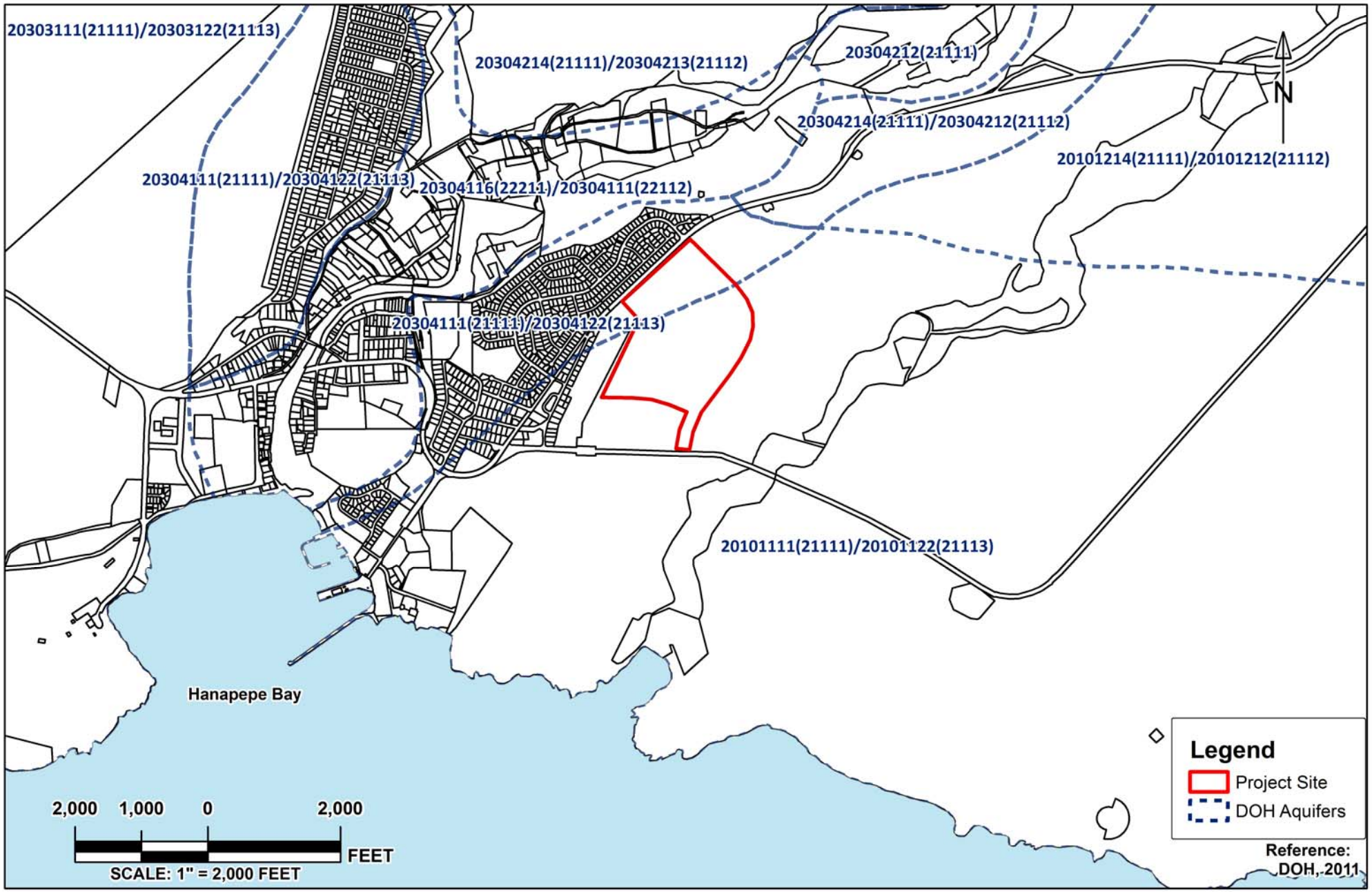
According to Federal Emergency Management Agency (FEMA) records, the project site is located within Flood Zone X, designated as "areas outside of the 0.2% annual chance floodplain" (FEMA, 2010a; FEMA, 2010b) (Figure 5).

*Wetlands*

The USFWS classifies an irrigation ditch (Pump No.1 Ditch) located at the project site as an intermittent, man-made riverine, which is occasionally flooded (USFWS, 2016). And the soils present within the project site are not listed on the Natural Resources Conservation Service (NRCS) (2016) National List of Hydric Soils. There are no listed natural wetlands or wetland habitats within the project site (Figure 6), however there are wetlands that exist in close proximity to the project site. Hanapēpē River is located approximately 1,000 feet to the northwest of the project site, and Wahiawa Stream is approximately 1,000 feet to the east of the project site (Figure 6).

**Approach to Analysis**

Determination of the significance of potential impacts to water resources is based on: 1) the importance (*i.e.*, legal, commercial, recreational, ecological, or scientific) of the resource; 2) the proportion of the resource that would be affected relative to its occurrence in the region; 3) the sensitivity of the resource to the Proposed Action; and 4) the duration of ecological ramifications. Impacts to water resources are significant if the occurrence, water quality, aquatic habitat extent, or visual aesthetic character are adversely affected over a relatively large area.




Community Planning and Engineering, Inc.

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT

AQUIFERS MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 4

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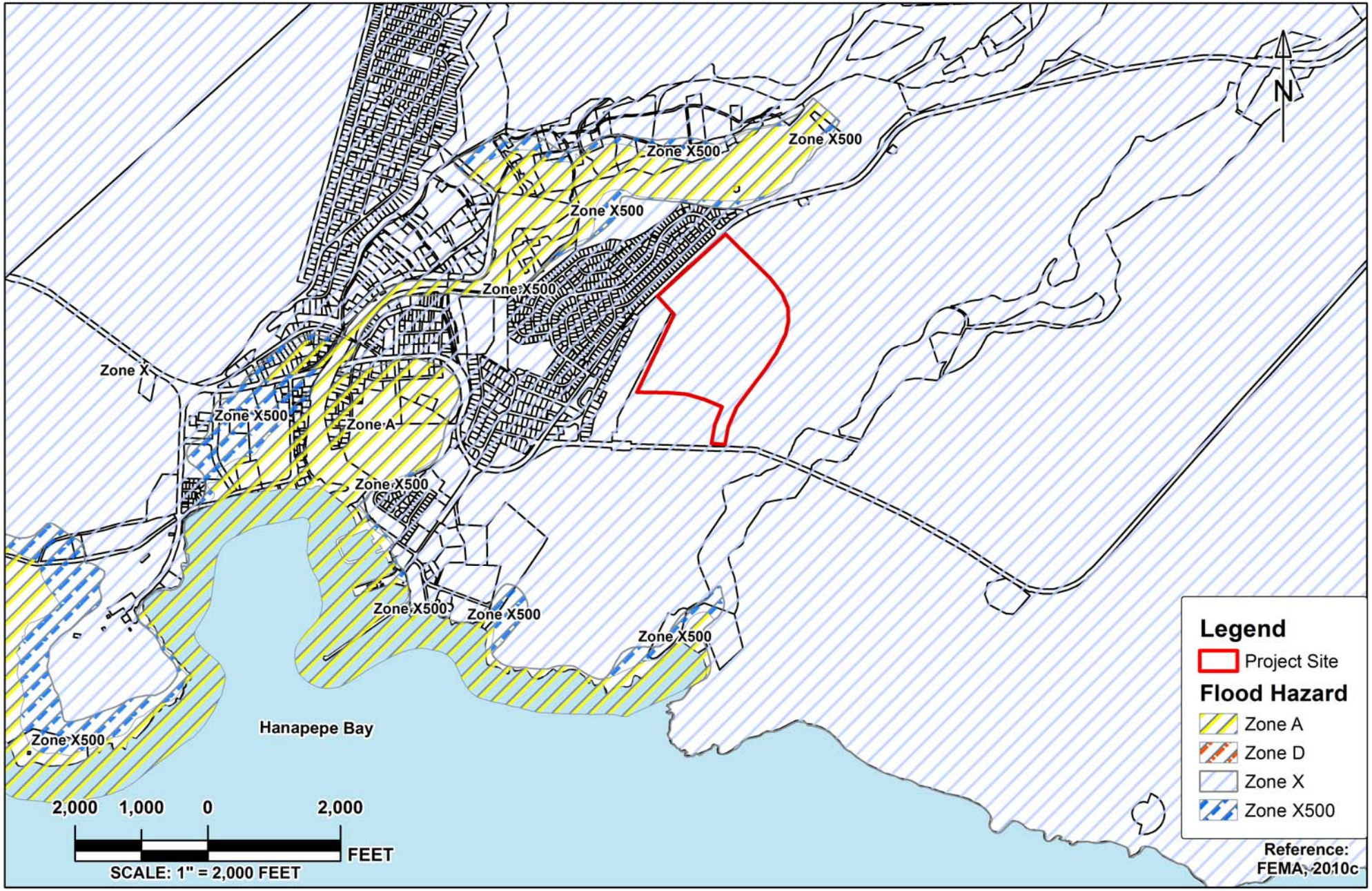


Community Planning and Engineering, Inc.

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT

FLOOD HAZARD MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 5

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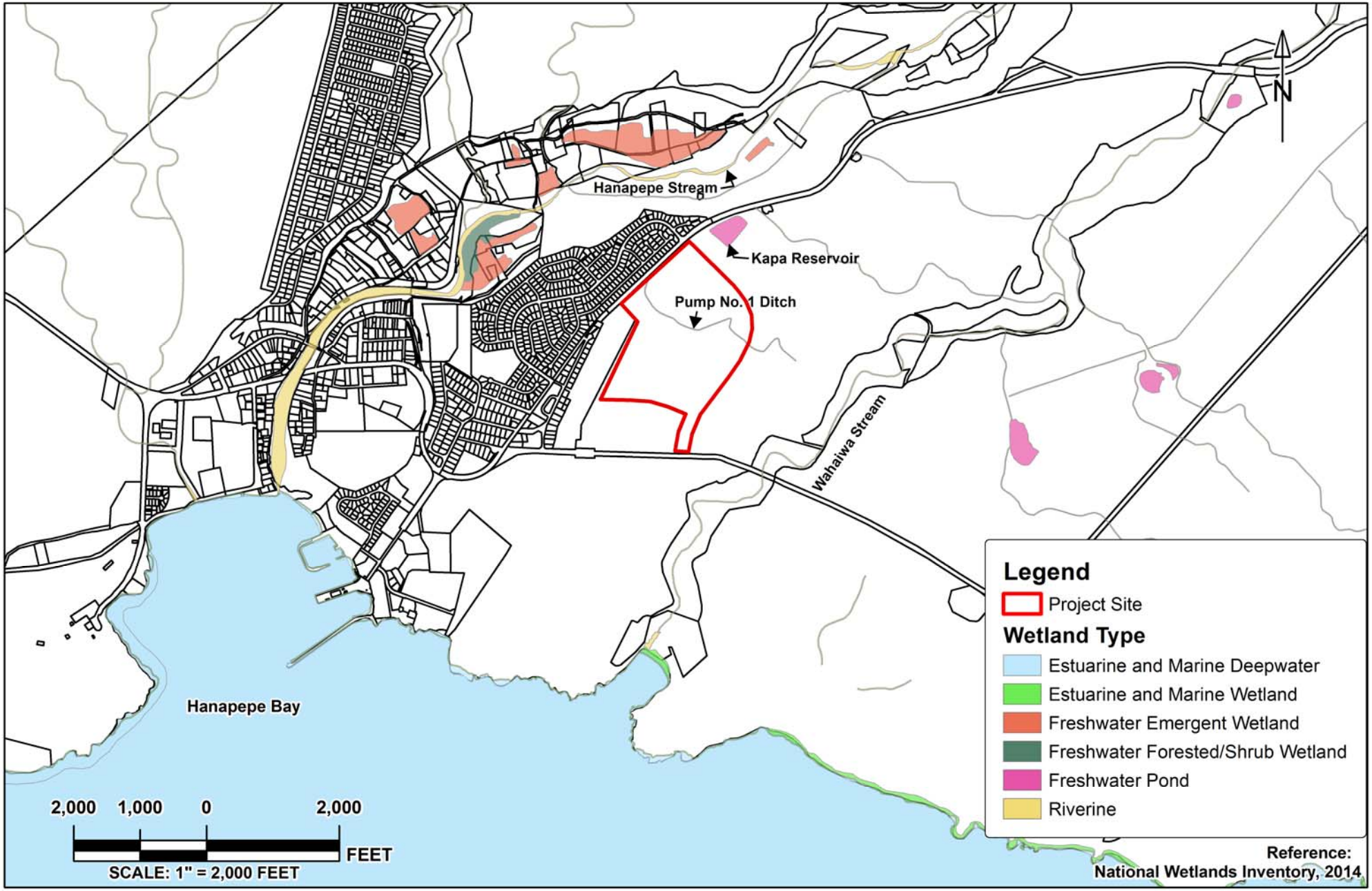


Community Planning and Engineering, Inc.

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT

WETLANDS MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 6

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#### 4.2.4.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the project site would remain unchanged and there would be no impacts to the current existing condition of the water resources within or in the vicinity of the project site. The potential discharge of suspended solids entrained in runoff to Wahiawa Stream would continue.

**Proposed Action**

Under the Proposed Action, there would be less than significant impacts to groundwater. Given the estimated depth to groundwater of approximately 100 feet below ground surface (bgs) (USGS, 2016a), groundwater is not anticipated to be encountered. The Proposed Action does require additional withdrawals from the county water supply, however, initial consultation with the County of Kaua‘i Department of Water (DOW), has determined that the current pumping capacity of the existing water system is well in excess of the maximum demand of the proposed development. Further, the underlying aquifers would not be adversely impacted (e.g., water level drawdown) by the additional demand needed by the Proposed Action. The proposed housing units would be serviced by potable water provided by the DOW, which regularly monitors water quality parameters to ensure adherence to all state and federal standards.

The Proposed Action would require the construction of a surface water drainage system to collect stormwater flow, due to the construction of impervious surfaces (paved roads and sidewalks). Stormwater would initially enter vegetated drainage swales, located along internal roadways, which would provide natural filtering. Water would then collect into subsurface reinforced concrete pipe culverts, which would channel water to an on-site vegetated detention basin, allowing for further natural filtration, as well as groundwater recharge and particle deposition. The detention basin would have a maximum storage capacity of 11.1 acre-feet and would be designed for a two-year storm and a drainage area of 85 acres. All features of the proposed surface water drainage system would be designed in accordance with the County of Kaua‘i, Department of Public Works Standards. With the proposed drainage system in place, the Proposed Action would have less than significant impacts on surface water at the project site, as well as the surrounding environment.

There would be less than significant impacts to surface water quality during the construction period. The Proposed Action would include soil excavation and stockpiling during grading activities. A stormwater pollution prevention plan would be developed, prior to the start of construction, in order to: identify potential sources of stormwater pollution; describe the practices that would be used to prevent stormwater pollution; and identify procedures the contractor would implement to comply with all requirements of a NPDES permit that would be implemented during construction. BMPs employed during construction (*e.g.*, silt fencing, tarping/covering exposed and stockpiled soils, surface revegetation) would minimize/eliminate impacts from stormwater generated at the project site.

The Proposed Action would have less than significant impacts on floodplains, since the proposed site drainage system would adequately manage stormwater runoff in accordance with applicable county drainage standards, and since the project site lies entirely within Flood Zone X,

designated as "areas outside of the 0.2% annual chance floodplain" (FEMA, 2010a; FEMA, 2010b) (Figure 5).

The Proposed Action would impact Pump No.1 Ditch, which is designated as an intermittent, man-made riverine, which is occasionally flooded (USFWS, 2016). The Pump No. 1 Ditch is not known to support any natural wetland features or important habitat, therefore no listed natural wetlands or wetland habitats would be impacted by the Proposed Action.

### 4.2.5 SOLID AND HAZARDOUS MATERIALS AND WASTES

**Definition of Resources**

*Solid Waste*

*Solid waste* is defined as garbage, refuse, and other discarded materials, including solid, liquid, semi-solid, or contained gaseous materials resulting from industrial, commercial, mining, and agricultural operations, sludge from waste treatment plants and water supply treatment plants, and residues from air pollution control facilities and community activities. However, solid waste does not include solid or dissolved materials in domestic sewage or other substances in water sources such as silt, dissolved or suspended solids in industrial waste water effluents, dissolved materials in irrigation return flows, or other common water pollutants, or source, special nuclear, or by-product material as defined by the Federal Atomic Energy Act of 1954, as amended (HAR 11-58.1).

*Hazardous Materials/Wastes*

*Hazardous materials* are defined as substances with strong physical properties of ignitability, corrosivity, reactivity, or toxicity, which may cause an increase in mortality, serious irreversible illness, incapacitating reversible illness, or pose a substantial threat to human health or to the environment. *Hazardous wastes* are defined as any solid, liquid, contained gaseous, or semisolid waste, or any combination of wastes that pose a substantial present or potential hazard to human health or to the environment.

Issues associated with hazardous materials and wastes typically center on underground storage tanks, aboveground storage tanks, and the storage, transport, and use of pesticides and fuel. When such resources are improperly used, they can threaten the health and well-being of wildlife species, botanical habitats, soil systems, water resources, and people.

**Regulatory Setting**

*Solid Waste*

Solid Waste management regulations are specified in HAR 11-58.1, with the intent to:

1) prevent pollution of the drinking water supply or waters of the state;
2) prevent air pollution;
3) prevent the spread of disease and the creation of nuisances;
4) protect public health and safety;
5) conserve natural resources; and

6) preserve and enhance the beauty and quality of the environment.

*Hazardous Waste*

HAR 11-262 specifies rules regulating hazardous waste management. Hazardous Waste Management regulations are specified in EPA state-specific Universal Waste Regulations and in Code of Federal Regulations (CFR) Title 40, Part 261- Identification and Listing of Hazardous Waste.

In 1980 the U.S. Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) in order to identify and remediate sites where hazardous substances were, or could be, released into the environment. As a result, CERCLA often addresses uncontrolled releases of hazardous substances from facilities no longer in operation. In addition, the Resource Conservation and Recovery Act (RCRA) was enacted in 1976 in order to focus on the prevention and remediation of releases from currently operating facilities. Together the two pieces of legislation effectively form the "safety net" intended to protect the ecosystems in which organisms thrive.

### 4.2.5.1 EXISTING CONDITIONS

The project site is located in the 'Ele'ele community on the west side of the island of Kaua'i. The project site consists of approximately 75 acres and is bordered by Kaumuali'i Highway to the north, a future Habitat for Humanity development to the west, and agricultural fields to the south and east. The land is zoned for agricultural uses and is currently being utilized as a commercial coffee farm.

Kimura International performed a Phase I Environmental Site Assessment on the project site in December 2009. No documented evidence of any recognized environmental conditions were discovered that would impact the site. However, historical agricultural use at the project site resulted in a Phase II Environmental Site Assessment being performed. Two (2) multi-incremental soil samples were collected at the project site that were analyzed for heavy metals, herbicides, and pesticides. None of the analytes were detected at levels above the State of Hawai'i Department of Health (DOH) Tier 1 Environmental Action Levels (Kimura International, 2010).

There is no known hazardous materials use or hazardous waste-generating activities that has occurred at the proposed project site. There is existing solid waste within the area (*e.g*. dead and dry brush, and small amounts of litter deposited throughout the coffee farm), as well as potential releases of small quantities of hazardous materials and petroleum products from the surrounding residential properties via stormwater sheet flow.

**Approach to Analysis**

Numerous local, federal, and state laws regulate the storage, handling, disposal, and transportation of hazardous materials and wastes; the primary purpose of these laws is to protect human health and the environment. The significance of potential impacts associated with hazardous substances is based on their toxicity, reactivity, ignitability, and corrosivity. Impacts associated with hazardous materials and wastes would be significant if the storage, use,

transportation, or disposal of hazardous substances substantially increased the human health risk or environmental exposure.

#### 4.2.5.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under implementation of the No Action Alternative, the Lima Ola Workforce Housing Development would not be constructed. The project site would remain unchanged, and there would be no additional hazardous materials or solid wastes generated at the project site.

**Proposed Action**

*Solid Waste*

The Proposed Action is expected to result in less than significant long-term impacts on the county Solid Waste collection system and landfill . Residential solid waste service would be provided by the County of Kaua‘i Refuse Division in accordance with current collection policies. In addition, the Proposed Action is planned to undertake proactive waste minimization strategies. These strategies would include a recyclables collection station within the community and the conversion of green waste into mulch that would be locally available for residents and community gardens (County of Kaua‘i Housing Agency, 2012). As a result, the Proposed Action would result in less than significant impacts to the county solid waste disposal system.

*Hazardous Waste Materials*

During construction of the Proposed Action, there may be the potential of petroleum spillage associated with construction vehicles and equipment. To minimize this hazard, all applicable spill and prevention control BMPs would be implemented to ensure that accidental releases are minimized and contained. For example, vehicles and equipment would be regularly inspected for leaks and adequate performance, and would be maintained accordingly. In the long-term, there is potential for petroleum spillage from residential sources (*e.g.*, vehicle leaks and improper disposal of hazardous materials). These potential impacts would be reduced by adherence to all applicable county and state regulations. As a result, implementation of the Proposed Action is expected to have a less than significant impact from hazardous materials and wastes.

### 4.2.6 CLIMATE AND AIR QUALITY

**Definition of Resource**

*Climate*

Climate is defined as long-term atmospheric patterns that characterize a region or location, and includes measures of temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count, and other meteorological variables. Knowing the climate of an area enables the predictability of short-term weather phenomena; however, only the weather can specify actual short-term atmospheric conditions. Some geographic regions with great topographic variations over relatively short distances (*e.g.*, slope steepness, aspect) have

micro-climates that are distinct to small areas (*e.g.*, canyons, leeward vs. windward, hilltops, basins).

*Air Quality*

Air quality at a given location is a function of several factors including the quantity and type of pollutants emitted locally and regionally, as well as the dispersion rates of these pollutants. Primary factors affecting pollutant dispersion are wind speed and direction, atmospheric stability, temperature, the presence or absence of inversions, and topography. Air quality is affected by both stationary sources (*e.g.*, industrial development) and mobile sources (*e.g.*, motor vehicles).

Air quality at a given location is determined by the concentration of various pollutants in the atmosphere. National Ambient Air Quality Standards (NAAQS) are established by the EPA for criteria pollutants, including: ozone ($O_3$), carbon monoxide (CO), nitrogen dioxide ($NO_2$), sulfur dioxide ($SO_2$), particulate matter less than or equal to ten microns in diameter ($PM_{10}$) and less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb). NAAQS represent maximum levels of background pollution that are considered safe, with an adequate margin of safety, to protect public health and welfare.

*Ozone ($O_3$)*. The majority of ground-level (or terrestrial) $O_3$ is formed as a result of complex photochemical reactions in the atmosphere involving volatile organic compounds (VOCs), nitrogen oxides ($NO_x$), and oxygen. $O_3$ is a highly reactive gas that damages lung tissue, reduces pulmonary function, and sensitizes the lung to other irritants. Although stratospheric $O_3$ shields the earth from damaging ultraviolet radiation, terrestrial $O_3$ is a highly damaging air pollutant and is the primary source of smog.

*Carbon Monoxide (CO).* CO is a colorless, odorless, and poisonous gas produced by incomplete burning of carbon in fuel. The health threat from CO is most serious for those who suffer from cardiovascular disease, particularly those with angina and peripheral vascular disease.

*Nitrogen Dioxide ($NO_2$).* $NO_2$ is a highly reactive gas that can irritate the lungs, cause bronchitis and pneumonia, and lower resistance to respiratory infections. Repeated exposure to high concentrations of $NO_2$ may cause acute respiratory disease in children. Because $NO_2$ is a key precursor in the formation of $O_3$ or smog, control of $NO_2$ emissions is an important component of overall pollution reduction strategies. The two primary sources of $NO_2$ in the U.S. are fuel combustion and transportation.

*Sulfur Dioxide ($SO_2$).* In Hawai‘i, the main source of $SO_2$ is vog from volcanic eruptions. $SO_2$ is also emitted from stationary source coal and oil combustion, steel mills, refineries, pulp and paper mills, and from nonferrous smelters. High concentrations of $SO_2$ may aggravate existing respiratory and cardiovascular disease; asthmatics and those with emphysema or bronchitis are the most sensitive to $SO_2$ exposure. $SO_2$ also contributes to acid rain, which can lead to the acidification of lakes and streams and damage trees.

*Particulate Matter ($PM_{10}$ and $PM_{2.5}$).* Particulate matter (PM) is a mixture of tiny particles that vary greatly in shape, size, and chemical composition, and can be composed of metals, soot, soil, and dust. $PM_{10}$ includes larger, coarse particles less than ten microns in size, whereas $PM_{2.5}$ includes smaller, fine particles less that 2.5 microns in size. Sources of coarse particles include crushing or grinding operations, and dust from paved or unpaved roads. Sources of fine particles

include vog, all types of combustion activities (*e.g.*, motor vehicles, power plants, wood burning) and certain industrial processes.

Exposure to $PM_{10}$ and $PM_{2.5}$ levels exceeding current standards can result in increased respiratory- and cardiac-related respiratory illness. Short-term effects from PM may include headaches, breathing difficulties, eye irritation, and sore throat. The EPA has concluded that $PM_{2.5}$ are more likely to contribute to health problems than $PM_{10}$.

*Airborne Lead (Pb).* Airborne Pb can be inhaled directly or ingested indirectly by consuming Pb-contaminated food, water, or non-food materials such as dust or soil. Fetuses, infants, and children are most sensitive to Pb exposure. Pb has been identified as a factor in high blood pressure and heart disease. Exposure to Pb has declined dramatically in the last 10 years as a result of the reduction of Pb in gasoline and paint, and the elimination of Pb from soldered cans.

*Greenhouse Gases (GHGs)*

Greenhouse gases (GHGs) trap heat in the earth's atmosphere, affecting climate change and contributing to global warming. Both naturally occurring and anthropogenic (man-made) GHGs include: water vapor, carbon dioxide ($CO_2$), methane ($CH_4$), nitric oxide (NO), and $O_3$. According to guidance from the Council on Environmental Quality (CEQ), during an analysis of direct effects it is appropriate to: (1) quantify cumulative emissions over the life of the project; (2) discuss measures to reduce GHG emissions, including consideration of reasonable alternatives; and (3) qualitatively discuss the link between such GHG emissions and climate change. However, it is not currently useful for National Environmental Policy Act (NEPA) analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions, as such direct linkage is difficult to isolate and to understand. The estimated level of GHG emissions can serve as a reasonable proxy for assessing potential climate change impacts, and provide decision makers and the public with useful information for a reasoned choice among alternatives (CEQ, 2010).

**Regulatory Setting**

The CAA Amendments of 1990 place most of the responsibility to achieve compliance with NAAQS on individual states. The DOH Clean Air Branch is responsible for air pollution control in the state. The primary services of the branch include: 1) Engineering, which includes engineering analysis and permitting; 2) Monitoring, which performs monitoring and investigations; and 3) Enforcement, in which federal and state air pollution control laws and regulations are enforced.

The EPA requires each state to prepare a state Implementation Plan (SIP). A SIP is a compilation of goals, strategies, schedules, and enforcement actions that would lead the state into compliance with all NAAQS for CO, $PM_{10}$, $PM_{2.5}$, $SO_2$, $NO_2$, and $O_3$ to thus reach attainment status. Areas not in compliance with a standard can be declared non-attainment areas by EPA or the appropriate state or local agency. There can be lenience for Exceptional Events, which are defined as "unusual or naturally occurring events that can affect air quality but are not reasonably controllable using techniques that tribal state, or local air agencies may implement in order to attain and maintain the NAAQS" (EPA, 2012). An example of an Exceptional Event is a volcanic eruption, which affects air quality by causing exceedances of NAAQS and cannot be controlled by human intervention.

#### 4.2.6.1 EXISTING CONDITIONS

The average annual temperature on Kaua‘i is 75.9 degrees Fahrenheit, with an annual average total precipitation of 37.44 inches. The months of the year with the most rainfall occur from October through March (Western Region Climate Center, 2008).

The project site is located on the leeward side of the island which is generally characterized as dry and sunny. The site is located between isohyets where median annual rainfall ranges between 29.5 to 34.4 inches (County of Kaua‘i Housing Agency, 2012).

The prevailing winds on Kaua‘i (known as trade winds) are from the east-northeast, with a mean wind speed of 13.1 mph (Western Region Climate Center , 2008). The trade winds prevail approximately nine months of the year. Trade winds blow vog (*i.e.*, volcanic fog) from the Hawai‘i Island volcanoes, as well as other air contaminants, to the southwest. During the winter months, winds tend to be less predictable, with longer periods of light and variable winds, and occurrences of strong southerly or “Kona” winds associated with weather fronts and storms. In addition, when trade winds are absent for prolonged periods, vog travels up the island chain and can affect air health by increasing levels of airborne $SO_2$ and $PM_{2.5}$. Although both of these pollutants are regulated by the EPA, Hawai‘i’s advisories for volcanic $SO_2$ and $PM_{2.5}$ have been customized for local conditions. Air monitoring stations in communities near Kīlauea Volcano on the Big Island of Hawai‘i record regular exceedances of the NAAQS for $SO_2$ and occasional exceedances of the NAAQS for $PM_{2.5}$. The EPA considers the volcano a natural, uncontrollable event, and therefore the state requests exclusion from these NAAQS exceedances for attainment/non-attainment determination (DOH, 2012). Shorter exposure time intervals have also been adopted due to variable wind conditions, which can cause volcanic gas concentrations to change rapidly (USGS, 2016b).

The project site is located in EPA attainment zones for CO, $NO_2$, $O_3$, $PM_{2.5}$, $PM_{10}$, $SO_2$, and Pb (EPA, 2016). In 2012, Hawai‘i was in attainment with NAAQS annual averages of $PM_{10}$, $PM_{2.5}$, $O_3$, CO, and $SO_2$, based upon three year averages of annual mean values from 12 air quality stations (four on O‘ahu, one on Maui, seven on Hawai‘i Island, and one on Kaua‘i) that represent the State of Hawai‘i. The air quality station positioned closest to the project site is located 13 miles east from the project site in Līhu‘e. The annual averages from this air quality station from 2008-2012 indicated that annual averages of $NO_2$, $PM_{2.5}$, $SO_2$, and CO levels in ambient air were well below their respective state (HAR 11-59) and federal (40 CFR Part 50) Standards (DOH, 2012). Levels of $PM_{10}$ and $O_3$ were not taken at the Līhu‘e air quality station, but annual average levels of $PM_{10}$ taken from 2008-2012 at the Kapolei air quality station (the station located closest to the project site that captures $PM_{10}$ levels) were one-third or less than the state and federal standard. Similarly, $O_3$ Fourth Highest Daily Maximum 8-Hour Averages from the same time period, taken at the Sand Island air quality station (the station located closest to the project site that captures $O_3$ levels) were two-thirds or less than the federal standard (DOH, 2012).

**Approach to Analysis**

The 1990 Amendments to the CAA require that federal agency activities conform to the SIP with respect to achieving and maintaining attainment of NAAQS and to addressing air quality impacts. The EPA General Conformity Rule requires that a conformity analysis be performed, which demonstrates that a proposed action does not: 1) cause or contribute to any violation of

any NAAQS in the area; 2) interfere with provisions in the SIP for maintenance or attainment of any NAAQS; 3) increase the frequency or severity of any existing violation of any NAAQS; or 4) delay timely attainment of any NAAQS, any interim emission reduction goals, or other milestones included in the SIP. Provisions in the General Conformity Rule allow for exemptions from performing a conformity determination only if total emissions of individual non-attainment area pollutants resulting from a proposed action fall below the *de minimis* threshold values.

A 2014 *Air Quality Study* was performed by B.D. Neal & Associates for the Proposed Action (Appendix D). The study examined the potential short- and long-term air quality impacts that would occur as a result of construction and use of the proposed facilities. Ambient air quality standards, regional and local climatology, present air quality, construction activities, roadway traffic, and indirect electrical demand were all taken into account in order to determine impacts to the project site.

#### 4.2.6.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the Lima Ola Workforce Housing Development would not be constructed. The project site would remain unchanged from current conditions. Existing agricultural usage would result in continuing fugitive dust and vehicular emissions due to the continued use of maintenance vehicles on the dirt roads located at the project site. No additional impacts to air quality would occur under implementation of the No Action Alternative.

**Proposed Action**

The Proposed Action would result in less than significant short-term impacts to air quality arising from construction activities. The major potential short-term air quality impacts would occur from the generation of fugitive dust. Uncontrolled fugitive dust emissions from construction activities are estimated to be about 1.2 tons per acre per month, depending on rainfall at the project site. State of Hawai‘i Air Pollution Control Regulations prohibit visible emissions of fugitive dust from construction activities at the property line. As a result, applicable BMPs would be implemented during construction activities in order to control fugitive dust emissions. These BMPs would include watering active work areas and unpaved work roads; use of wind screens; establishment of a routine road cleaning and/or tire washing program; paving of parking areas; establishment of landscaping early in the construction schedule; and monitoring dust at the project boundary (Appendix D).

The use of construction equipment and personal vehicles to access the project site could lead to temporary increases in vehicular airborne pollutant concentrations. To reduce vehicle and equipment emissions, carpooling and ensuring that equipment is functioning properly would be included in regular construction work practices. Further, increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers may occur. These increased vehicular emissions would be alleviated by moving equipment and personnel to the project site during off-peak traffic hours (B.D. Neal & Associates, 2014). As a result, short-term impacts to air quality due to construction activities would be less than significant.

Direct long-term impacts to air quality due to increased vehicular traffic are not expected to be significant. The Proposed Action would result in increased annual emissions. However, worst-case projected concentrations should remain well within both the state and national ambient air quality standards (below *de minimus* threshold concentrations for all area pollutants) (B.D. Neal & Associates, 2014). As a result, direct long-term impacts to air quality would be less than significant.

The following planned energy-saving features would reduce energy consumption for the Proposed Action: use of solar water heaters; energy-efficient lighting systems; designing building space so that window positions maximize indoor light without unduly increasing indoor heat; using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning; installation of insulation and double-glazed doors to reduce the effects of the sun and heat; providing movable, controlled openings for ventilation at opportune times; and installing automated room occupancy sensors (Appendix D). Therefore, long-term impacts to air quality due to the Proposed Action would be considered less than significant.

### 4.2.7 NOISE

**Definition of Resources**

Noise is generally defined as unwanted sound. Noise can be any sound that is undesirable because it interferes with communication, is intense enough to damage hearing, or is otherwise annoying. Human responses to noise vary depending on the type and characteristics of the noise, distance between the noise source and receptor, receptor sensitivity, and time of day.

Determination of noise levels are based on: 1) sound pressure level generated (decibels [dB] scale); 2) distance of listener from source of noise; 3) attenuating and propagating effects of the medium between the source and the listener; and 4) period of exposure.

An A-weighted decibel (dBA) sound level is one measurement of noise. The human ear can perceive sound over a range of frequencies, which varies for individuals. In using the A-weighted scale for measurement, only the frequencies heard by most listeners are considered. This gives a more accurate representation of the perception of noise. The noise measure in a residential area, similar to conditions within the project site, is estimated at approximately 70 dBA. Normal conversational speech at a distance of five to ten feet is approximately 70 dBA. The decibel scale is logarithmic, so, for example, sound at 90 dB would be perceived to be twice as loud as sound at 80 dBA. Passenger vehicles, motorcycles, and trucks use the roads in the vicinity of the project site. Noise levels generated by vehicles vary based on a number of factors including vehicle type, speed, and level of maintenance. Intensity of noise is attenuated with distance. Some estimates of noise levels from vehicles are listed in Table 3-1 (Cavanaugh and Tocci, 1998).

*Table 4-1: Typical Noise Sources*

| Source | Distance (feet) | Noise Level (dBA) |
|---|---|---|
| Automobile, 40 mph | 50 | 72 |
| Automobile Horn | 10 | 95 |
| Light Automobile Traffic | 100 | 50 |
| Truck, 40 mph | 50 | 84 |
| Heavy Truck or Motorcycle | 25 | 90 |

Note: mph = miles per hour
Source: Cavanaugh and Tocci, 1998.

## Regulatory Setting

HAR Title 11, Chapter 46 Community Noise Control sets permissible noise levels in order to provide for the prevention, control, and abatement of noise pollution in the state. The regulation creates noise districts based on land use that dictate acceptable noise levels. The project site is currently zoned for agricultural use. Therefore, the project site is in a Class C zoning district, as defined by HAR 11-46. The maximum permissible sound level in a Class C district is 70 dBA from 7:00 am-10:00 pm and 70 dBA from 10:00 pm-7:00 am (DOH, 1969).

The EPA has identified a range of yearly day-night sound level (DNL) standards that are sufficient to protect public health and welfare from the effects of environmental noise (EPA, 1977). The EPA has established a goal to reduce exterior environmental noise to a DNL not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to a DNL not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population would not be at risk from any of the identified effects of noise.

The U.S. Occupational Safety and Health Administration (OSHA) has established acceptable noise levels for workers. Table 3-2 shows permissible noise levels for varying exposure times.

*Table 4-2: OSHA Permissible Noise Exposures*

| Duration per day-hours | Sound level dBA slow response |
|---|---|
| 8 | 90 |
| 6 | 92 |
| 4 | 95 |
| 3 | 97 |
| 2 | 100 |
| 1.5 | 102 |
| 1 | 105 |
| 0.5 | 110 |
| 0.25 or less | 115 |

Source: OSHA, 2012

#### 4.2.7.1 EXISTING CONDITIONS

The project site is located in the ‘Ele‘ele community on the west side of the island of Kaua‘i. The project site consists of approximately 75 acres and is bordered by Kaumuali‘i Highway to the north and west, and agricultural fields to the south and east. The land is currently being utilized as a commercial coffee farm. The noise environment currently is dominated by traffic, wind, birds, occasional distant aircraft flyovers, and farm and construction equipment. Noise receptors within the vicinity of the project area include ‘Ele‘ele Subdivision located west of the project site, across Kaumuali‘i Highway, as well as open and agricultural lands that comprise and surround the project area.

An *Environmental Noise Assessment Report* (Appendix F) was conducted by D.L. Adams Associates, Ltd. in 2014 for the Proposed Action. The purpose of the report was to evaluate potential noise impacts to the proposed development as well as to the surrounding community. According to the report, the project site is currently exposed to varying daytime ambient noise levels, depending on the proximity to major roadways. The areas adjacent to Kaumuali‘i Highway experience high ambient noise levels during peak traffic hours. Ambient noise levels range from 50 to 68 dBA adjacent to Kaumuali‘i Highway. The ambient noise environment is relatively low in areas that are far from the major roadways, where ambient noise levels range from 44 to 70 dBA. The dominant noise sources are traffic, wind, birds, occasional distant aircraft flyovers, and farm and construction equipment (Appendix F). The closest airfield to the project site, Port Allen Airport, is located approximately 2.2 miles to the southwest.

**Approach to Analysis**

Noise impact analyses address potential changes to existing noise environments that would result from implementation of a proposed action. Potential changes in the noise environment can be beneficial (*e.g.*, if they reduce the number of sensitive receptors exposed to unacceptable noise levels), negligible (*e.g.*, if the total area exposed to unacceptable noise levels is essentially unchanged), or adverse (*e.g.*, if they result in increased exposure to unacceptable noise levels).

### 4.2.7.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under implementation of the No Action Alternative, the Lima Ola Workforce Housing Development would not be constructed. No construction activity or accompanying noise associated with the use of construction equipment would occur. The proposed project site would remain unchanged, and the noise environment in the project site would continue to be dominated by traffic, wind, birds, occasional distant aircraft flyovers, and farm and construction equipment.

**Proposed Action**

Under the Proposed Action, less than significant short-term noise impacts from construction activities would occur. Development of the project site would involve excavation, grading, and other typical construction activities. The Proposed Action is not expected to significantly impact any existing sensitive noise receptors within the vicinity of the project site (i.e., ‘Ele‘ele Subdivision). However, residences from the initial phase of construction may be impacted by construction-related noise due to subsequent phases of work. However, these impacts would be less than significant (Appendix F).

According to the 2012 *Lima Ola Workforce Housing Development Master Plan* (Appendix A), construction activities related to the Proposed Action would likely span several decades. Multiple construction phases are tentatively planned for the Lima Ola community, with the early development occurring in a limited number of locations (County of Kaua‘i Housing Agency, 2012). As a result, construction-related noise would be generated from construction equipment and vehicles. However, noise exposure from construction activities would not be continuous at any one location throughout the entire construction process and BMPs (*e.g.*, construction scheduling; insulation/muffling; reduced power options; equipment substitution, selection, retrofit, and maintenance; utilization of staging areas; and non-permanent noise barriers) would be implemented to reduce or eliminate noise. Further, buffer zones between construction activities and residential areas would be created, and construction work would be limited to the hours between 7:30 am and 3:30 pm on weekdays. As a result, short-term impacts from construction activities would be less than significant to the surrounding environment.

Upon completion, the Proposed Action would have less than significant long-term impacts to noise receptors. The housing development is expected to incorporate stationary mechanical equipment that is typical for residential buildings. Typical stationary mechanical equipment present in housing developments include but are not limited to, air handling equipment,

condensing units, and refrigeration units. These stationary mechanical units are a source of noise that must meet DOH Community Noise Control rules. In order to comply with noise rules and prevent noise impacts to residences, the Proposed Action would incorporate design considerations to control the noise emanating from stationary mechanical sources. Design features that could be incorporated would include sufficient spacing between noise source(s) and receptor(s); and installing measures such as mufflers, silencers, acoustical enclosures, or noise barrier walls.

Future traffic volume increases due to the development of the Proposed Action would be less than significant. A vehicular traffic noise analysis was completed for the existing conditions and future year 2040 projections. Analyses were run for the No Action and Proposed Action alternatives with peak traffic values provided by the projects traffic report (Hatch Mott MacDonald, 2014) (Appendix E). The greatest increase of noise levels to the surrounding community is two dB for the homes adjacent to Mahea Road. However, this increase is considered less than the threshold of human perception (Appendix F).

Future year traffic projections show that the Federal Highway Administration maximum noise limit of 67 dBA would be satisfied for homes that are located more than 75 feet from the center line of Kaumualiʻi Highway. In addition, the DNL would be less than 67 dBA for areas located beyond 40 feet from the center line of Kaumualiʻi Highway. Therefore, the noise levels for the majority of the project site are within the United States Department of Housing and Urban Development (HUD) site acceptability standards, which states a design goal of DNLs less than or equal to 65 dBA for the exterior noise level. Vehicular traffic noise contours resulting from the Proposed Action are presented in Figure 8 of Appendix F. As a result, long-term impacts to noise generation would be less than significant.

## 4.3 SOCIAL ENVIRONMENT

### 4.3.1 LAND USE CONSIDERATIONS AND ZONING

**Definition of Resources**

Land use comprises natural conditions or human-modified activities occurring at a particular location. Human-modified land use categories include residential; commercial; industrial; transportation; communications and utilities; agricultural; institutional; recreational; and other developed use areas.

Management plans and zoning regulations determine the type and extent of land use allowable in specific areas and are often intended to protect specially designated or environmentally sensitive areas.

**Regulatory Setting**

The Hawaiʻi State Land Use Law (HRS Chapter 205) establishes a framework of land use management and regulation in which all lands in the State of Hawaiʻi are classified into four land use districts (Urban, Rural, Agricultural, and Conservation). The State Land Use Commission (LUC) was established by the state legislature in order to administer the land use law.

The Council of the County of Kaua‘i adopted an amended Comprehensive Zoning Ordinance (CZO) in 2012. The CZO was adopted for multiple purposes including: “implementing the intent and purpose of the adopted General Plan; regulating the use of buildings, structures, and land for different purposes; regulating location, height, bulk, and size of buildings and structures, the size of yards, courts, and other open spaces to maintain the concept of Kaua‘i as ‘The Garden Isle,’ thus assuring that any growth would be consistent with the unique landscape and environmental character of the island; to insure that all physical growth is carried out so as to maintain the natural ecology of the island to the extent feasible; to provide opportunities for desirable living quarters for all residents in all income levels; [and] to guide and control development to take full advantage of the island’s form, beauty and climate, and preserve the opportunity for an improved quality of life” (County of Kaua‘i, 2012a).

#### 4.3.1.1 EXISTING CONDITIONS

*Land Use*

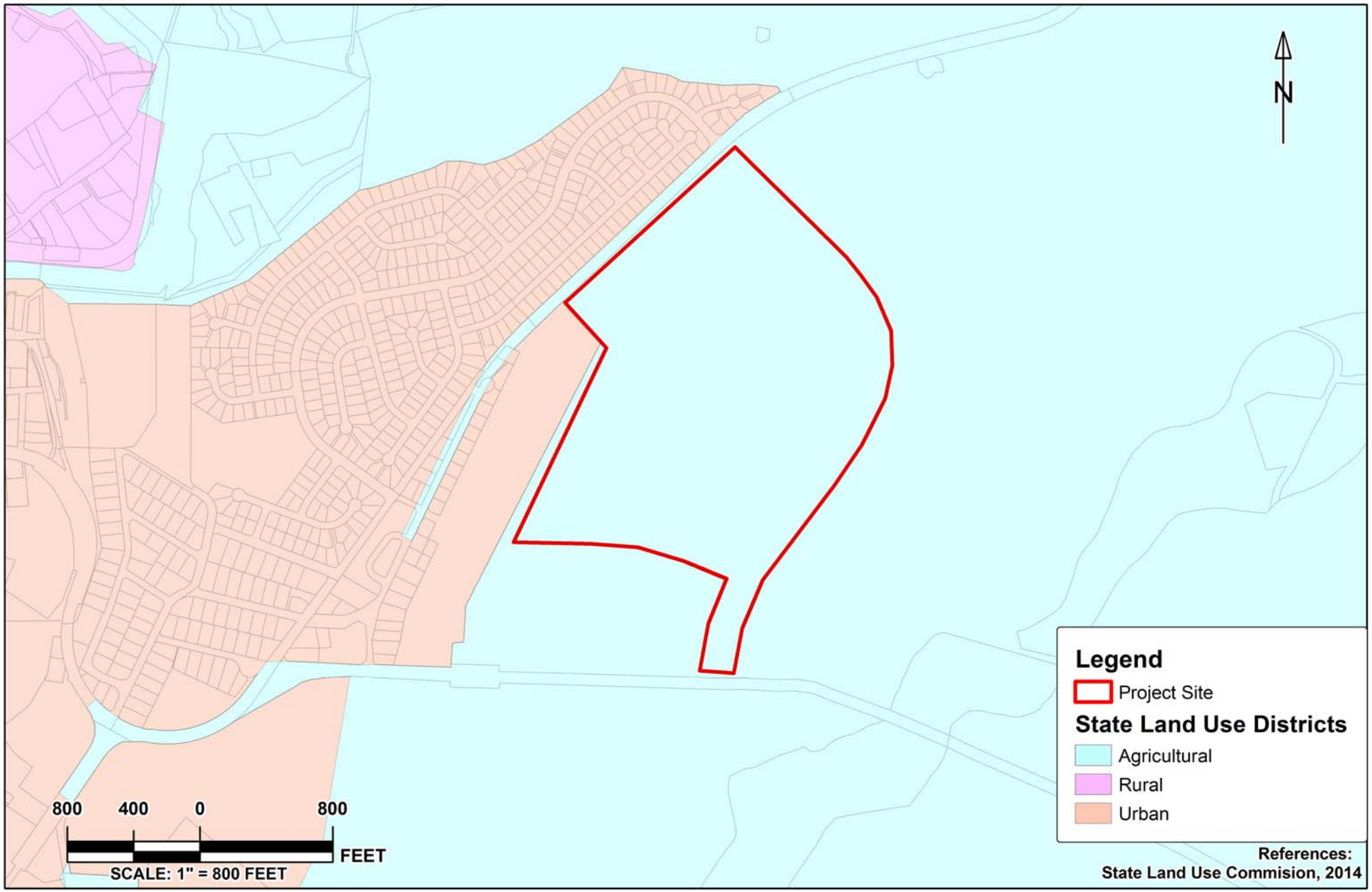
The project site is located on a 75-acre parcel in ‘Ele‘ele on the west side of the island of Kaua‘i (Figure 1). The project site is currently used as a commercial coffee farm. Land use activities surrounding the project site include residential, agricultural and commercial uses. The 75-acre parcel included within the project site was purchased by the County of Kaua‘i in 2010 for the purpose of developing affordable housing (County of Kaua‘i, 2012).

*Zoning*

According to the State LUC district classifications, and County zoning, the project site is located within the Agricultural District (Figure 7 and Figure 8), and is located adjacent to parcels designated as Urban to the west and southwest.. However, the project site is not included within the Important Agricultural Lands (IALs) as defined by the State of Hawai‘i Land Evaluation and Site Assessment Commission (Figure 9). The land parcel zoning information for the project site is summarized in Table 3-3.

*Table 4-3: Project Site Land Parcel Information*

| Tax Map Key (TMK) Number | Parcel Area (acres) | State Land Use District | County Zoning Designation | Fee Owner | Lessee |
|---|---|---|---|---|---|
| (4) 2-1-001:054 | 75 | Agricultural | Agricultural | County of Kaua‘i | Kaua‘i Coffee |

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STATE LAND USE DISTRICTS MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 7

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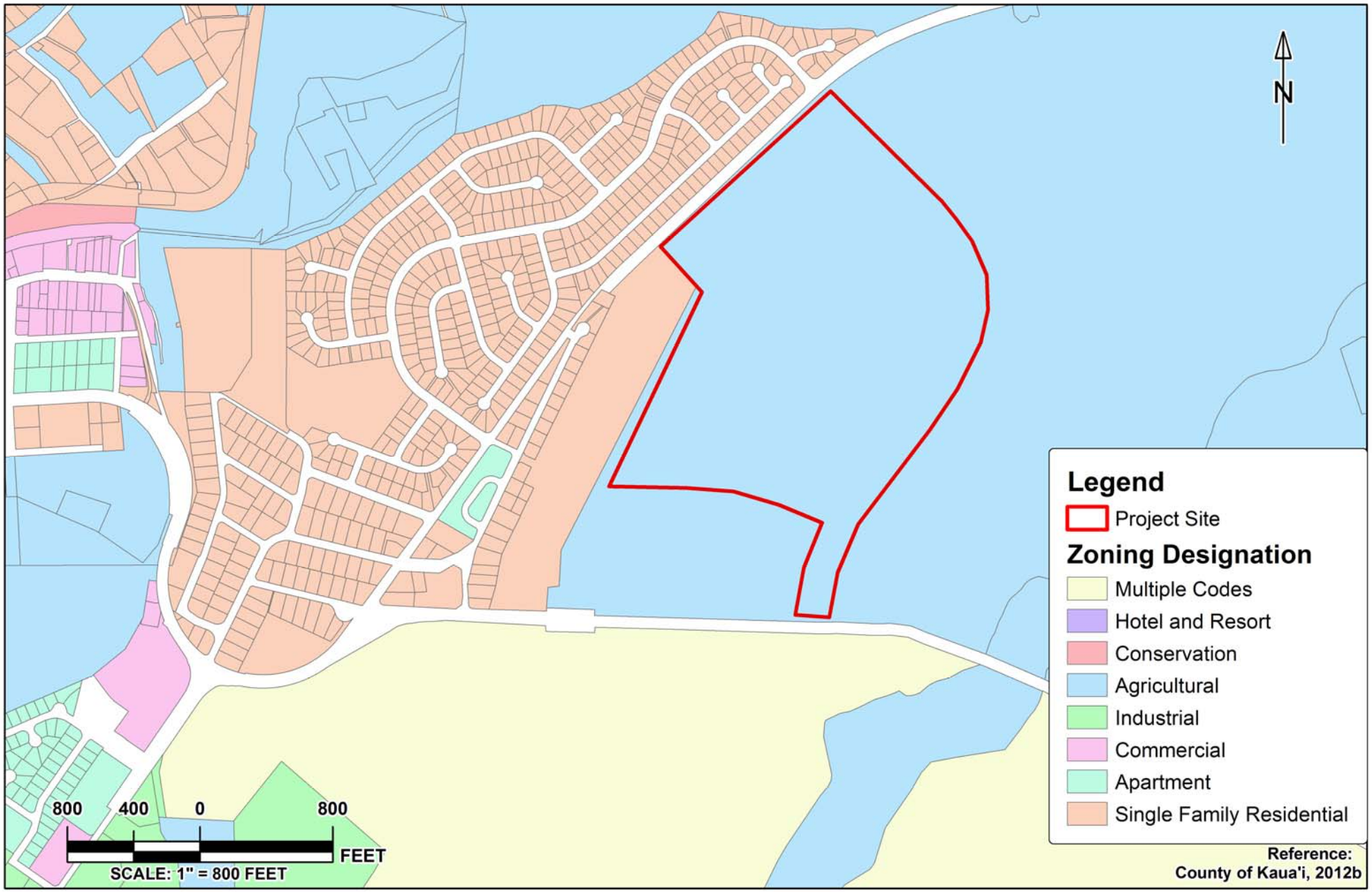


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COUNTY ZONING DESIGNATION MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 8

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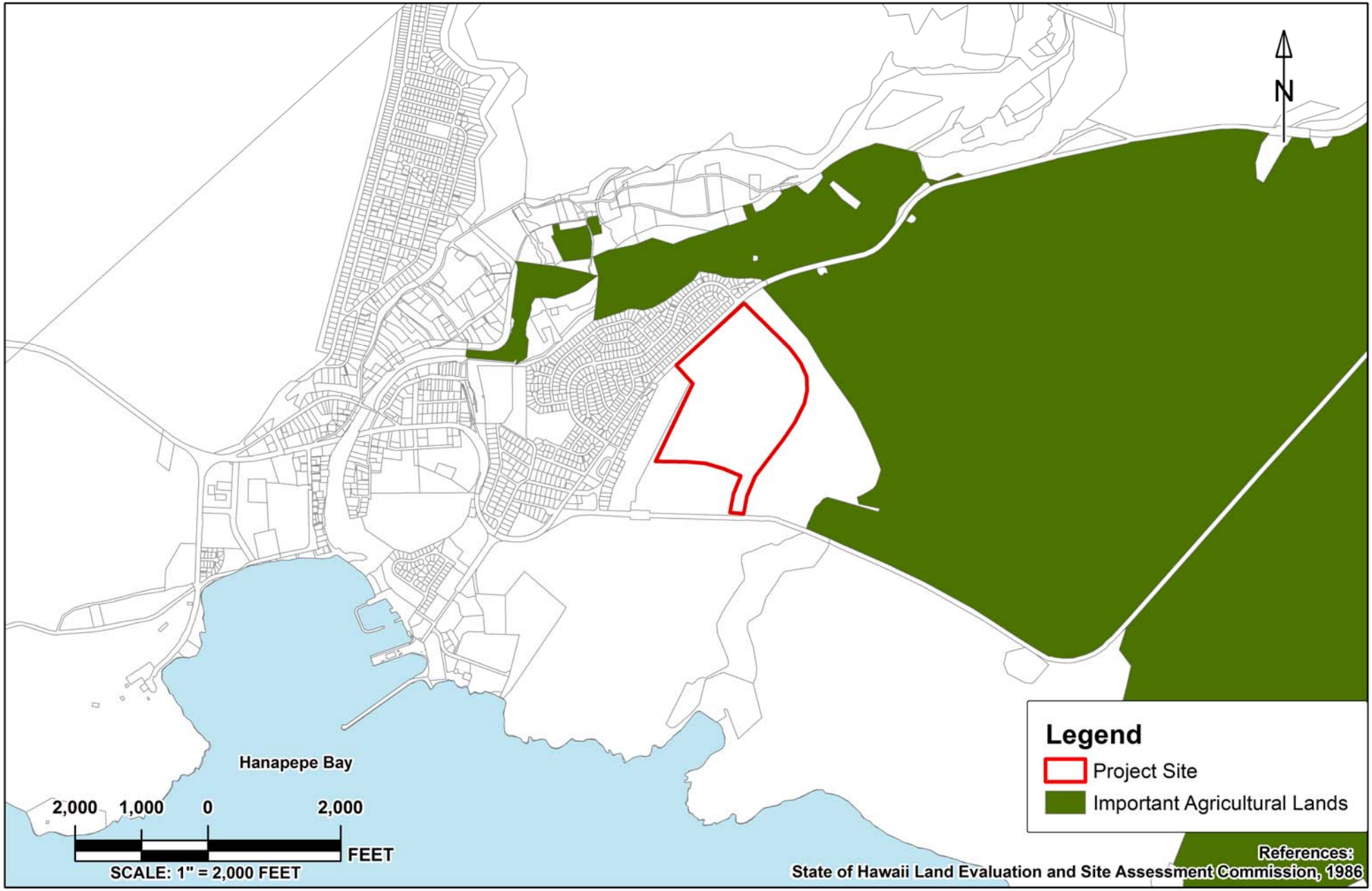


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IMPORTANT AGRICULTURAL LANDS MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 9

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*Tsunami Hazard Zones*

The project site is located outside of the tsunami evacuation zone as determined by the National Oceanic and Atmospheric Administration (NOAA) in partnership with the Hawai‘i State Civil Defense (NOAA, 2016; State of Hawai‘i, 2016).

*Coastal Zone Consistency*

The entire island of Kaua‘i falls within the coastal zone, and is therefore under the jurisdiction of the CZM Program, which was established in compliance with the Coastal Zone Management Act. The program is administered by the State of Hawai‘i Office of Planning and is intended to provide for the effective management, beneficial use, protection, and development of the coastal zone (HRS 205A).

**Approach to Analysis**

Significance of potential land use impacts is based on the level of land use sensitivity in areas affected by a proposed action. In general, land use impacts would be significant if they would: 1) be inconsistent or noncompliant with applicable land use plans or policies; 2) preclude the viability of existing land use; 3) preclude continued use or occupation of an area; or 4) be incompatible with adjacent or vicinity land use to the extent that public health or safety is threatened.

#### 4.3.1.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the Lima Ola Housing Development would not be constructed. No changes to current land use would occur. Therefore, there would be no impact to land use at the project site.

**Proposed Action**

The Proposed Action would result in less than significant short-term impacts to land use from construction activities. The project site is located east of Kaumuali‘i Highway in the town of ‘Ele‘ele. Currently there is no public access to the project site since the land is being used for coffee cultivation by a private company. The agreement upon purchase of the project site by the County stipulated that cultivation would continue at the project site until construction activities begin (County of Kaua‘i Housing Agency, 2012). As a result, access to the project site would not be affected by construction activities and short-term impacts to land use arising from construction activities would be less than significant.

Once developed, the Proposed Action would be considered compatible, consistent, and not in conflict with any of the objectives of the CZM program through minimal impact to the recreational uses and coastal resources affected. Development of the community would not impact coastal recreation opportunities, impede economic uses, increase coastal hazards, or conflict with development within the coastal zone. The proposed project site is not included in the State of Hawai‘i Special Management Area. Therefore, the Proposed Action would be considered compatible and consistent with the program goals, and would not require a Special

Management Area permit. The State of Hawai‘i Office of Planning will be consulted during the environmental review process for applicable federal CZM consistency review.

The Proposed Action would require obtaining development entitlements from the County of Kaua‘i Planning Department. The project site is zoned for agricultural use under state and county zoning regulations. However, since the County of Kaua‘i identified and purchased the project site to provide affordable housing to Kaua‘i residents, an HRS Chapter 201H application would be submitted to the Kaua‘i County Council in order to obtain an exemption from having to process a Zoning Map Amendment, a General Plan Map Amendment and a Zoning Use Permit. In addition a petition for Land Use District Boundary Amendment from Agricultural to Urban will be processed though the State Land Use commission via the 201H expedited review process. A discussion of the HRS Chapter 201H process as it relates to the Proposed Action is included in Section 3 and Section 5.2.1 of this EA.

Agricultural resources would not be significantly impacted by the proposed residential use due to the adequate amount of available agricultural lands surrounding the project site, and within the County of Kaua‘i. Further, the project site was purchased by the County of Kaua‘i for the purpose of providing much needed affordable housing for Kaua‘i residents.

The Proposed Action would meet the criteria established by the County of Kaua‘i General Plan and would be consistent with the General Plan Vision (County of Kaua‘i, 2000). Kaua‘i’s General Plan Vision describes Kaua‘i as a “rural environment of towns separated by broad open spaces,” as well as “a rural place whose population size and economy have been shaped to sustain Kaua‘i’s natural beauty, rural environment and lifestyle.”

The Proposed Action would be consistent with the stated vision by maintaining a rural environment within the project site, and providing the needed development for housing to sustain the environment and lifestyle of Kaua‘i. The General Plan states that preserving Kaua‘i’s rural character is the framework for new development, and that “within that framework, enhancing Kaua‘i’s towns and urban centers and directing new development to towns and urban centers are equally as important as maintaining open space between towns.” The Proposed Action would benefit the people of Kaua‘i by fulfilling a significant need for affordable housing, while maintaining the qualities of development identified in the General Plan (i.e., developing within the vicinity of established residential and commercial communities).

According to the Hawai‘i Housing Planning Study, a total of 1,312 housing units are needed on Kaua‘i from 2012 to 2016, 70% of which are needed by households with an annual income of less than or equal to 80% of the area median income (County of Kaua‘i Housing Agency, 2012). The need for additional affordable housing is evident and the County of Kaua‘i views the provision of affordable housing as a fundamental responsibility of local government. The development would be an extension of the urban development to the west (‘Ele‘ele Subdivision) and southwest (‘Ele‘ele Shopping Center), and would be located adjacent to Habitat for Humanity’s planned residential development to the southwest. As a result, the development would be in continuity with the established urban area, and the Proposed Action would meet the criteria of the General Plan by “focusing development.”

While the Proposed Action would represent a change in land use of the project site, additional agricultural lands would be available within the vicinity of the project site, as well as in the county in general. The Proposed Action would provide very much needed affordable housing, and would focus development near an established urban center in adherence with the County of Kaua‘i General Plan. Therefore, long-term impacts to land use from the Proposed Action would be less than significant.

### 4.3.2 CULTURAL RESOURCES

**Definition of Resources**

Cultural resources represent and document activities, accomplishments, and traditions of previous civilizations, and link current and former inhabitants of an area. Depending on their conditions and historic uses, these resources may provide insight to living conditions in previous civilizations and may retain cultural and religious significance to modern groups. Traditional cultural resources can include archaeological resources, structures, neighborhoods, prominent topographic features, habitats, plants, animals, and minerals that native Hawaiians or other groups consider essential for the persistence of traditional culture. The term historic properties refers to cultural resources that meet specific eligibility criteria for listing on the National Register of Historic Places (NRHP), such as age (generally at least 50 years old), architectural integrity, and/or significant association with historical events, activities, or developments.

**Regulatory Setting**

Several federal laws and regulations have been established to manage cultural resources, including the National Historic Preservation Act (NHPA) of 1966, the Archaeological and Historic Preservation Act (1974), and the Archaeological Resource Protection Act (1979).

The DLNR State Historic Preservation Division (SHPD) works to preserve and sustain historical and cultural resources through three branches: History and Culture, Archaeology, and Architecture. The SHPD maintains the statewide inventory of Historic Properties and reviews development projects in order to lessen the effects of change on Hawai‘i’s historical and cultural assets. Administrative rules pertaining to historic preservation in Hawai‘i can be found in HAR Chapters 197-198, 275-284, and 300. Statutes pertaining to historic preservation in Hawai‘i are found in HRS Chapter 6E.

Traditional cultural practices acknowledged in the State of Hawai‘i include rights of access and gathering. Traditional gathering rights have been codified in HRS 1-1 and 7-1, Article 12-7 of the Constitution of the State of Hawai‘i.

Articles IX and XII of the State Constitution of Hawai‘i (HRS Chapter 343) require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiian and other ethnic groups. The “Guidelines for Assessing Cultural Impacts,” adopted by the Environmental Council of the State of Hawai‘i (1997), identifies the protocol for conducting cultural assessments. Once a cultural resource has been identified, a significance evaluation is conducted in which resources are assessed for scientific or historic research, for the general public, and for traditional cultural groups. In order for a cultural resource to be considered

significant, per HAR §13-275-6, it must meet one or more of the following criteria for inclusion on the NRHP:

A) associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property;
B) associated with the lives of persons significant in the past;
C) embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction;
D) has yielded or may be likely to yield, information important in prehistory or history; and/or
E) have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

#### 4.3.2.1 EXISTING CONDITIONS

*Regional and Local History*

The project site is located in the Hanapēpē ahupuaʻa (land subdivision). Although the project site is not specifically referenced in texts documenting the pre-Contact period, the surrounding area (i.e., the Wahiawa and Hanapēpē Valleys) are described as having extensive taro terraces, cottages, and sweet potato plantations (Scientific Consultant Services, Inc. [SCS], 2014a; SCS, 2014b).

In post-Contact times, during the Great Māhele (i.e., the division of Hawaiian lands), the project site and surrounding lands were awarded to M. Kekūanāoa under the Land Commission Award 7712 (SCS, 2014a; SCS, 2014b). The McBryde Sugar Co., formed in 1889, eventually acquired the lands that included the project site, and established a large plantation, with the required infrastructure to create a successful operation. The McBryde Sugar Co. stopped producing sugar officially on July 1996 when the Kōloa Mill was shut down. The McBryde Sugar Co. was terminated and replaced by Kauaʻi Coffee Co., which continues to grow coffee to the present day (SCS, 2014a).

*Traditional Cultural Practices*

A Cultural Impact Assessment (CIA) (Appendix G-1) was undertaken to identify the possibility of on-going traditional cultural practices within the project site, or its vicinity, and then assess the potential for impacts by the Proposed Action. This effort involved archival and documentary research, as well as communication with organizations having knowledge of the project site, its cultural resources, and its practices and beliefs (SCS, 2014a).

A response to the request seeking information pertaining to traditional cultural practices conducted in the vicinity of the proposed development site was received from one individual. The response stated that the area including and surrounding the project site has been used for sugar cane or coffee production, and any native Hawaiian cultural sites that may have existed at the project site are likely to have been impacted by past and current agricultural activities (Appendix G-1).

*Historic Properties*

An Archaeological Inventory Survey (AIS) was conducted at the project site in September 2013 and April 2014 (SCS, 2014b) (Appendix G-2) in order to identify and document historical properties, to assess their historical significance for eligibility for listing on the Hawai‘i NRHP, and to make project effect recommendations. A single historic property was identified during the AIS, designated as State Site 50-30-09-2219, which is known as the "Pump No.1 Ditch" and runs east-west through the project site. The ditch was constructed in 1908 to irrigate the sugar cane fields, and represents historic-era, plantation use of the landscape. The historic property is significant under HAR §13-275-6 Criteria D, defined as: has yielded or may be likely to yield, information important in pre-history or history. This historical-era, plantation-related site conforms to expectations, which predicted historic sites related to the long history of plantation and ranching activities in these environs. No pre-Contact historic properties were found at the project site.

**Approach to Analysis**

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may occur by: 1) physically altering, damaging, or destroying all or part of a resource; 2) altering the characteristics of the surrounding environment that contribute to resource significance; 3) introducing visual, audible, or atmospheric elements that are out of character with the property or alter its setting; or 4) neglecting the resource to the extent that it is deteriorated or destroyed.

Identifying the locations of Proposed Action and determining the exact locations of cultural resources that could be affected can assess direct impacts. Indirect impacts primarily result from the effects of project-induced population increases and the resultant need to develop new housing areas, utilities services, and other support functions necessary to accommodate population growth. These activities and the subsequent use of the facilities can disturb or destroy cultural resources.

### 4.3.2.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the proposed affordable housing development would not be constructed. The project site would remain unchanged from current conditions and there would be no direct or indirect impacts to any potential cultural resources.

**Proposed Action**

It is not anticipated that implementation of the Proposed Action would have significant short- or long-term impacts on cultural or historic resources. The Proposed Action would impact Pump No. 1 Ditch (*i.e.*, State Site No. 50-30-09-2219). However, since the feature has been properly documented according to state regulations, and there are other examples of similar features in the area, alteration of the feature from the Proposed Action would not represent a significant impact. Further, due to extensive landscape modification over the past 100+ years, it is not likely that other historic resources exist within the project site.

### 4.3.3 TRAFFIC AND CIRCULATION

**Definition of Resources**

Traffic and circulation refer to the movement of vehicles throughout a road or highway network. Primary roads are principal arterials, such as major interstates, designed to move traffic and not necessarily to provide access to all adjacent areas. Secondary roads are arterials such as rural routes and major surface streets, which provide access to residential and commercial areas, hospitals, and schools.

**Regulatory Setting**

State of Hawai‘i Department of Transportation (HDOT) Highway Manual for Sustainable Landscape Maintenance, Chapter 4, Section 645: Work Zone Traffic Control describes the following procedures on:

1) Furnishing, installing, maintaining, and subsequently removing work zone traffic control devices and personnel. Work zone traffic control shall include providing flaggers and police officers.
2) Keeping roads for public traffic open and in passable condition; providing and maintaining temporary access crossings for trails, businesses, parking lots, garages, residences, farms, parks, and other driveways; taking necessary work precautions for the protection, safety, and convenience of the public; should pedestrian facilities exist, taking necessary measures for the safe and accessible passage, with route information and Americans with Disabilities Act of 1990 Accessible Guidelines compliance, for pedestrians traveling through or near work zone.
3) Taking safety and precautionary measures, such as illuminating roadway obstructions during hours of darkness, in accordance with HRS Chapter 286; Title 19, Subtitle 5, Chapters 127, 128, and HAR 129; Manual on Uniform Traffic Control Devices.

Regulations for necessary signs, barricades, traffic delineators, cones, lane closures, advisory signs, and advertisement needed for construction activity shutdowns described in HDOT Section 645 would be adhered to if needed, and a Traffic Control Plan (TCP) would be drafted if construction work extends into the public roadways located adjacent to the project site.

#### 4.3.3.1 EXISTING CONDITIONS

The project site is located in the ‘Ele‘ele community on the west side of the island of Kaua‘i. The project site consists of approximately 75 acres and is bordered by Kaumuali‘i Highway to the north, a future Habitat for Humanity development to the west, and agricultural fields to the south and east. The land is zoned for agricultural uses and is currently being utilized as a coffee farm.

A *Traffic Impact Analysis* (Appendix E) was conducted by Hatch Mott MacDonald at four intersections surrounding the project site. The intersections analyzed as part of the analysis are presented in Figure 10. Intersection traffic operations were evaluated based on the level of service (LOS) concept. LOS is a qualitative description of an intersection and roadway operation ranging from LOS A to LOS F. LOS A represents free flowing uncongested traffic

conditions. LOS F represents highly congested traffic conditions with what is commonly considered unacceptable delay to vehicles on the road segments and at intersections. The intermediate levels of service represent incremental levels of congestion and delay between those two extremes (Appendix E).

According to the *Traffic Impact Analysis*, under existing conditions two of the stop-controlled intersections – Kaumuali‘i Highway / Halewili Road and Kaumuali‘i Highway / Laulea Street-Mahea Road – currently operate at an overall LOS A with side-street operations of LOS C (am) and LOS E (pm). The other stop-controlled intersection – Kaumuali‘i Highway / Laulea Street – currently operates at an overall LOS A with side-street operations of LOS C. The signalized intersection under existing conditions – Waialo Road - ‘Ele‘ele Road / Kaumuali‘i Highway – currently operates at LOS C (am) and LOS E (pm) (Appendix E). Table 3-4 presents the traffic operations at four intersections surrounding the project site under existing conditions.

**Approach to Analysis**

Potential impacts to traffic and circulation patterns are assessed with respect to anticipated disruption or improvement of current transportation patterns and systems, deterioration or improvement of existing levels of service, and changes in existing levels of transportation safety. Beneficial or adverse impacts may arise from physical changes to circulation (*e.g.*, closing, rerouting, or creating roads), construction activity, introduction of construction-related traffic on local roads, or changes in daily or peak-hour traffic volumes created by installation workforce and population changes. Adverse impacts on roadway capacities would be significant if roads with no history of exceeding capacity were forced to operate at or above their full design capacity.

The *Traffic Impact Analysis* (Appendix E) included a traffic impact analysis of operations at four intersections during typical weekday am and pm peak hours. The following intersections were analyzed (see Figure 10):

- Waialo Road - ‘Ele‘ele Road / Kaumuali‘i Highway;
- Kaumuali‘i Highway / Halewili Road;
- Kaumuali‘i Highway / Laulea Street - Mahea Road; and
- Kaumuali‘i Highway / Laulea Street.

The traffic scenarios evaluated during the study included:

- existing traffic conditions;
- future without Proposed Action (year 2040);
- future with Proposed Action (year 2040); and
- future with Proposed Action (phases 1 and 2-year 2030)

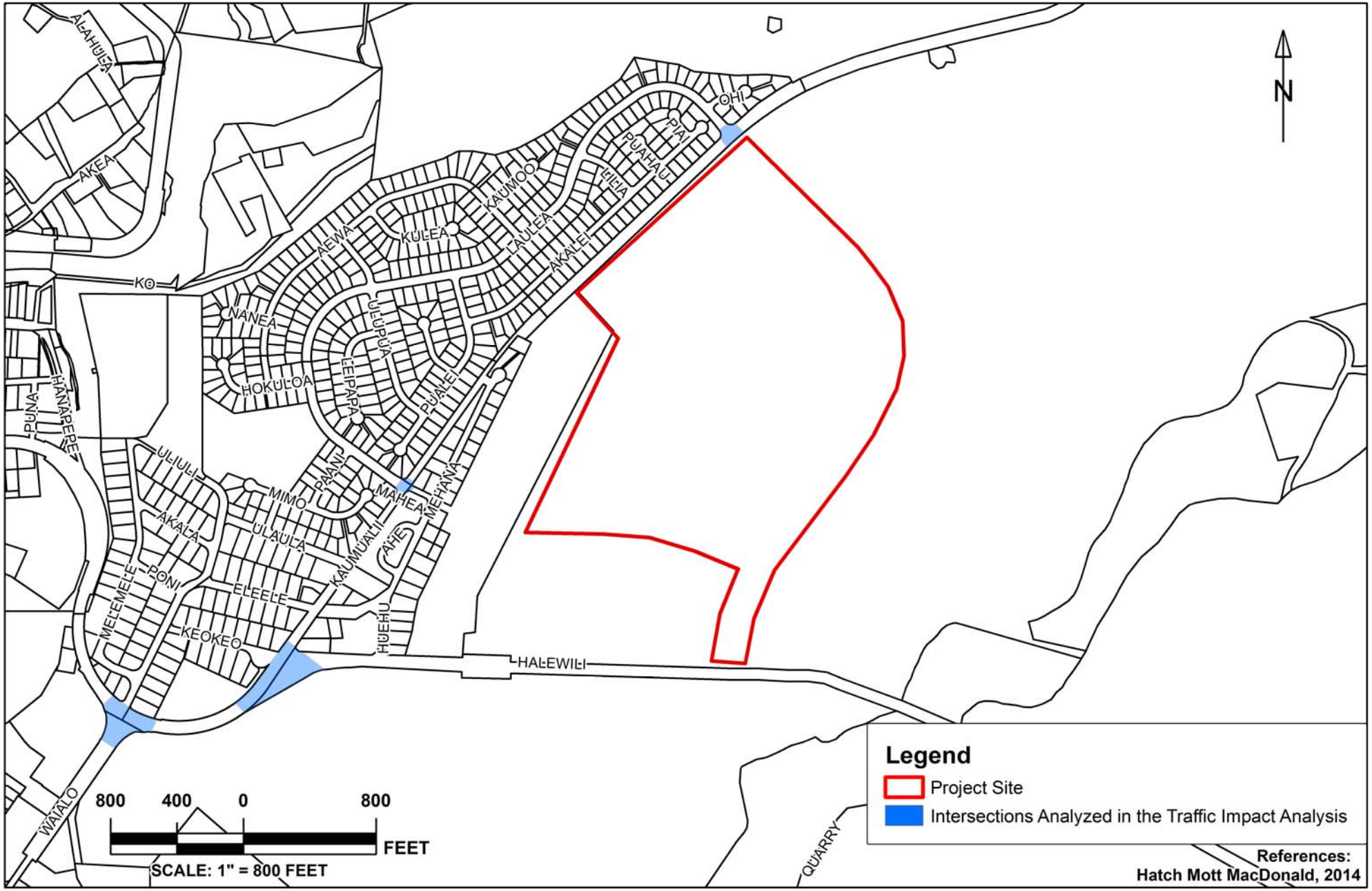
Table 3-4 displays the traffic operations at the four intersections under existing conditions, future conditions under the No Action Alternative (year 2040), and future conditions under the Proposed Action Alternative (year 2040). The LOS at each intersection is shown for future

conditions with no control measures, as well as with the recommended traffic control measures discussed in the following subsections.

*Table 4-4: Traffic Operations under Existing Conditions, Future No Action Alternative, and the Proposed Action*

| **Intersection** | **Intersection Control** | **Existing Conditions (Year 2014)** | | **No Action (Year 2040)** | | **Proposed Action (Year 2040)** | |
|---|---|---|---|---|---|---|---|
| | | **LOS** | | **LOS** | | **LOS** | |
| | | am | pm | am | pm | am | pm |
| Waialo Road - ‘Ele‘ele Road / Kaumuali‘i Highway | Signal (existing) | C | E | D | F | D | F |
| | With Proposed Improvement | N/A | N/A | N/A | N/A | D | E |
| Kaumuali‘i Highway / Halewili Road | One-Way Stop (existing) | overall (A); side-street (C) | overall (A); side-street (E) | overall (A); side-street (E) | overall (A); side-street (F) | overall (A); side-street (E) | overall (A); side-street (F) |
| | With Proposed Improvement | N/A | N/A | N/A | N/A | overall (A); side-street (C) | overall (A); side-street (E) |
| Kaumuali‘i Highway / Laulea Street - Mahea Road | Two-Way Stop (existing) | overall (A); side-street (C) | overall (A); side-street (E) | overall (A); side-street (D) | overall (A); side-street (F) | overall (E); side-street (F) | overall (E); side-street (F) |
| | With Proposed Improvement | N/A | N/A | N/A | N/A | B | B |
| Kaumuali‘i Highway / Laulea Street | One-Way Stop (existing) | overall (A); side-street (C) | overall (A); side-street (C) | overall (A); side-street (D) | overall (A); side-street (C) | overall (E); side-street (F) | overall (B); side-street (F) |
| | With Proposed Improvement | N/A | N/A | N/A | N/A | B | A |

Source: Hatch Mott MacDonald, 2014

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**TRAFFIC MAP**
**'ELE'ELE, KAUA'I, HAWAI'I**

**FIGURE 10**

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#### 4.3.3.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under implementation of the No Action Alternative, the Lima Ola Workforce Housing Development would not be constructed, and no short-term construction vehicular traffic would be generated. The project site would remain unchanged, and existing truck traffic from the existing agricultural activity at the project site would continue without additional impacts associated with the Lima Ola Workforce Housing Development.

However, traffic within the vicinity of the project site would still be adversely impacted by long-term growth and anticipated increased vehicular traffic from the adjacent approved housing subdivision ‘Ele‘ele Iluna. All four intersections surrounding the project site would experience a degradation of LOS at either the signalized intersections or side-streets without the implementation of the Proposed Action. Table 3-4 displays the traffic operations of the intersections under the No Action Alternative in the year 2040.

**Proposed Action**

Implementation of the Proposed Action would result in less than significant, short-term impacts to traffic and circulation during the construction period. Construction activities would include improvements to existing roadways such as Mahea Road, Halewili Road, Iluna Road, and Kaumuali‘i Highway. Therefore, construction activities would need to comply with HDOT construction traffic control measures, and a TCP would be created prior to commencement of construction activities. Negligible direct impacts resulting from additional vehicle trips to and from the project site by construction workers and contractors via the local roadway network would occur during the construction phase. Contractor parking would be provided in the staging areas established for the various phases of construction activities. As much as possible, the number of vehicles would be reduced through the implementation of vanpooling. As a result, direct and indirect short-term impacts to traffic and circulation due to construction activities would be considered less than significant.

Upon completion, the Proposed Action is expected to generate long-term traffic and circulation impacts on traffic in the project site. Table 3-4 displays the traffic operations at four intersections surrounding the project site under the Proposed Action in the year 2040. Traffic operations at three of the four intersections would be adversely affected as a result of construction of the Lima Ola Workforce Housing Development.

In order to address the project-induced projected impacts, improvements to the four intersections surrounding the project site are presented in Table 3-5.

*Table 4-5: Recommended Traffic Improvements under the Proposed Action*

| Intersection | Recommended Improvements |
|---|---|
| Waialo Road - ‘Ele‘ele Road / Kaumuali‘i Highway | add a second westbound Kaumuali‘i Highway left turn lane |
| | add a second southbound through lane on Waialo Road leaving the intersection (*i.e.*, between Kaumuali‘i Highway and the ‘Ele‘ele Shopping Center driveway) |
| Kaumuali‘i Highway / Halewili Road | add a southbound median acceleration lane along Kaumuali‘i Highway |
| | add a southbound left turn lane along Kaumuali‘i Highway at this intersection |
| Kaumuali‘i Highway / Laulea Street – Mahea Road | signalize intersection |
| | lengthen the existing southbound Kaumuali‘i Highway left turn lane to provide a minimum of 100 feet of vehicle storage |
| Kaumuali‘i Highway / Laulea Street | signalize intersection |
| | convert the existing northbound median acceleration lane on Kaumuali‘i Highway into a southbound left turn lane |

Source: Hatch Mott MacDonald, 2014

The roadway improvements recommended by the traffic study would alleviate the LOS degradation associated with the increased traffic burden in the project site (Table 3-4). Therefore, the long-term impacts to traffic would be considered less than significant. A future follow up traffic study is recommended within the affected traffic network upon completion of Phases 1 and 2 of the proposed project, in order to verify the projected LOS that justifies the suggested traffic improvements.

Long-term impacts to pedestrian circulation include discontinuous sidewalks between the project site and the remainder of the ‘Ele‘ele community and increased pedestrian demand across Kaumuali‘i Highway. Traffic study recommendations to address these impacts include constructing sidewalks or pedestrian/bicycle pathways along the northern frontage of Mahea Road between the project site and Kaumuali‘i Highway and along the north-south internal roadway within the ‘Ele‘ele Iluna project. In addition, the existing sidewalk along Laulea Street should be extended one block east to Kaumuali‘i Highway. Traffic calming devices and management strategies would be utilized to balance traffic on streets with pedestrian uses. These traffic calming devices include roundabouts, multi-way stops, curved roadways and visual cues, and mid-block street crossings.

It is also recommended that The County of Kaua'i should consider adding new bus stops for Routes 100 and 200 along Waialo Road (Route 541) in the vicinity of the 'Ele'ele Shopping Center. This improvement would help to reduce vehicular demand to and from the shopping center, including to and from the project site. Currently, there are no bus stops within a five-minute walk of the shopping center.

With these proposed improvements, the Proposed Action would combine compact neighborhoods, links between homes and community facilities, an attractive pedestrian and bikeway system, and a convenient transit route to allow residents to move around the community on either foot or bike. Therefore, long-term impacts to pedestrian circulation due to the Proposed Action would be considered beneficial.

### 4.3.4 SOCIOECONOMICS

**Definition of Resources**

Socioeconomics are defined as the basic attributes and resources associated with the human environment, particularly population and economic activity. Human population is affected by regional birth and death rates as well as net in- or outmigration. Economic activity typically comprises employment, personal income, and industrial growth. Impacts on these fundamental socioeconomic indicators can also influence other components such as housing availability and public services provision.

Socioeconomic data in this section are presented at the county, state, and national levels to analyze baseline socioeconomic conditions in the context of regional, state, and national trends. Data have been collected from previously published documents issued by federal, state, and local agencies and from state and national databases (*e.g.*, U.S Bureau of Economic Analysis [BEA] Regional Economic Information System).

**Regulatory Setting**

In 1994, Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," was issued to focus the attention on human health and environmental conditions in minority and low income communities and to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed.

Because children may suffer disproportionately from environmental health risks and safety risks, Executive Order 13045, "Protection of Children from Environmental Health and Safety Risks," was introduced in 1997 to prioritize the identification and assessment of environmental health risks and safety risks that may affect children and to ensure that policies, programs, activities, and standards address environmental health risks and safety risks to children.

#### 4.3.4.1 EXISTING CONDITIONS

*Social Factors and Community Identity*

The project site is located in Census Tract 407, County of Kaua‘i, Hawai‘i, thus the following statistics reflect the population of Census Tract 407, which includes the ‘Ele‘ele, Kalaheo, and a portion of the Lawa‘i Census Designated Places (CDPs).

According to the 2010 Census, the population of the State of Hawai‘i was 1,360,301, with the population of the County of Kaua‘i accounting for approximately 67,091 of those residents. The population on Kaua‘i in 2010 was almost 15% more than that in 2000 (U.S. Census Bureau, 2016). Census Tract 407 had a population of 8,403 residents in 2010; approximately 12.5% of the total population of Kaua‘i. Persons aged 18 years and over accounted for 77.3% of Kaua‘i’s population, while this age group made up about 76.6% of the Census Tract 407 population. Kaua‘i’s 65 years and older population was approximately 9,985, or 14.9% of the island’s population, and this age group consisted of 15.0% of Census Tract 407’s population.

Census Tract 407’s racial distribution was such that individuals with one race were 34.8% White, 0.3% Black or African American, 0.4% American Indian and Alaska Native, 33.6% Asian, 4.8% Native Hawaiian and other Pacific Islanders, and 0.7% of some other race. 25.3 percent of the Census Tract 407 population consisted of two or more races. In addition, 25.9% of the population was either full or part Native Hawaiian and Other Pacific Islander, 51.1% of the population was either full or part Asian, and 50.9% of the population was either full or part White (U.S. Census Bureau, 2016).

The Kaua‘i General Plan, written in 2000, sets forth community values and a vision for Kaua‘i in 2020. Community values, formulated by the Citizen’s Advisory Committee using input from 25 outreach meetings with a variety of community, business, and public interest groups, are identified as the following:

- protection, management, and enjoyment of open spaces, unique natural beauty, rural lifestyle, outdoor recreation and parks;
- conservation of fishing grounds and other natural resources, so that individuals and families can support themselves through traditional gathering and agricultural activities;
- access to and along shorelines, waterways, and mountains for all. However, access should be controlled where necessary to conserve natural resources and to maintain the quality of public sites for fishing, hunting, recreation, and wilderness activities valued by the local community;
- recognition that the environment is Kaua‘i’s economy, natural capital, the basis of its economic survival and success;
- balanced management of Kaua‘i’s built environment, clustering new development around existing communities and maintaining the four-story height limit;
- diverse job and business opportunities so that people of all skill levels and capabilities can support themselves and their families;
- government that supports and encourages business;

- balanced economic growth development providing good jobs and a strong economy, without sacrificing Kaua‘i’s environment and or quality of life;
- respect and protection for the values and rights of Kaua‘i’s many cultures, in compliance with the laws and responsibilities as citizens;
- preservation of Kaua‘i’s cultural, historical, sacred and archaeological sites;
- appreciation and support for the traditions of the Native Hawaiian host culture and the many other cultural traditions and values that make up the Kaua‘i community;
- appreciation and support for the visitor industry’s role in preserving and honoring all cultures and their values as Kaua‘i’s leading source of income and as a supporter of community festivals, recreation, arts and culture;
- protection of Kaua‘i’s unique character;
- recognition of the uniqueness of Kaua‘i’s communities, supporting people with roots and history in those communities to continue to live and raise their families there;
- safety for all citizens and visitors;
- support for Kaua‘i’s youth, educating them to succeed; and
- broad participation in the public process.

An essential aspect of the County of Kaua‘i’s vision and one of the driving forces behind the General Plan is to preserve Kaua‘i’s special rural character. “Rural” describes many aspects of Kaua‘i that people value: green, open lands for raising crops for food; small communities where people know each other; the absence of city noise and lights; and not feeling crowded. Some important elements of Kaua‘i’s physical environment that contribute to the “rural” classification are:

- small towns and communities that have a distinct character and are compact rather than spread out;
- wide expanses of open lands – natural areas and lands in active cultivation – provide separation between the towns and communities. The rhythm of communities alternating with open lands is pleasing; and the separation highlights the special identity of each community;
- buildings are relatively small in scale and low in height, complementing rather than dominating the landscape; and
- the relatively small scale of Kaua‘i roads, the presence of natural vegetation along the roads, and the absence of medial concrete barriers also contribute to the rural ambiance.

However, within the policy framework for maintaining rural character in land use and future growth, enhancing Kaua‘i’s towns and urban centers and directing new development is equally important as maintaining open space between towns. The County of Kaua‘i has generated strategies to develop towns and urban centers while keeping its rural profile. Rather than allowing development to sprawl along Kaua‘i’s main roads, the intent is to focus development in a way that supports Urban Centers and Town Centers, while allowing already-existing, outlying

residential communities and agricultural communities to build outwards (County of Kaua‘i, 2000).

The County of Kaua‘i has the largest aging population in the state, thus housing needs for elderly households are higher on Kaua‘i than in the other Hawai‘i counties. Units needed to serve elderly households account for 11.4% of total needed units in all Hawai‘i counties except County of Kaua‘i, where they account for 19% of the need. The number of housing units needed to accommodate low and moderate income elderly households in County of Kaua‘i (under 80% of area median income [AMI]) accounts for 82% of the total elderly units needed. In other counties, elderly housing need for the same income range is 60-69% (County of Kaua‘i Housing Agency, 2012).

To address the needs of Kaua‘i’s growing senior population, the Agency on Elderly Affairs launched a Four-Year Area Plan on Aging that spans from 1 October 2011 to 30 September 2015 to assess the needs of the elderly in the community. The plan presents strategies that are focused around principles put forth in the Older Americans Act, which forms the basis for the direction. The plan outlines six major issue areas: activities for disease prevention and social engagement; support for caregivers; in-home and community-based programs and services; access to information and care options; person-centered approaches for at-risk older adults; and elderly rights and benefits (County of Kaua‘i, 2011).

In addition to the growing need for housing the aging population, there is also an urgent need for housing in general for West Kaua‘i. The development and expansion of West Kaua‘i has been slower than other parts of the island, and there is a disproportionately low amount of new housing units in comparison to the number of new residents in the area. From 2000-2010, there was a 23.3% share of population growth in West Kaua‘i, while the share of housing unit growth in the area for the same time period was only 15% (County of Kaua’i Housing Agency, 2012).

*Socioeconomics*

The median household annual income for the Census Tract 407 was $64,050 in 2010. This figure is slightly less than the median household income for the County of Kaua‘i ($64,752), and less than that of the State of Hawai‘i ($67,492) (U.S. Census Bureau, 2016). According the County of Kaua‘i General Plan, the visitor industry is projected to continue to be the driving force of ‘Ele‘ele’s economy for the foreseeable future (County of Kaua‘i, 2000).

*Environmental Justice*

In order to comply with Executive Order 12898, ethnicity and poverty status in the vicinity of the project site were examined and compared to regional, state, and national data to determine if any minority or low-income communities could potentially be disproportionately affected by implementation of the Proposed Action.

Based on data contained in the 2010 Census of Population and Housing (1999 model-based estimate), the percentage of the population that includes the project site (Census Tract 407) below the poverty level is 15.3%, which is more than the County of Kaua‘i (11%), the State of Hawai‘i (10.8%), as well as the national percentage (14.9%).

The percentage of minority residents in Census Tract 407 (65.2%) is less than the percentage of minority residents for the island of Hawai‘i (75.3%) and the County of Kaua‘i (87.9%), but significantly greater than the nation (24.9%) (U.S. Census Bureau, 2016).

*Protection of Children*

In order to comply with Executive Order 13045, the number of children under age 18 in the vicinity of the project site was examined and compared to City and County, state, and national levels. Additionally, locations where populations of children may be concentrated (*e.g.*, child care centers, schools, and parks) were determined to address potentially disproportionate health and safety risks to children that may result from the implementation of the Proposed Action.

In 2010, there were 6,433 children under the age of 18 in Census Tract 407, comprising 23.4% of the overall census tract population. This is slightly higher than the 22.7% for the County of Kaua‘i, 21.8% for the State of Hawai‘i, and just below the 23.5% for the nation (U.S. Census Bureau 2016).

The State of Hawai‘i Department of Education (DOE) has a total of eight school districts and 320 public schools statewide. Children living in the vicinity of the project site attend schools in the Kaua‘i School District. ‘Ele‘ele Elementary, the nearest school to the project site, is located approximately 0.6 miles to the west. The nearest high school to the project site is Waimea High School, located approximately six miles to the west.

**Approach to Analysis**

Significance of population and expenditure impacts are assessed in terms of their direct effects on the local economy and related effects on other socioeconomic resources (*e.g.*, housing). The magnitude of potential impacts varies depending on the location of a Proposed Action; for example, an action that creates 20 employment positions may be unnoticed in an urban area, but may have significant impacts in a more rural region. If potential socioeconomic impacts would result in substantial shifts in population trends, or adversely affect regional spending and earning patterns, they would be significant.

### 4.3.4.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the proposed Lima Ola Housing Development would not be constructed. There would be fewer construction jobs, and new affordable housing units available within the area. There would be indirect adverse effects on affordable housing availability in the area, as the growing need for affordable and senior housing in the county would remain (County of Kaua‘i Housing Agency, 2012).

**Proposed Action**

Under the Proposed Action, beneficial short-term and long-term impacts to socioeconomic resources are expected. The project site is located on a parcel of land that has been used for commercial agriculture production. Although the current lessee would have to vacate the project site prior to development of the Proposed Action, there are adequate lands within the vicinity of the project site and within the County of Kaua‘i that are suitable for agricultural use. There would be long-term beneficial socioeconomic impacts from the much needed additional affordable housing options that would be available to Kaua‘i residents (County of Kaua’i Housing Agency, 2012).

‘Ele‘ele Elementary is the closest school to the project site, located approximately 0.6 miles to the west. Construction activities are not expected to increase the hazard or risk to children since the construction area would be fenced and inaccessible to the public.

Construction activities would result in the short- and long-term creation of jobs and materials spending lasting until project completion, which could be as long as 30 years. The creation of construction jobs would help to reduce the higher than national and state average unemployment in the census tract area. As a result, short- and long-term impacts on socioeconomics on the project site are considered beneficial.

Once completed, the Proposed Action is expected to result in long-term beneficial socioeconomic impacts in the project site. Lima Ola would not be a stand-alone development, but one that would create linkages to surrounding existing and future neighborhoods. The interconnection of the new Lima Ola community with the existing ‘Ele‘ele and Hanapēpē communities would encourage the interaction and movement of people and resources. In addition, the Proposed Action would be guided by planning concepts of how residential development in a rural community can better encourage active and healthy lifestyles by offering viable options to walk and bike, and lower reliance on non-renewable resources for transportation and home energy. The influx of new residents is expected to bring greater economic vitality and civic energy to the area, as well as strengthen the region’s sense of community.

Lima Ola would be designed to maintain a rural town feeling, incorporating green space and pedestrian access. The Lima Ola residential area would be compact, contiguous to an existing town, and contain small road profiles; all of which would promote the rural character. In addition, a community park/center, sustainable development including permeable surfaces and drainage, solar energy for water heating and electricity, and neutral ventilation and shade are planned for the neighborhood design to provide a greater sense of sustainability associated with rural areas.

The proposed Lima Ola housing development would have a positive impact on Environmental Justice, as its primary goal is to “design and develop a community that provides a range of affordable housing options” (County of Kaua’i Housing Agency, 2012), especially to poverty and minority groups. Housing opportunities would be available to Kaua‘i households earning from 80% and below of the Kaua‘i median household income and would be designed to fulfill the preferences of people at all different stages of life.

In addition, there would be a positive impact to children. The Proposed Action would provide shelter and create a compact neighborhood with a community center, playgrounds, and pavilions that are safe and conducive to children. ‘Ele‘ele Elementary school is located within walking distance to the project site; located approximately 0.6 miles to the west.

### 4.3.5 RECREATIONAL/RESOURCE USE

**Definition of Resources**

Recreation is comprised of terrestrial- and water-based activities associated with the local population or visitors to the island. Recreation may consist of aquatic activities such as

swimming, windsurfing, surfing, fishing, jet skiing, kayaking, snorkeling, scuba diving, and water skiing. Terrestrial recreational activities may consist of shopping, indoor shooting ranges, restaurants, hiking trails, biking, jogging, and golfing.

Resource use includes any commitment of natural resources such as aggregate for concrete and petroleum products to fuel construction equipment needed to construct the Proposed Action, as well as to operate and maintain it.

### 4.3.5.1 EXISTING CONDITIONS

The project site is located on a 75-acre parcel in ‘Ele‘ele, Kaua‘i on the southern side of the island of Kaua‘i (Figure 1).

There are several County Department of Parks and Recreation facilities located west of the project site. ‘Ele‘ele Nani Park is located approximately one quarter mile from the project site and includes a 7.50 acre neighborhood park with playground equipment. ‘Ele‘ele Park is a 2.86 acre neighborhood park, located approximately 0.35 miles from the project site. ‘Ele‘ele Park includes a multi-purpose field, a comfort station, pavilion and basketball court (County of Kaua‘i Housing Agency, 2012).

Hanapēpē Bay is located approximately one mile south of the project site, which has many recreational uses, including biking, boating, swimming, and diving.

The project site is currently used for commercial agricultural purposes. As a result, public access to the project site is restricted and the site has no recreational use at this time.

**Approach to Analysis**

The significance of potential impacts on recreational activities and resources due to the Proposed Action would be assessed. The significance of potential impacts would be determined by considering the direct effects of the Proposed Action on the beneficial use of recreational activities and natural resources. Substantial secondary impacts such as population changes or effects on public facilities would also be considered.

### 4.3.5.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the Proposed Action would not be constructed. There would be no use of additional recreational areas or resources. Therefore, there would be no impact to recreational or resource use within the project site.

**Proposed Action**

*Recreation*

Under the Proposed Action, no impacts to short-term recreational use in the project site are expected. Construction activities would be restricted to the project site. Currently there is no public access to the project site because the land is being used for coffee cultivation. As a result, no recreational activities take place at the project site. The recreational activities located closest

to the project site are those of the ‘Ele‘ele community across Kaumuali‘i Highway, which include community parks and recreation facilities, as well as Hanapēpē Bay’s water recreation activities. Considering their distance and physical separation from the project site by the highway, recreational use in the ‘Ele‘ele community is not anticipated to be impacted. Therefore, short-term recreational use in the project site would not be impacted by construction activities associated with implementation of the Proposed Action.

Under the Proposed Action, beneficial long-term impacts to recreational use in the project site are expected. According to the 2012 *Lima Ola Workforce Housing Development Master Plan* (Appendix A), the Proposed Action would include a “network of shared use paths, open play spaces, passive leisure parks, and community gardens” for the residents and visitors to enjoy. In addition, the Proposed Action would provide a range of mobility options including biking and walking throughout the community. Therefore, long-term impacts to recreational use in the project site would be considered beneficial.

*Resource Use*

Less than significant impacts to short-term resource use in the project site due to construction activities are expected. The Proposed Action would require the commitment of natural resources such as aggregate for concrete and petroleum products to fuel construction equipment. However, the amount of resources needed to complete housing development would not represent a significant commitment of resources in the project site since the needed resources are available within the county and/or state. Therefore, short-term impacts on resource use in the project site due to construction activities would be considered less than significant.

Less than significant long-term impacts to resource use in the project site are also expected. Upon completion of the development’s construction, various resources would be used within the community. These resources include gasoline and refuse space needed for trash pickup, park services, and road services in order to maintain the Proposed Action. However, the Proposed Action would be located adjacent to similar developments by which these resources are already used; therefore, the Proposed Action would not represent a significant increase to these resources in the long-term.

### 4.3.6 VISUAL AND AESTHETIC RESOURCES

**Definition of Resources**

Visual resources are defined as the natural and manufactured features that comprise the aesthetic qualities of an area. These features form the overall impressions that an observer receives of an area or its landscape character. Landforms, water surfaces, vegetation, and manufactured features are considered characteristic of an area if they are inherent to the structure and function of a landscape.

**Regulatory Setting**

The County of Kaua‘i General Plan calls for maintaining the rural character of Kaua‘i, including its natural beauty and green open spaces that make it the “Garden Isle.” In order to accomplish that aim, the plan identifies multiple elements for Kaua‘i’s physical environment, including small, compact towns and communities; wide expanses of open land; relatively small and low

buildings; and relatively small scaled roads with natural vegetation and no concrete barriers (Appendix A).

### 4.3.6.1 EXISTING CONDITIONS

The visual environment at the project site includes coffee trees and a series of unpaved roads that are used by vehicles and machinery in support of commercial agricultural use at the project site. Elevation at the project site ranges from 175 feet above msl to 275 feet above msl. Views from the project site include coffee trees, the Pacific Ocean, and the Port Allen commercial/industrial area to the south, and a view of the central Kaua‘i mountains to the north.

**Approach to Analysis**

Determination of the significance of impacts to visual resources is based on the level of visual sensitivity in the area. Visual sensitivity is defined as the degree of public interest in a visual resource and concern over adverse changes in the quality of the resource. In general, an impact to a visual resource is significant if implementation of the Proposed Action would result in substantial alterations to an existing sensitive visual setting.

### 4.3.6.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the Proposed Action would not be constructed. There would be no change to visual and aesthetic resources at the project site. Therefore, there would be no impact to visual and aesthetic resources under this alternative.

**Proposed Action**

Under the Proposed Action, short-term, less than significant impacts to visual and aesthetic resources during construction activities are expected to occur. These impacts would be due to the presence of construction equipment within and around the project site. According to the *Lima Ola Workforce Housing Development Master Plan* (Appendix A), construction activities related to the Proposed Action would likely span several decades. A total of six construction phases are tentatively planned for the proposed development. As a result, impacts to visual resources would not be continuous at any one location throughout the construction process.

In addition, the surrounding area is moderately urbanized and the presence of construction equipment would be limited to the project site. Further, there is no public access to the project site because the land is being used for coffee cultivation by a private company. As a result, the Proposed Action would not be placing construction equipment in a special use area such as a park, beach, or scenic vista. Therefore, short-term impacts to visual and aesthetic resources within the project site would be considered less than significant.

The Proposed Action would result in less than significant long-term impacts to visual and aesthetic resources. Although a visual change would result from the construction of the community, the project site is not located in a sensitive visual setting as defined above to be related to public interest in the visual resource. In addition, the Proposed Action calls for a

mauka to makai visual corridor through the community which would preserve the existing visual assets of the project site. Further, the community would not adversely contrast with the existing residential developments located to the west of the project site. As a result, the Proposed Action would not represent a significant change in visual aesthetics in the project site.

Finally, the Proposed Action would be compatible with the County of Kaua‘i General Plan which calls for the use of green open space, small, low buildings, and the presence of natural vegetation along roads (County of Kaua‘i, 2000). The Proposed Action would include a permanent greenway system throughout the development, a network of paths and open spaces, and parks and community gardens. A green perimeter is planned to remain along the west end of the development, and a green space in the mauka area of the community would provide improved aesthetics as well as a noise buffer between the highway and the community. In accordance with the general plan, open spaces would be interspersed throughout the community. Also in accordance with the County General Plan, all residences would be a maximum of two stories in height (County of Kaua‘i, 2000). Therefore, long-term impacts to visual and aesthetic resources due to the construction of the Proposed Action are considered less than significant.

### 4.3.7 PUBLIC INFRASTRUCTURE AND UTILITIES

**Definition of Resources**

Public infrastructure and utilities comprise functional services provided to a facility by public agencies or by a facility to the community. Such services may include police and fire protection, water and solid waste service, sanitary sewer and wastewater treatment, and recreational facilities. Utilities include infrastructure services that support facility operations, including electricity, natural gas, or telecommunications. On-site utility production, such as power generation or wastewater treatment, occurs at some facilities.

**Regulatory Setting**

The State of Hawai‘i Public Utilities Commission (PUC) regulates all franchised or certificated public service companies operating in the state. Franchised or certified public service companies operating under PUC regulation include:

- electric providers;
- telecommunication providers;
- motor and water carriers; and
- privately owned water and sewage treatment utilities.

The PUC’s primary purpose is to ensure that regulated companies efficiently and safely provide their customers with adequate and reliable services at just and reasonable rates, while providing regulated companies with a fair opportunity to earn a reasonable rate of return.

#### 4.3.7.1 EXISTING CONDITIONS

The project site is currently used for agricultural production. Existing infrastructure at the project site includes a private catchment water system for agricultural irrigation. There are no other utilities currently at the project site.

*Electricity and Telecommunications*

Kaua‘i Island Utility Cooperative (KIUC) is a generation, transmission, and distribution cooperative serving more than 32,000 electrical accounts throughout Kaua‘i, including the areas around the project site. The average demand for electricity on KIUC’s system is approximately 75 megawatts; however, KIUC operates an electric generation fleet capable of producing up to 125 megawatts of electricity (KIUC, 2016). Hawaiian Telcom (HT) and Oceanic Time Warner Cable (OTWC) provide telecommunications and cable television service to the surrounding areas.

*Potable Water*

Water resource and distribution systems for the project site are managed by the County of Kaua‘i DOW. The DOW has four well sources in the Hanapēpē-‘Ele‘ele system. Two wells, Hanapēpē A and Hanapēpē B, are located in Hanapēpē Valley. Hanapēpē A was drilled in 1974 at 98 feet above msl, and has a pumping capacity of 500 gallons per minute (gpm). Hanapēpē B was drilled in 1980 at 99 feet above msl, and has a pumping capacity of 900 gpm. The two other wells, Hanapēpē 25-1 and Hanapēpē 4, are located on the west side of Hanapēpē. Hanapēpē 25-1 is abandoned and no longer used by the DOW. It was drilled in 1966 and has a pumping capacity of 150 gpm. Hanapēpē 4 was drilled in 1993 at an elevation of 463 feet above msl, and has a pumping capacity of 700 gpm.

The DOW has three storage tanks along Kaumuali‘i Highway within the vicinity of the project site: two 0.4-million gallon tanks with 340 foot spillway elevations and one 0.2-million gallon tank with a 402 foot spillway elevation. Delivery of water from any of the wells into the storage tanks is accomplished by two 750 gpm ‘Ele‘ele Booster pumps in Hanapēpē Valley and a 27-inch pipe in the valley wall to the steel tanks at 340 feet elevation. A smaller 120 gpm booster pump station delivers water from the 340 foot tanks to the 402 foot tank. The total existing pumping capacity of the Hanapēpē-‘Ele‘ele water system is approximately 1.7 million gallons per day (mgd).

*Wastewater*

The County of Kaua‘i Division of Wastewater Management’s ‘Ele‘ele Wastewater Treatment Plant (WWTP) manages and operates the wastewater generated by the ‘Ele‘ele and Hanapēpē communities. The capacity of the ‘Ele‘ele WWTP is 0.8 mgd, while the current usage is approximately 0.4 mgd. There are 12.83 miles of gravity sewer lines associated with the ‘Ele‘ele WWTP.

*Stormwater Drainage System*

Elevations within the project site range from approximately 175 to 275 feet above msl. The existing surface water runoff path flows generally in a north to south direction at an approximate 4% average slope. The subsurface soils at the project site vary from stiff to very stiff clayey silt

and silty clays with low expansion potential. An abandoned irrigation ditch exists on the project site that diverts a portion of surface water flow east towards Wahiawa Stream.

*Roads and Intersections*

The Kaumualiʻi Highway runs along the northwest border of the project site, and Halewili Road runs directly south of the project site. There are a series of internal dirt roads throughout the project site that are used in support of commercial agricultural activities. These internal roads are accessed from both Kaumualiʻi Highway and Halewili Road.

*Solid Waste*

Residential solid waste service in the project site is provided by the County of Kauaʻi Refuse Division in accordance with current collection policies.

*Law Enforcement*

The Kauaʻi Police Department serves as the primary law enforcement agency for ʻEleʻele and the entire island of Kauaʻi. The project site is in the Waimea District, which provides police services from Halfway Bridge on Kaumualiʻi Highway to the far west side of the island (Polihale), including Kokeʻe State Park (Kauaʻi Police Department, 2016).

*Fire Protection*

The Kauaʻi Fire Department protects life and preserves property from all hazards, and enhances the environment of the County of Kauaʻi. There are seven fire stations on Kauaʻi; the nearest to the project site being the Hanapēpē Fire Station located less than a mile west of the project site (Kauaʻi Fire Department, 2016).

**Approach to Analysis**

Significance of public services or utilities systems impacts are assessed in terms of their direct effects on the public service or utility providers. The magnitude of potential impacts varies depending on the location of a proposed action; for example, an action that alters existing utility systems infrastructure may be unnoticed in an urban area, but may have significant impacts in a more rural region. If potential public service and utility system impacts would result in substantial shifts in the amount of services provided, or substantial changes to the utility systems infrastructure, the action would be significant.

### 4.3.7.2 POTENTIAL IMPACTS AND MITIGATION

**No Action Alternative**

Under the No Action Alternative, the Proposed Action would not be constructed, and the installation of water, sewer, electric, and telecommunication infrastructure systems and utilities would not occur. There would be no change to public infrastructure, and the existing demand on public services and utilities in the project site would remain the same. Therefore, there would be no impact to public infrastructure and utilities.

**Proposed Action**

Under the Proposed Action, beneficial impacts to public infrastructure and utilities would occur. Public community spaces, including a community center, pavilions, playgrounds, and community gardens, would become available for use. The Proposed Action would require connection with various utilities and services, including electricity and telecommunications, potable water, wastewater, and roadways. The Proposed Action is anticipated to have less than significant impacts on public infrastructure and utilities. The details of the projected impacts to public infrastructure and utilities systems from the Proposed Action are described in the following paragraphs.

*Electricity and Telecommunications*

The Proposed Action would include the connection of electrical and telecommunication services to the proposed housing units. Electrical service by KIUC would be extended overhead into the project site from Mahea Road. HT and OTWC would follow KIUC's overhead lines into the project site to provide telecommunications and cable television service. The overhead electrical and communication lines would transition to underground upon entering the project site. Electrical plans and service requests must be submitted to KIUC, HT, and OTWC for design coordination and approval.

The total estimated electrical demand for the proposed Lima Ola Housing Development is 1,150 kilowatts (kW), or 843,000 kW hours per month (Ronald N. S. Ho & Associates, Inc., 2014). When added to the current average demand for electricity on KIUC's system (75 megawatts), the total estimated demand of electricity is well in range of the combined capacities of KIUC facilities (125 megawatts), and would not significantly impact the existing KIUC electrical grid (KIUC, 2014).

*Potable Water*

The Proposed Action would require the design and installation of potable water lines at the project site. The maximum daily demand of the Hanapēpē-'Ele'ele water system is approximately 1.04 mgd (based on current water consumption data) and the projected maximum daily demand of the proposed Lima Ola development is approximately 0.38 mgd, for a total projected use of approximately 1.42 mgd of water. The total existing pump capacity of the Hanapēpē-'Ele'ele water system is approximately 1.7 mgd, therefore the existing pumping capacity is well in excess of the maximum existing demand, together with the projected demand of the Proposed Action. Since the current water supply would be able to accommodate the proposed use under the Proposed Action, there would not be significant impacts from water use.

*Wastewater*

Wastewater generated by the Proposed Action would be serviced by the County of Kaua'i Wastewater Management Division 'Ele'ele WWTP. The Proposed Action would require the design and installation of sewer lines at the project site. The wastewater generated by the Lima Ola Housing Development would gravity flow towards the connection point (*i.e.*, an existing 12-inch polyvinyl chloride (PVC) county sewer line located at the eastern end of Mahea Road, near the project boundary). The proposed development would generate an average wastewater flow of 0.14 mgd, which combined with the current usage of 0.4 mgd in the area, is well within the

treatment capacity of the ‘Ele‘ele Wastewater Treatment Plant of 0.8 mgd. Therefore, the Proposed Action would have a less than significant impact on the county wastewater system.

*Stormwater Drainage System*

The Proposed Action would include the construction of additional impervious surfaces (paved roads and sidewalks) that would collect and convey stormwater runoff. Therefore an on-site drainage system would be implemented. The drainage system would include vegetated drainage swales located along the internal roadways that would collect and bio-filter storm water, which would then be deposited into subsurface reinforced concrete pipe culverts. The stormwater would then be channeled to an on-site detention basin that would allow collected surface water to percolate into the underlying aquifer. The detention basin would have a maximum storage capacity of 2.7 acre-feet and would be designed for a two-year storm and a drainage area of 87 acres.

The proposed drainage system would be designed in accordance with the County of Kaua‘i Department of Public Works Standards. An NPDES permit would be necessary for the construction period of the Proposed Action. With the planned drainage system in place, the Proposed Action would have less than significant impacts on stormwater drainage at the project site, as well as the surrounding environment since the planned drainage system would comply with the provisions of the County of Kaua‘i Department of Public Works Standards, as well as provisions of an NPDES permit for construction work.

*Solid Waste*

During the construction period the contractor would be required to complete and follow a waste minimization plan in order to control construction-related waste generation. The Proposed Action would require residential solid waste service that would be provided by the County of Kaua‘i Refuse Division in accordance with current collection policies. Lima Ola presents an opportunity to model a proactive waste minimization strategy. Possible actions include a recyclables collection station within the community and the conversion of green waste into mulch that is locally available for residents and community gardeners (County of Kaua‘i Housing Agency, 2012). Since the Proposed Action would comply with County of Kaua‘i Refuse Division policies and procedures, there would be less than significant impacts to the existing county solid waste collection process.

*Law Enforcement*

The Proposed Action would be included in the patrol area for the Kaua‘i Police Department Waimea District, which provides police services from Halfway Bridge on Kaumuali‘i Highway to the far westside of the island (Polihale), including Koke‘e State Park (Kaua‘i Police Department, 2016). Since the Proposed Action would be located within close proximity of existing towns that are currently patrolled (‘Ele‘ele and Hanapēpē), it would not represent a significant impact to existing law enforcement services.

*Fire Protection*

The Proposed Action would be in the response vicinity of the Hanapēpē Fire Station, located approximately 1.3 miles to the west. Since the Proposed Action is in close proximity to an existing fire station and would conform to county fire protection standards, including the

installation of fire hydrants and smoke alarms, it would not represent a significant impact to existing fire protection services.

### 4.3.8 CUMULATIVE IMPACTS ASSOCIATED WITH THE PROPOSED ACTION

Cumulative impacts on environmental resources result from incremental impacts of the Proposed Action that, when combined with other past, present, and reasonably foreseeable future projects in an affected area, may collectively cause more substantial adverse impacts. Cumulative impacts can result from minor, but collectively substantial, actions undertaken over a period of time by various agencies (federal, state, or local) or persons. In accordance with NEPA and the CEQ memorandum of "Guidance on the Consideration of Past Actions in Cumulative Effects Analysis," a discussion of cumulative impacts resulting from projects which are proposed, under construction, recently completed, or anticipated to be implemented in the near future is required.

There are no other known major public infrastructure or development projects planned within the project site at this time. There are future and ongoing projects directly adjacent to the project site, including developments with Habitat for Humanity and Alexander and Baldwin (A&B) Properties. Immediately southwest of the project site, Habitat for Humanity plans to construct a new phase of their development with 107 additional units. Immediately south and southeast of the project site are lands owned by A&B Properties. These lands are intended for mixed-use development in the future (County of Kaua‘i Housing Agency, 2012). These adjacent developments and planned construction projects would contribute to the impacts on the area. The foreseeable cumulative impacts that would result would be an increase in traffic due to the increased population of residents and visitors, as well as impacts on resource use (*e.g.*, potable water, electricity, and sewer). Close coordination between project proponents and the county of Kaua‘i would need to occur in order to avoid cumulative impacts to available resources and traffic flow patterns. Since these Proposed Action is evaluated based on its incremental impact to the existing environment and would be closely coordinated with the community and applicable regulatory agencies, it would not represent a significant incremental impact that would contribute to adverse cumulative impacts.

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# 5 RELATIONSHIP TO ENVIRONMENTAL REGULATIONS

The purpose of this section is to summarize the relationship of the relevant plans and policies to project actions. Additionally, the intent is to revisit these plans and policies to qualify any significant effects from actions proposed in this EA.

## 5.1 FEDERAL REGULATIONS

**Clean Water Act (CWA)**

The CWA establishes the basic structure for regulating discharges of pollutants into the waters of the U.S. and regulating quality standards for surface waters. Under Section 402 of the CWA, the EPA establishes the NPDES permit program to regulate point source discharges of pollutants into waters of the U.S. Section 404 of the CWA regulates the discharge of dredged and fill material into waters of the U.S.

*Discussion:*

Since the Proposed Action would include disturbance of more than one acre of land an NPDES permit would be required for construction activities, and would be applied for with the DOH. A Department of Army permit may also be necessary to comply with the CWA according to correspondence with the U.S. Army Corps of Engineers (Appendix B). Close coordination with the U.S. Army Corps of Engineers and DOH will continue throughout the project planning process in order to assure all applicable provisions of the CWA are followed.

**Clean Air Act (CAA)**

The CAA (42 U.S.C. 7401) requires the adoption of national ambient air quality standards to protect public health, safety, and welfare from known or anticipated effects of air pollution. The DOH Clean Air Branch is responsible for air pollution control in the state.

*Discussion:*

The Proposed Action would be in compliance with the provisions of the CAA since its implementation would be subject to approval from the DOH. It is not anticipated that the Proposed Action would result in any necessary air quality permits since it would not result in significant or chronic emissions.

**Endangered Species Act (ESA) of 1973**

The ESA of 1973 provides a legal means by which identified ecosystems that are determined to be essential to the sustainability of an endangered or threatened species can be conserved. Under this act, the USFWS is responsible for all terrestrial and freshwater species, as well as migratory birds. Likewise, the NMFS in the Department of Commerce is responsible for the protection of marine, estuarine, and anadromous species.

*Discussion:*

The USFWS has jurisdiction over endangered and threatened terrestrial flora, fauna, and birds in the State of Hawai‘i. Consultation with USFWS and DLNR has been initiated (Appendix B), and would continue during the environmental review process. Control measures discussed in Section 4.2.3.2of this EA would reduce potential impacts to endangered species that may be present within the project area.

**Coastal Zone Management (CZM) Act of 1972**

In 1972, the federal government enacted the CZM Act to protect, preserve, develop, restore, and enhance the resources of the nation's coastal zone for current and future generations. This process is achieved by providing assistance to coastal states, including Hawai‘i, to develop and manage Coastal Management Programs. Enforcement authority for the Federal Coastal Management Program (Public Law 104-150, as amended in 1996) has been delegated to the State of Hawai‘i (HRS, Chapter 205A).

*Discussion:*

Through the CZM Program promulgated by HRS Chapter 205A, each county is required to establish special management areas and shoreline setbacks within which permits are required for development. The proposed project would comply with HRS Chapter 205A since it is not located on the shoreline or within the special management area.

## 5.2 STATE LAND USE PLANS AND POLICIES

### 5.2.1 STATE OF HAWAI‘I

**Environmental Impact Statements Chapter 343, HRS**

Compliance with Chapter 343, HRS is required as previously described in Section 2.1 Scope and Authority.

**§343-5 Applicability and Requirements.** *(a) Except as otherwise provided, an environmental assessment shall be required for actions that:*

> *Propose the use of the state or county lands or the use of state or county funds, other than funds to be used for feasibility or planning studies for possible future programs or projects that the agency has not approved, adopted, or funded, or funds to be used for the acquisition of unimproved real property; provided that the agency shall consider environmental factors and available alternatives in its feasibility or planning studies; provided further that an environmental assessment for proposed uses under section [205-2(d)(10)] or [205-4.5(a)(13)] shall only be required pursuant to Section 205-5(b).*
>
> *HRS, Chapter 343, defines the State of Hawai‘i's environmental review process by which an environmental impact statement must be conducted to identify any potential impacts that could result from a proposed action involving state or county lands or funds.*

*Discussion:*

The County of Kaua‘i is titled to the land within the project site; therefore, an environmental review under HRS Chapter 343 is required because the project entails the use of county lands. This document has been prepared to meet HRS Chapter 343 requirements and would be processed through the OEQC.

**Environmental Impact Statement Rules Title 11, Chapter 200, HAR**

HAR Title 11, Chapter 200 provides the procedures, definitions and criteria for completing environmental assessments and environmental impact statements in compliance with HRS 343.

*Discussion:*

Evaluation of the potential environmental, social and economic impacts from the Proposed Action have followed the applicable procedures, definitions and criteria outlined in HAR 11-200.

**Hawai‘i State Plan, Chapter 226, HRS**

The Hawai‘i State Plan, Chapter 226, HRS was developed as a guideline for the future growth of the State of Hawai‘i. The State Plan identifies goals, objectives, policies, and priorities for the development and growth of the state. It provides a basis for prioritizing and allocating the limited resources such as public funds, services, human resources, land, energy, and water. The State Plan establishes a system for the formulation and program coordination of state and county plans, policies, programs, projects, and regulatory activities. The State Plan also facilitates the integration of all major state and county activities. The proposed project would be in conformance with the State Plan’s objectives and policies for socio-cultural advancement with regard to housing. Specifically, the proposed project would fulfill the following objectives of the State Plan:

- *Provide greater opportunities for Hawai‘i’s people to secure reasonably priced, safe, sanitary, and livable homes, located in suitable environments that satisfactorily accommodate the needs and desires of families and individuals, through collaboration and cooperation between government and non-profit and for-profit developers to ensure that more affordable housing is made available to very low-, low- and moderate-income segments of Hawai‘i's population.*

- *Effectively accommodate the housing needs of Hawai‘i’s people.*

- *Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.*

- *Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.*

- *Foster a variety of lifestyles traditional to Hawai‘i through the design and maintenance of neighborhoods that reflect the culture and values of the community.*

**Historic Preservation Chapter 6E, HRS**

Regulatory statutes related to historic preservation issues are provided in Chapter 6E of the HRS, which mandates that the SHPD of the DLNR must review proposed state projects, which may have an impact upon historic and cultural resources that are located within the project site. Further, Chapter 6E also provides procedural guidelines in the event of an inadvertent discovery of burial sites during project development.

*Discussion:*

The SHPD has been consulted during the environmental review process. Correspondence is included in Appendix B. A historical/cultural survey was conducted in accordance with HRS, Chapter 6E at the project site in order to determine if cultural and/or historical resources are present at the project site.

**State of Hawai‘i Land Use Law Chapter 205, HRS**

Chapter 205, HRS promulgates the State Land Use Law. This law is intended to preserve, protect, and encourage the development of lands in the State of Hawai‘i for uses that are best suited to the public health and welfare of its people. The LUC classifies all land into four districts: Urban, Conservation, Agriculture, and Rural.

*Discussion:*

The project site is designated within the State LUC Agricultural District. While the proposed project would be used for residential purposes, the County of Kaua‘i has identified the project site as the most suitable location for the proposed affordable housing community, and has allocated sufficient alternative lands in the area, as well as additional lands in the county, for agricultural use. Since the Proposed Action is located on lands in excess of 15 acres within the Agricultural District, as defined by the State of Hawai‘i LUC, a petition to amend the Agricultural land use district boundary into the Urban District would be necessary.

**Hawai‘i Revised Statues, Chapter 201H**

HRS Section 201H-38, was enacted into law to provide a process whereby an affordable housing project may be granted exemptions from any statutes, ordinances, charter provisions, and rules of any governmental agency relating to planning, zoning and construction standards that do not negatively affect the health and safety of the general public. The Kaua‘i County Housing Agency administers this law for the County of Kaua‘i.

Typical exemptions may include but are not limited to General Plan, Development Plan, and Zoning District designations, zoning district and subdivision requirements (e.g., undergrounding of utilities, parking requirements, lot size, street design), relief from park dedication requirements, and various fees.

Affordable housing projects are eligible for exemption if more than half (51%) of the units are made affordable to income target groups established by county rules, based on guidelines provided by the HUD. The target groups are defined as a percentage (usually 80-140%) of the median income for Kaua‘i as determined by HUD. Additional requirements apply, and a project and developer must be determined as eligible by the Housing Agency for 201H consideration.

*Discussion:*

Since all of the residential units included in the Proposed Action would be affordable housing, the Proposed Action would be eligible for exemptions included in HRS Section 201H. Proposed exemptions requested under HRS Section 201H are presented in Section 3 of this EA:

## 5.3 COUNTY LAND USE PLANS AND POLICIES

### 5.3.1 COUNTY OF KAUA‘I

#### 5.3.1.1 GENERAL PLAN (AMENDED NOVEMBER 2000)

Pursuant to the provisions of the Charter for the County of Kaua‘i, the General Plan sets forth policies to govern the future physical development of the county. The General Plan is intended to improve the physical environment of the county and the health, safety and general welfare of Kaua‘i’s people.

*Discussion:*

Chapter 6 of the General Plan discusses the enhancement of communities and providing for growth on Kaua‘i. The plan states that ‘Ele‘ele has been a growing residential community that supports the local businesses and visitors. The plan also states that the west side, which includes the towns of Waimea, Kekaha, Hanapēpē and ‘Ele‘ele have an estimated capacity for additional residential growth, and that Port Allen, located *makai* of ‘Ele‘ele, is planned for expanded commercial and harbor growth. Growth is planned within existing towns and developed areas to reduce isolated sprawl. The Proposed Action would include a compact walkable community located directly adjacent to the established residential community of ‘Ele‘ele Heights, and *mauka* of ‘Ele‘ele shopping center and Port Allen. Therefore, the Proposed Action would be in accordance with the guidance established in the County General Plan.

#### 5.3.1.2 KAUA‘I COUNTY CODE

The Kaua‘i County Code 1987, as amended, was prepared pursuant to the authority of Section 4.05 of the Kaua‘i County Charter, and sets forth guidelines and rules for various County functions, including development standards, taxation, County administration organization and other matters affecting the general public.

*Chapter 8 of the Kaua‘i County Code: CZO*

The purpose of the CZO is to provide regulations and standards for land development and the construction of buildings and other structures in the County of Kaua‘i (County of Kaua‘i, 2015a). The project site is located in the Agricultural District.

*Discussion:*

The project site is currently zoned for agricultural use under county zoning regulations. While the proposed project would be used for residential purposes, the County of Kaua‘i has identified the project site as the most suitable location for the proposed affordable housing community, and has allocated sufficient alternative lands in the area, as well as additional lands in the county, for agricultural use. Proposed exemptions from the County CZO, as well as Chapter 9 of the County Code are discussed in the preceeding subsection titled “Hawai‘i Revised Statues, Chapter 201H”.

### 5.3.2 PERMITS AND APPROVALS

#### 5.3.2.1 SECTION 402 NPDES PERMIT

Discharge of pollutants into surface waters of the U.S. are controlled under the NPDES program, pursuant to Section 402 of the CWA. This program is administered by the DOH under HAR Title 11, Chapter 55 Water Pollution Control. This chapter requires submission of a NPDES application or a Notice of Intent for NPDES General Permit coverage, for discharges of regulated pollutants, or for substantially altering the quality of any discharge, or for substantially increasing the quantity of discharge.

The State NPDES General Permit program regulates discharges into Class A waters such as Hanapēpē Bay. Any discharges associated with construction activities such as dewatering or hydrotesting must comply with the provisions of HAR Title 11, Chapters 54 and 55. A Department of the Army permit may be necessary in order to comply with Section 404 of the CWA. Consultation will continue with the U.S. Army Corps of Engineers in order to comply with Section 404 of the CWA.

#### 5.3.2.2 REQUIREMENTS FOR CONSTRUCTION ACTIVITIES

The following County of Kaua‘i permits are associated with construction activities and are expected to be required for the Proposed Action:

- Grading Permit from the Department of Public Works, Building Department;
- Building Permits from the Department of Public Works, Building Department;
- Sewer Connection Approval from the Department of Public Works Wastewater Division; and
- Potable water connected approval from the DOW.

# 6 FINDINGS AND DETERMINATIONS

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

A review of the "Significance Criteria" used as a basis for the above determination is presented below. An action is determined to have a significant impact on the environment if it meets any one of the thirteen (13) criteria, as established under HRS Chapter 343.

**Involves an irrevocable commitment to loss or destruction of any natural or cultural resources;**

The Proposed Action would not provide irrevocable commitment to loss or the destruction of any natural or cultural resources since the research conducted did not reveal any known significant cultural or natural resources that would be adversely affected by the Proposed Action. Control measures relating to construction timing and lighting used for the Proposed Action would reduce potential impacts to protected species to a level of insignificance.

**Curtails the range of beneficial uses of the environment;**

The Proposed Action would not curtail the range of beneficial uses of the environment. The project site is currently used for agricultural production. While the Proposed Action would include a change of use at the project site to residential, since there are adequate agricultural lands both within the vicinity of the project site, and within the county, the Proposed Action would not curtail beneficial uses of the environment.

**Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 343, HRS; and any revisions thereof and amendments thereto, court decisions, or executive orders;**

The Proposed Action would be in conformance with the Chapter 343 HRS State Environmental Policy, to enhance the quality of life.

**Substantially affects the economic or social welfare of the community or state;**

The Proposed Action would have a beneficial impact on the economic and social welfare of the community or the state. The proposed project would have short-term beneficial impacts by creating temporary construction jobs for the duration of the construction period, as well as long-term beneficial impacts by providing much needed affordable housing to the people of Kaua'i.

**Substantially affects public health;**

The Proposed Action would have beneficial effects on public health by incorporating pedestrian paths and a community center that would encourage exercise and fitness.

**Involves substantial secondary impacts, such as population changes or effects on public facilities;**

The Proposed Action would not result in substantial secondary impacts, such as population changes or effects on public facilities. Since there currently is a need for affordable housing for the existing county population, it is not anticipated that the residents of the planned community would represent an increase in overall county population. Rather, the existing population would utilize the planned affordable housing units. Further, the public facilities in the area are not anticipated to be significantly impacted by the community residents.

**Involves a substantial degradation of environmental quality;**

The Proposed Action would not likely result in a substantial degradation of environmental quality. All construction activities would be implemented in compliance with applicable county and state BMPs/regulations.

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

The Proposed Action is one of several planned residential communities within the area. However, according to the County of Kaua‘i General Plan, residential development on the west side of Kaua‘i is planned in order to offer adequate housing to the area population, as well as visitors. The Proposed Action would adhere to all applicable county construction BMPs, and would not have an adverse effect on the environment, nor would it involve a commitment for larger actions.

**Substantially affects a rare, threatened, or endangered species or its habitat;**

The Proposed Action is not anticipated to have substantial effects on a rare, threatened, or endangered species, or any critical habitat. The endangered Hawaiian hoary bat was detected within the vicinity of the project site; however, there is no evidence that the project site is acting as habitat for the Hawaiian hoary bat. The endangered Hawaiian petrel and threatened Newell’s shearwater may fly over the project site at night while travelling to and from their upland nesting sites to the ocean. Measures to avoid or minimize impacts to these biological resources have been incorporated in this EA, and would reduce impacts to a level of insignificance.

**Detrimentally affects air or water quality or ambient noise levels;**

No significant impacts on the long-term air or water quality or ambient noise levels within the affected environment are anticipated to result from the Proposed Action. Construction noise that exceeds DOH guidelines should be controlled to reduce the potential of noise level exceedances. Water quality impacts would be reduced with the use of silt fences and other applicable BMPs, including an NPDES permit during construction activities to contain runoff that may potentially reach receiving waters. Dust abatement measures should be used to reduce potential of impact to air quality during construction. With these measures in place, the project would not detrimentally affect air, water, or noise quality within the affected environment.

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

The project site is not located in an environmentally sensitive area; it is not located in a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, freshwater, or coastal waters.

**Substantially affects scenic vistas and view planes identified in county or state plans or studies; and**

The Proposed Action would not substantially affect the visual aesthetics of the area identified in the county or state plans and studies. The residences would adhere to county height restrictions, and a view corridor from the mountains to the sea would be maintained.

**Requires substantial energy consumption.**

The Proposed Action would not require substantial energy consumption. The KIUC currently has the capacity to supply the proposed residential community with the needed electricity service. Additionally, the community residences are planned to incorporate energy saving measures, such as solar hot water and photovoltaic electricity panels.

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# 7 AGENCIES AND ORGANIZATIONS CONSULTED

The following is a list of agencies and organizations to which pre-assessment letters as well as notices of the availability of the draft EA for review were sent. Appendix B includes the comment and response letters.

*Table 7-1: List of Agencies and Organizations Consulted*

| | **Consulted Agency or Organization** | **Pre-Assessment Response Received** |
|---|---|---|
| Federal Agencies | Postmaster - Līhuʻe Post Office | |
| | Postmaster - ʻEleʻele | |
| | USEPA, Region 9 Pacific Islands Contact Office | |
| | US Army Corps of Engineers | X |
| | US Geological Survey | |
| | United States Fish and Wildlife Service | X |
| | US Department of Agriculture Natural Resources Conservation Service | X |
| State Agencies | HDOT Highways Division | |
| | HDOT Kauaʻi District | |
| | DOH Environmental Planning Office | |
| | State of Hawaiʻi Department of Health | |
| | Land Use Commission | |
| | DBEDT, Office of Planning | X |
| | DOH Office of Environmental Quality Control | |
| | Department of Education | |
| | HDOT Highways Division | X |
| | DOH Environmental Planning Office | |
| | HDOT Airports Division | X |
| | Department of Land & Natural Resources | |
| | Department of Agriculture | |
| | DBEDT Hawaiʻi Housing Finance & Development Corporation | |

| | Consulted Agency or Organization | Pre-Assessment Response Received |
|---|---|---|
| State Agencies (cont.) | Association of Hawaiian Civic Clubs | |
| | Office of Hawaiian Affairs | |
| County of Kaua‘i | Agency on Elderly Affairs | |
| | Kaua‘i Fire Department | |
| | Department of Parks & Recreation | X |
| | Planning Department | X |
| | Kaua‘i Police Department | |
| | Public Works Department | |
| | Transportation Agency | X |
| | Department of Water | |
| | Kaua‘i Civil Defense Agency | |
| | Office of Economic Development | |
| | Hanapepe Neighborhood Center | |
| | Hanapepe Public Library | |
| | Historical Preservation Commission | X |
| | ‘Ele‘ele Post Office | |
| | Lihue Post Office | |
| Utility Companies | Kaua‘i Island Utility Cooperative | |
| | Hawaiian Telecom | |
| | Oceanic Time Warner Cable | |
| Citizen Groups and Individuals | Hui Kako‘o ‘o ‘Aina Ho‘opulapula | |
| | Kaua'i/Niihau Island Burial Council | |
| | Hui Mālama I Nā Kupuna ‘O Hawai‘i Nei | |

# 8 REFERENCES

B.D. Neal & Associates, 2014. *Draft Air Quality Study for the Proposed Lima Ola Workforce Housing Project.* 25 April 2014.

Cavanaugh and Tocci, 1998. *Environmental Noise, the Invisible Pollutant.* Environmental Excellence in South Carolina. Volume 1, Number 1, University of Southern California Institute of Public Affairs. <http://www.cavtocci.com/portfolio/publications/EnvironmentalNoise.pdf>

CEQ, 2010. *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*. Memorandum for Heads of Federal Departments and Agencies.

County of Kaua‘i, 2000. *Kaua‘i County General Plan.* Accessed 1 April 2016. <http://www.kauai.gov/Government/Departments/PlanningDepartment/TheKauaiGeneralPlan/tabid/130/Default.aspx>

County of Kaua‘i, 2004. *Interim Construction Best Management Practices for Sediment and Erosion Control for the County of Kaua‘i.* Department of Public Works.

County of Kaua‘i, 2011. *County of Kaua‘i Agency on Elderly Affairs Four Year Plan on Aging October 1, 2011- September 30, 2015.* Accessed April 1 2016. <http://kauaiadrc.org/Portals/_AgencySite/docs/kauaiareaplan-final-2012-2015-1-28-2011.pdf>

County of Kaua‘i, 2015. Kaua‘i County Code, 1987, as Amended. Council of the County of Kaua‘i, November 24, 2015.

County of Kaua‘i Housing Agency, 2012. *Lima Ola Workforce Housing Development Master Plan County of Kaua‘i Housing Agency.* March 2012.

County of Kaua‘i, 2015. Exemptions for Affordable Housing Projects Pursuant to Chapters 201H-38 and 46-15.1, Hawaii Revised Statutes and Section 7A-9.3, Kaua‘i County Code as amended. November 24.

D.L. Adams Associates, Ltd., 2014. *Environmental Noise Assessment Report Lima Ola Workforce Housing Development, ‘Ele‘ele, Island of Kaua‘i, Hawai‘i*.

DOH, 1969. Title 11: Hawai‘i Administrative Rules. Chapter 46: Community Noise Control.

DOH, 2011. *Islands of Hawai‘i, Kaua‘i, Lana‘i, Maui, Moloka‘i, and O‘ahu.* Scale 1:24,000. Accessed 7 July 2014. June.

DOH, 2012. *State of Hawai‘i Annual Summary 2012 Air Quality Data.* Accessed 20 March 2014. <http://health.hawaii.gov/cab/files/2013/05/aqbook_2012.pdf>

EPA, 1977. *Toward a National Strategy for Noise Control*. U.S. Environmental Protection Agency.

EPA, 2012. *Air and Radiation.* Accessed 20 March 2014. <http://www.epa.gov/air/>

EPA, 2016. *EPA Region 9 Air Quality Maps.* Accessed 10, April 2016. <http://www.epa.gov/region09/air/maps/>

FEMA, 2010a. *Hawai'i County Flood Insurance Rate Map. Parcel ID: 1500020287F.* Accessed 10 June 2014. <https://msc.fema.gov>

FEMA, 2010b. *Hawai'i County Flood Insurance Rate Map. Parcel ID: 1500020289F.* Accessed 10 June 2014. <https://msc.fema.gov>

FEMA, 2010c. Digital Flood Insurance Rate Map Database, Kaua'i County, Hawai'I, USA. Accessed 7 July 2014. 26 November 2010. < www.msc.fema.gov>

Foote, D. E., Hill, E. L., Nakamura, S., & Stepehens, F., 1972. *Soil Survey, Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lana'i, State of Hawai'i.*

Hatch Mott MacDonald, 2014. *Lima Ola Workforce Housing Project. 'Ele'ele, Hawai'i. Traffic Impact Analysis Final Report.* October.

Kaua'i Fire Department, 2016. Accessed 1 April 2016. <http://www.kauai.gov/Government/Departments/FireDepartment/tabid/107/Default.aspx>

Kaua'i Police Department, 2016. Accessed 1 April 2016. <http://www.kauai.gov/tabid/298/Default.aspx>

Kimura International, 2010. *Phase 2: Environmental Site Assessment, TMK (4) 2-1-001: Parcel 027 'Ele'ele, Kaua'i.* January.

KIUC, 2014. *Energy Information. Power Cost and Generation Fleet.* Accessed 1 April 2016. <http://website.kiuc.coop/content/energy-information-0>

Macdonald, G.A., Abbott, A.T. and Peterson, F.L.,1983. *Volcanoes in the Sea, the Geology of Hawai'i.* Honolulu, University of Hawai'i Press.

Mink, John and Stephen Lau, 1992. *Aquifer Identification and Classification for Kaua'i: Groundwater Protection Strategy for Hawai'i*, September.

National Wetlands Inventory, 2016. *Hawaii Wetlands.* Accessed 1 April 2016. <http://www.fws.gov/wetlands/>

NOAA, 2016. *Tsunami Hazard Map.* Accessed 1 April 2016. <http://tsunami.csc.noaa.gov/map.html?mapname=KAUA_I-POIPU&submit1=Search+Island+Area>

NRCS, 2016. *National List of Hydric Soils 2014.* Accessed 1 April 2016. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/>

OSHA, 2012. *29 CFR, Part 1910, Subpart: G: Occupational Safety and Health Standards.*

Ronald N. S. Ho & Associates, Inc., 2014. From Kanemura, Bryce. "RE: (Pn 213109) Lima Ola - Electric Demand Estimate" Message to Hernan N. Co. 24 March 2014. E-mail.

Scientific Consultant Services (SCS), 2014a. *A Cultural Impact Assessment for a 75-acre Parcel in Hanapēpē Ahupua'a, District of Kona, Kaua'i Island, Hawai'i.* TMK. (4)-2-1-001:054. Prepared for CPE.

SCS, 2014b. *An Archaeological Inventory Survey of a 75-acre Parcel in Hanapēpē Ahupua'a, District of Kona, Kaua'i Island, Hawai'i.* TMK. (4)-2-1-001:054. Prepared for CPE.

State of Hawai‘i, 2008. *Hawai‘i Revised Statutes Chapter 343 Environmental Impact Statements.* Updated January 2008.

State of Hawai‘i, 2012. *Land Use District Boundary Maps - Island of Kaua‘i.* Accessed 1 April 2016. <http://luc.hawaii.gov/maps/land-use-district-boundary-maps/ludb-maps-island-of-kauai/>

State of Hawai‘i, 2014. *Kaua‘i Tsunami Evacuation Zones.* Accessed 1 April 2016. <http://www.kauai.gov/Government/Departments/CivilDefenseAgency/tabid/90/Default.aspx>

State of Hawai‘i Environmental Council, 1997. *Guidelines for Assessing Cultural Impacts.* November.

State of Hawai‘i Land Evaluation and Site Assessment Commission, 1986. *Important Agricultural Lands.* Accessed 1 April 2016. <http://planning.hawaii.gov/gis/>

SWCA, 2013. Biological *Resource Assessment for Lima Ola Workforce Housing.* SWCA Project No. 25727.00. October.

U.S. Census Bureau, 2014. *American Fact Finder.* Accessed 1 April 2016. <http://factfinder2.census.gov/>

USFWS, 2016. *National Wetlands Inventory Website.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Accessed 1 April 2016. <http://www.fws.gov/wetlands/>

USGS, 1996. Hanapepe, HI. Scale 1: 24,000. Accessed 1 April 2016. <http://magis.manoa.hawaii.edu/maps/index.html>

USGS, 2001. *Earthquakes Hazards and Zoning in Hawai‘i.* Accessed 1 April 2016. <http://hvo.wr.usgs.gov/earthquakes/hazards/>

USGS, 2014a. *National Water Information System: Mapper.* Accessed 1 April 2016. <http://maps.waterdata.usgs.gov/mapper>

USGS, 2014b. *Online tools help Hawai‘i breathe easier during trade wind time-outs. Accessed 1 April 2016* < http://hvo.wr.usgs.gov/volcanowatch/view.php?id=202>

Western Regional Climate Center, 2008. *Hawai‘i Climate Summaries.* Accessed April, 2016. <http://www.wrcc.dri.edu/ summary/climsmhi.html>

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# APPENDIX A: LIMA OLA WORKFORCE HOUSING DEVELOPMENT MASTER PLAN

# Lima Ola

## Workforce Housing Development

# Master Plan

## County of Kaua'i Housing Agency

**March 2012**

This report was sponsored by
**Communities Putting Prevention to Work-Hawai'i –**
improving healthy eating and healthy activities, creating jobs,
and promoting sustainability on the islands of Kaua'i and Maui –
Made possible with funding from the Centers for Disease Control and Prevention.

# Lima Ola

## Workforce Housing Development

# Master Plan

Prepared for
County of Kaua'i
Housing Agency

Prepared by
Kimura International, Inc.

March 2012

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This report was made possible with funding from and supported
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from the Centers for Disease Control and Prevention.
Its contents are solely the responsibility of the authors
and do not necessarily represent the official views of
the Centers for Disease Control and Prevention.

**Bernard P. Carvalho, Jr.**
Mayor

**Gary K. Heu**
Managing Director

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# MESSAGE FROM THE MAYOR

March 2012

Aloha!

Providing affordable housing options is a fundamental responsibility of local governments throughout our nation. In an isolated, rural community like Kauai, the importance of offering safe, adequate housing for all cannot be overstated.

The *Lima Ola Master Plan* is the first step for our island community toward realizing the dream of housing that is not just affordable, but also is environmentally responsible, encourages long-term intergenerational relationships, integrates with the surrounding community and promotes healthy living.

*Lima Ola* is one of 38 projects identified in our Holo Holo 2020 plan, which calls for all organizations, businesses, residents and visitors on Kaua'i to be part of creating an island that is sustainable, values our native culture, has a thriving and healthy economy, cares for all – keiki to kupuna, and has a responsible and user-friendly local government.

The *Lima Ola* project is an important part of that vision, and will be a showcase like no other for the varied concepts of sustainability. This future "green" community will provide much-needed housing for families on the west side of Kauai, many of whom work on the south shore, in the Eleele/Hanapepe area, or points further west such as Waimea, Kekaha, the Pacific Missile Range Facility and Kokee.

The Lima Ola Master Plan could not have been realized without grant funding from the Center for Disease Control's Communities Putting Prevention to Work (CPPW) program, via the Hawaii State Department of Health – Kauai District Health Office. I would also like to extend a warm Mahalo to the Kauai County Council, the Kauai County Housing Agency, R.M. Towill Corporation, Kimura International, the Lima Ola Community Advisory Committee, members of the public and numerous state and county agencies which participated in the dialogue as the plan was being developed.

Please join us in creating a new community on Kauai that will be a model of sustainability and healthy living for others to follow.

Mahalo nui loa,

Bernard P. Carvalho, Jr.
Mayor, County of Kauai

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Chapter 1

# INTRODUCTION

In February, 2010 the County of Kaua'i acquired 75 acres in 'Ele'ele, on the west side of the island (Figure 1). The land was acquired for the purpose of developing housing for the working people of Kaua'i. But more than creating a discrete residential development, County leaders see Lima Ola as an unprecedented opportunity to establish a model for affordable housing development that will shape the way residents relate to their environment.

Development of the Lima Ola site may take up to 30 years to complete. The community planned for Lima Ola will provide a real world example that integrates progressive objectives for residential living, environmental sustainability, and affordability at a significant scale of development. Lima Ola is guided by planning concepts of how residential development in a rural community can better encourage active and healthy lifestyles, offer viable options to walk and bike, and lower reliance on nonrenewable resources for transportation and home energy. Lima Ola is not a stand alone development, but one that will create linkages to surrounding neighborhoods. The influx of new residents is expected to bring greater economic vitality and civic energy to the area, and strengthen the region's sense of community.

*The words **Lima Ola** literally translate to "hand" and "life." Our hands are symbolic of work—this is true of Hawaiian culture and many other cultures. This housing development is being built as workforce housing for the working people of Kaua'i. The addition of the word "ola" speaks to how this work sustains you. The relationship between working hands and the sustenance of life is reflected in the 'olelo no'eau or proverb "Huli ka lima i lalo, maona ka opu" which means "When hands are turned down, the stomach is full." When hands are turned down toward the earth, they are working and, through this work, people are fed and thrive.*

Figure 1 Lima Ola, Aerial View

## Goals and Objectives

Goals and objectives are statements that establish a framework for the master plan. Goals generally describe the desired outcomes or end states of the plan. Objectives are more concrete, attainable actions that contribute to goal achievement.

### 1 Goal: Design and develop a community that provides a range of affordable housing options.

a. Objective: Provide housing opportunities for Kaua'i households earning from 80 percent and below of the Kaua'i median household income to 140 percent of the Kaua'i median household income.

b. Objective: Provide a variety of housing types and occupancy that meet the lifestyle needs and preferences of people at different stages of life.

c. Objective: Design a community where income levels and household types are integrated, not segregated.

### 2 Goal: Design and develop a community that incorporates smart growth principles.

a. Objective: Create a compact neighborhood that is safe and convenient.

b. Objective: Provide a transportation infrastructure that enables residents to make meaningful choices to walk, ride a bicycle, take transit, or drive.

c. Objective: Design streets that are safe and inviting for all users—motorists, pedestrians, bicyclists, and transit users—including such means as appropriate speeds, widths, accommodations for pedestrians and bicycles, and traffic calming measures.

d. Objective: Design a circulation network with multiple entry points to distribute traffic and offer different routes for connecting one point to another.

### 3 Goal: Design and develop a community that fosters social interaction and a spirit of aloha.

a. Objective: Provide community spaces and amenities where people can get to know, and interact with their neighbors.

b. Objective: Incorporate design elements that create a distinctive sense of place and reflect local heritage.

c. Objective: Relate to the larger context so that the community fits into the regional fabric of today and the future.

## 4 Goal: Design and develop a community that supports healthy living initiatives.

a. Objective: Provide opportunities for public recreation and leisure where people can more easily incorporate physical activity into their daily lives.

b. Objective: Provide safe walking and bicycling routes to school.

c. Objective: Provide housing and community facilities that enable people to stay in the same neighborhood as they grow older, while remaining active, independent, and socially connected.

d. Objective: Design accessible facilities in compliance with the Americans with Disabilities Act (ADA).

e. Objective: Provide areas for community gardens and green spaces.

## 5 Goal: Design and develop a community that allows building "green" and is environmentally sustainable.

a. Objective: Design and develop units to take advantage of natural ventilation and cooling, solar water heating and other alternative energy systems, rainwater catchment for irrigation, and the use of recycled or recyclable materials.

b. Objective: Encourage walking and bicycling by providing safe and attractive facilities to reduce the community's carbon footprint.

c. Objective: Engineer the community with minimal land disturbance and proper placement and sizing of storm water runoff facilities.

d. Objective: Limit solar heat gain by providing shade trees, landscaping with appropriate native vegetation, and minimal road widths.

## 6 Goal: Design and develop a community that serves as a prudent public investment for Kaua'i.

a. Objective: Encourage community and stakeholder collaboration in development decisions.

b. Objective: Maximize the use of public resources by locating new development in an area where urban services can be extended cost effectively.

c. Objective: Consider the fiscal costs of providing public services and ongoing maintenance and repair in planning and designing public infrastructure and facilities.

## Purpose of the Master Plan

The master plan is a statement of the County's goals for the site's development and defines the direction for development. It provides a framework to guide development of the parcel over the next several decades. The framework is intended to endure over many years and establish the context in which public and private investments can occur. The six stated goals and related objectives are the cornerstones in defining this framework. As such, they collectively represent a long-term vision for this project.

The master plan serves as a roadmap for early decision making regarding important components of the development program. It provides the project description that will be used for the environmental impact statement and applications to obtain entitlements and regulatory approvals required for development to proceed. The master plan identifies the general scale, character, density, and mix of land uses. At the same time, it is recognized that no plan can be definitive, especially for long-term development, and a reasonable amount of flexibility must be retained when community build-out will occur over many years. Specific parcel and building configurations will vary. At this stage, the master plan is primarily concerned with establishing the basic character of future development, the circulation system, public infrastructure, open spaces, and sites for public facilities.

Chapter 2

# BACKGROUND

## History

In the mid 2000s, during the administration of Mayor Bryan Baptiste, the Kaua‘i housing market experienced a boom. There was a surge in private development activity, but little of the new housing inventory was affordable for many Kaua‘i residents. The County began looking for ways to bring relief. In 2004, working in collaboration with the County Council, an affordable housing resolution was passed to acquire land for affordable housing, as the County did not have extensive real estate under its jurisdiction for housing development. After researching options offered by landowners, Mayor Baptiste selected for purchase the 75-acre ‘Ele‘ele site at a cost of $2.5 million. Mayor Bernard Carvalho, who succeeded Bryan Baptiste as mayor, was director of the Housing Agency at that time.

The 75-acre parcel was purchased from McBryde Sugar Company with the stipulation that the site be used for affordable housing as defined by the County’s Housing Policy Ordinance. The subject land has a long history in agricultural production—formerly planted in sugarcane and, more recently, in coffee. The County has a license agreement with Kaua‘i Coffee that it vacate the land only when housing development is about to occur.

## Planning Process

The County Housing Agency began master planning the ‘Ele‘ele parcel in 2009 with a bond allocation from the general fund. Additional planning funds became available in Spring 2011 when the County received a federal grant from the Centers for Disease Control and Prevention under the Communities Putting Prevention to Work (CPPW) program. The grant, administered through the Hawai‘i Department of Health, is aimed at local initiatives to reduce obesity and other chronic diseases by lowering risk factors, such as the lack of physical activity and poor nutrition.

The master planning team was assisted by a Citizen Advisory Committee (CAC) that included seven community members with long-standing ties to and knowledge of ‘Ele‘ele/Hanapēpē and the larger Westside region. The CAC met in August and October, 2011 to review three alternative site plans and subsequent revisions.

A public information meeting was held in September 2011, during which participants provided input on the preliminary alternatives.

The master planning team provided informal briefings to the Mayor and cabinet officials in July 2011. County Council members were also briefed in July.

Follow-up meetings were held with the following agencies to discuss future public facilities and services.

County of Kaua‘i

- Fire Department
- Department of Parks and Recreation
- Planning Department
- Department of Public Works
- Transportation Agency
- Department of Water

State of Hawai‘i

- Department of Health
- Department of Transportation, Highways Division

# PLANNING CONTEXT

This section reviews the major factors considered in preparing the plan, including demographic characteristics, housing demand and preferences, and site conditions.

## Demographics

According to the U.S. Census Bureau, Kaua'i had a total population of 66,921 persons in 2010. Islandwide there was a net increase of 8,618 persons or 14.8 percent growth during the ten-year period from 2000 to 2010. The Kalāheo-'Ele'ele-Hanapēpē area[1] had a population of 12,174, and experienced a net increase of 1,295 (+11.9 percent) over the decade.

Expanding the geography to encompass all of West Kaua'i[2], the demographic story is one of slow growth through the 1990s, and even net population decline in the Waimea-Kekaha community, as the era of sugar production ended. The 2000s was a period of recovery as population growth in the region began to pick up, increasing by 9.4 percent. Although West Kaua'i is not expanding as quickly as other parts of the island, overall, the region still accounts for 35 percent of Kaua'i's total population.

In part, population growth depends on where new housing units are constructed. The Census reported that in 2010, the Kalāheo-'Ele'ele-Hanapēpē area contained 4,541 housing units, a net increase of 550 units (+13.8 percent) since 2000. The net increase in housing units for the West Kaua'i region was 652 units (+6.8 percent).

The pie charts below provide a comparison of where population growth is occurring relative to growth in housing units. In comparison to West Kaua'i's share of new residents, its share of new housing units is disproportionately low.

**Chart 1**

**Share of Population Growth, 2000-2010**

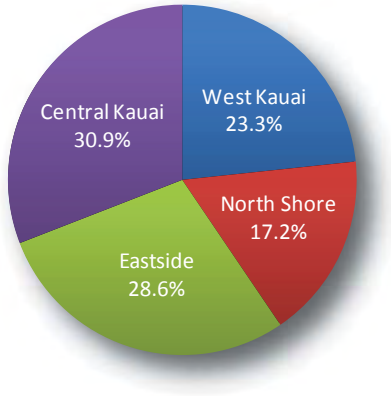
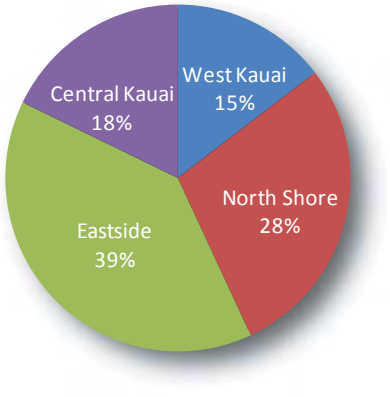



**Chart 2**

**Share of Housing Unit Growth, 2000-2010**




[1] This area includes Census Tract 407 (Kalāheo-'Ele'ele) and Census Tract 408 (Hanapēpē).

[2] The West Kaua'i region is defined as the entire area west of Līhu'e-Puhi, including Census Tracts 406 (Kōloa-Po'ipū), 407 (Kalāheo-'Ele'ele), 408 (Hanapēpē), and 409 (Waimea-Kekaha).

## Age Profile of Households

In 2010, 34.4 percent or about one-third of West Kaua'i households included one or more persons under 18 years old. This percentage closely matched the levels for Kaua'i as a whole and the state. A greater percentage of households had one or more persons over 60 years old. In West Kaua'i, the percentage of households with seniors was 44.1 percent compared to 43.5 percent among all Kaua'i households and 41.0 percent among households across the state. The higher percentage in West Kaua'i indicates a generally older population in the region, where only Central Kaua'i (Līhu'e area) had a higher percentage of senior households.

**Chart 3**

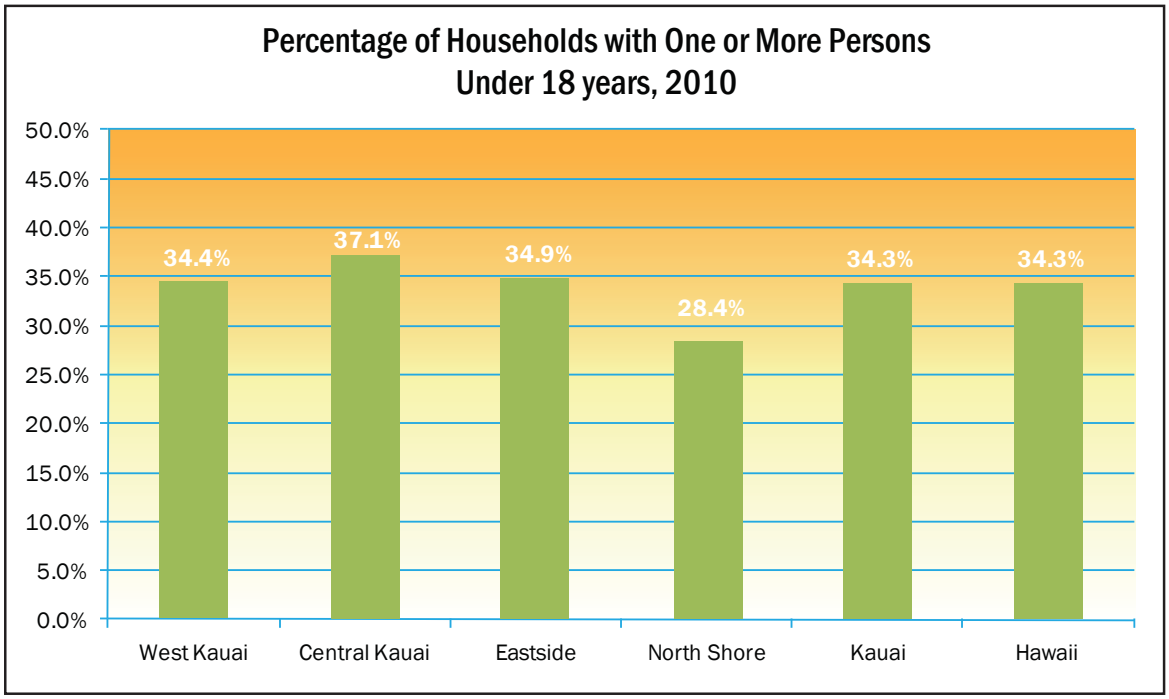
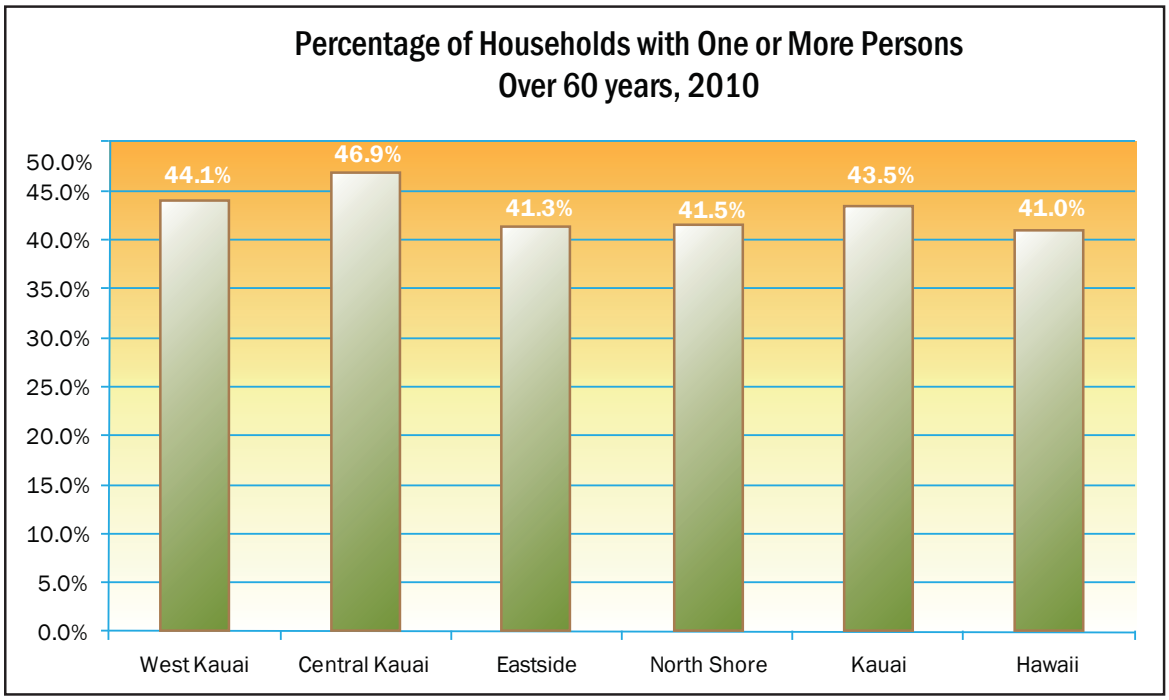



**Chart 4**

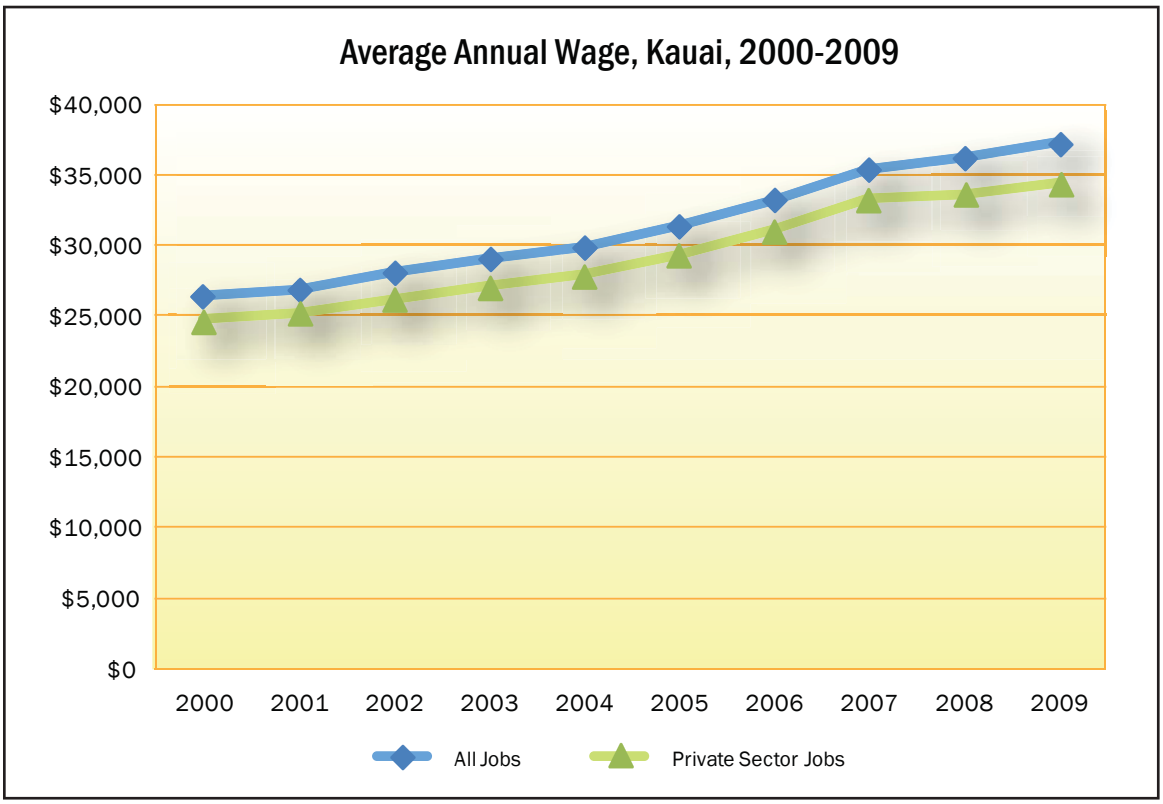


## Employment and Income

Employment on Kaua'i peaked in 2007 with average annual employment of 30,820 according to the Hawai'i Department of Labor and Industrial Relations. In 2009, the latest year for which published data are available, total employment consisted of 28,291 jobs, of which 23,869 jobs (84.4 percent) were in the private sector and 4,422 jobs (15.6 percent) were in the government sector. During the mid 2000s, Kaua'i's unemployment rate dropped below 4 percent, but currently stands at over 8 percent.

As seen in the chart below, nominal average wage increased every year through the 2000s. But since 2007, there has been a noticeable flattening in the trend line. With annual inflation hovering at 3 percent in recent years, real growth in average household income has stagnated or declined slightly.

**Chart 5**



The following table shows the major employment sectors in Kaua'i's economy and average annual wage. Earning levels are modest for many working households. The Kaua'i Planning and Action Alliance conducted a telephone survey of 400 households in 2011. Fully 26 percent of respondents reported household members with multiple jobs.

**Table 1**

### Employment in Major Sectors and Wages, Kaua'i, 2009

| Industry | Average Employment* | Average Annual Wage |
|---|---|---|
| Construction | 1,563 | $56,685 |
| Retail trade | 3,832 | $26,931 |
| Transportation & warehousing | 1,077 | $31,668 |
| Administrative services | 1,844 | $36,363 |
| Health care & social assistance | 2,256 | $45,585 |
| Hotel & food service | 6,807 | $26,621 |
| All other private industries | 6,490 | n.a. |
| Government | 4,422 | $52,828 |
| **Total** | **28,291** | **$37,269** |

Source: State of Hawai'i, Department of Labor and Industrial Relations
* Includes workers covered by Hawai'i employment security law and unemployment compensation for federal employees

## Housing Demand and Preferences

The Hawai'i Housing Planning Study (HHPS) is an ongoing effort to compile and analyze housing data at the state and county levels. The information in this master plan is from the November 2011 edition of the HHPS. One component of the HHPS is the Housing Demand Survey, a statewide telephone survey of more than 5,000 households to measure current housing conditions, relocation expectations, housing preferences, financial qualifications, and demographic characteristics. The HHPS also includes the Hawai'i housing model which forecasts housing unit needs by income group.

The U.S. Department of Housing and Urban Development (HUD) classifies households qualified for government-assisted housing by annual income that is pegged to the County's median annual income for households of a given size—a concept that is condensed into the acronym AMI (or area median income). HUD defines low income as households with incomes ≤80 percent of AMI. Workforce housing would be available to households with incomes from below 80 percent and up to 140 percent of AMI.

The HHPS forecasts that a total of 1,312 housing units are needed on Kaua'i from 2012 through 2016. Of this total, 925 units (70 percent) are needed by households with an annual income of ≤80 percent of AMI. A total of 212 units (16 percent) are needed by households with an annual income of 80 to 140 percent of AMI. Therefore, of the total units needed, 1,137 units or 86 percent would need to be affordable to some extent.

The HHPS breaks down total units needed into "owned units" and "rental units" based on information collected about financial qualifications. Of the 1,137 affordable units, there is a need for 319 owned units and 818 rental units. HHPS also estimates the demand for "single family (detached) units" and "multi-family (attached) units". Through 2016, there is a need for 521 single family units and 616 multi-family units.

**Table 2**

### Total Units Needed, Kaua'i County, 2012 through 2016

| | HUD Income Classification | | | |
|---|---|---|---|---|
| | < 30 to 80% of AMI | 80 to 140% of AMI | >140 % of AMI | Total |
| **Owned Units** | **200** | **119** | **57** | **376** |
| Single family | 138 | 114 | 52 | 304 |
| Multi-family | 62 | 5 | 5 | 72 |
| | | | | |
| **Rental Units** | **725** | **93** | **118** | **936** |
| Single family | 247 | 22 | 19 | 288 |
| Multi-family | 478 | 71 | 99 | 648 |
| | | | | |
| **All Units** | **925** | **212** | **175** | **1,312** |

Source: Hawai'i Housing Planning Study, November 2011

## Affordability vs. Location

In the Housing Demand Survey, prospective Kaua'i home buyers were given a choice between a home located closer to work (shorter commute time) or a home costing $20,000 less, but requiring double the commute time. Fifty-nine percent chose the longer commute to save $20,000 on home price, while 30 percent chose the reduction in daily time travel. The proposed location in 'Ele'ele offers two advantages in this regard. It is near existing infrastructure that will reduce the cost of developable lots. It is also on transit routes with connections to employment centers on the South Shore and Westside.

## Small Lot Single Family Dwelling vs. Multi-family Dwelling

Prospective Kaua'i home buyers were asked about their preference for a single family dwelling on a small lot or a multi-family dwelling. Eighty-five percent opted for the small lot single family dwelling. Almost 11 percent preferred the multi-family dwelling, and the remaining 4 percent were unsure.

**Table 3**

### Acceptable Lot Sizes

| Minimum Lot Size | Percent of Respondents (claiming acceptability) |
|---|---|
| 6,000 SF | <40% |
| 5,000 SF | 18% |
| 4,000 to 5,000 SF | 26% |
| 3,000 to 4,000 SF | 9% |
| Unsure | 9% |

*Total exceeds 100% due to rounding error.

Those who preferred a small-lot home were then asked about minimum acceptable lot sizes as shown in the table. The proposed plan offers small lot housing options as well as multi-family options.

### Units Needed for Elderly Housing

Elderly households are households with one or more persons 60 years of age or older, with no children under the age of 18, and no persons other than immediate family. Housing needs for elderly households are higher on Kaua‘i than in the other counties. Units needed to serve elderly households account for 11.4 percent of total needed units in all counties except Kaua‘i County, where they account for 19 percent of the need The number of housing units needed to accommodate low- and moderate-income elderly households in Kaua‘i County (under 80 percent of AMI) accounts for 82 percent of total elderly units needed or approximately 205 units. In other counties, elderly housing need for the same income range is 60-69 percent. The proposed plan offers elderly households the option to rent or purchase in an environment that is supportive of healthful aging in place.

## Site Conditions

### Surrounding Uses

Figure 2 provides a regional view of Lima Ola and surrounding land uses. The new development will be an extension of urban development to the west. A subdivision being developed by Habitat for Humanity lies immediately southwest of the site. Habitat recently began a new phase of development in which 107 units are planned for construction. ‘Ele‘ele Nani is an established community located across Kaumuali‘i Highway. Within this residential area are ‘Ele‘ele Elementary School and ‘Ele‘ele Nani Park.

Lands immediately northeast of the site, currently in coffee production, have been designated Important Agricultural Lands (IAL). The IAL boundary runs east to Wahiawa Gulch with the designation encompassing the gulch and lands mauka of Halewili Road. IAL means lands reserved for agricultural use in perpetuity, and a permanent greenbelt on Kaumuali‘i Highway separating ‘Ele‘ele and Kalāheo. Lands adjoining Lima Ola to the south and southeast are owned by A&B Properties, Inc. and are being planned for mixed-used development. While no specific plans have been announced, the parcel immediately south of Lima Ola has been identified as a future district park site.

‘Ele‘ele’s main commercial district is located at the intersection of Kaumuali‘i Highway and Waialo Road. The shopping area contains a supermarket, hardware store, specialty stores, and restaurants. The ‘Ele‘ele Post Office is located within the commercial district. Another commercial district is located in nearby Port Allen at the makai end of Waialo Road. The West Kaua‘i Health Clinic is located in the Port Allen commercial center.

## Figure 2 Regional View

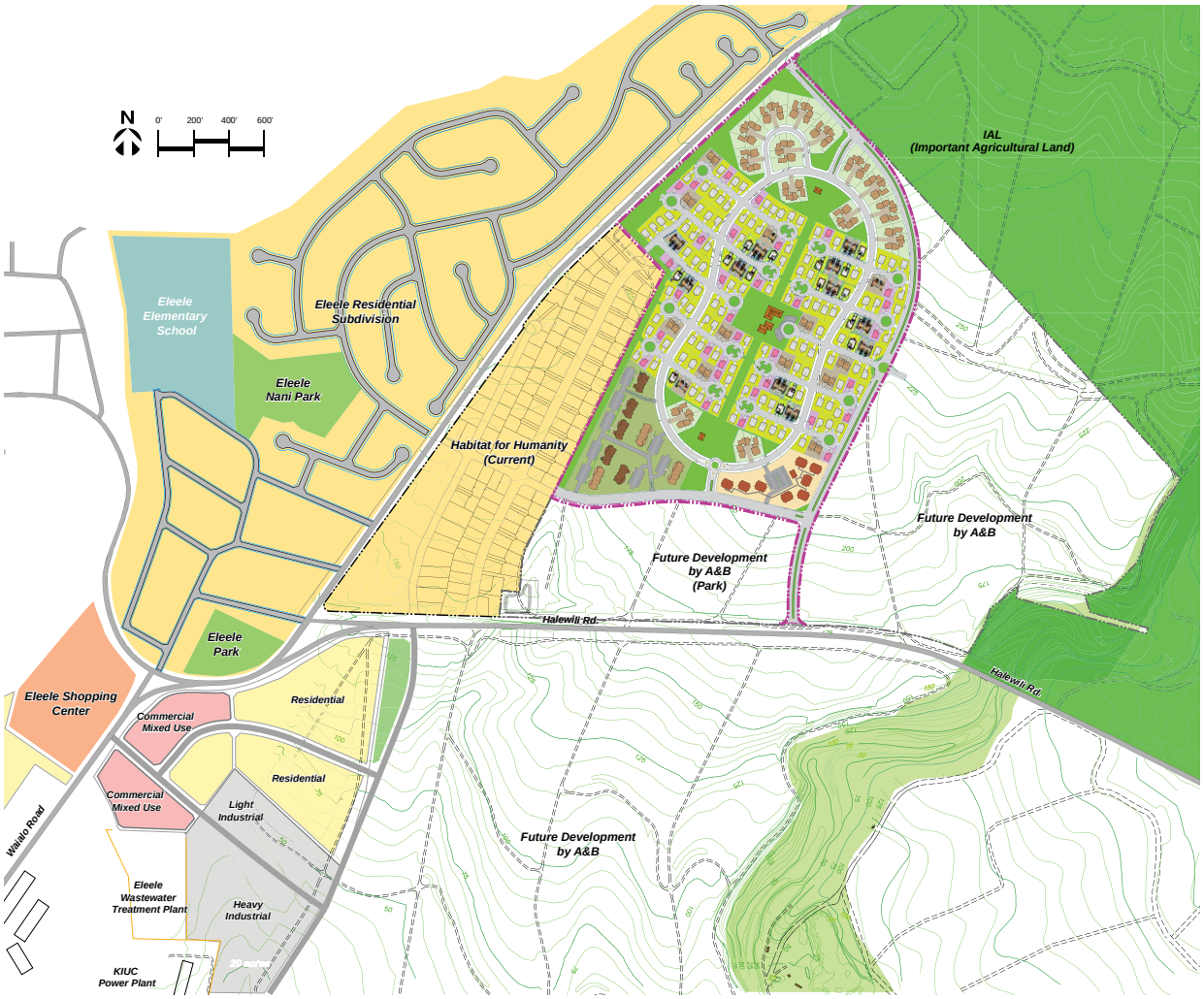


Figure 3 shows ¼- and ½-mile radii from key points within the Lima Ola development and surrounding area. These radii represent distances that are walkable within 15 to 30 minutes. The diagram indicates that places east of Kaumuali'i Highway and portions of 'Ele'ele Nani are easily walkable from Lima Ola. Conversely, residents living in the Habitat and 'Ele'ele Nani neighborhoods and who wish to use public amenities at Lima Ola can readily reach them by walking.

**Figure 3** **Walking Radii**

Figure 4 shows one-mile radii representing bicycling distance. Using a rough guide of 15-20 minutes of bicycling, 3 miles is often considered an average trip length. As seen in the diagram, even a one-mile radius will cover key community facilities in the ‘Ele‘ele/Port Allen area. Destinations such as the elementary school, grocery and hardware store, and post office are within bikeable distances of Lima Ola.

**Figure 4** **Biking Radii**

## Site Analysis

Figure 5 provides a graphic overview of site conditions. Analyzing these conditions is an important step so that future development can address and mitigate site constraints, and enhance site advantages.

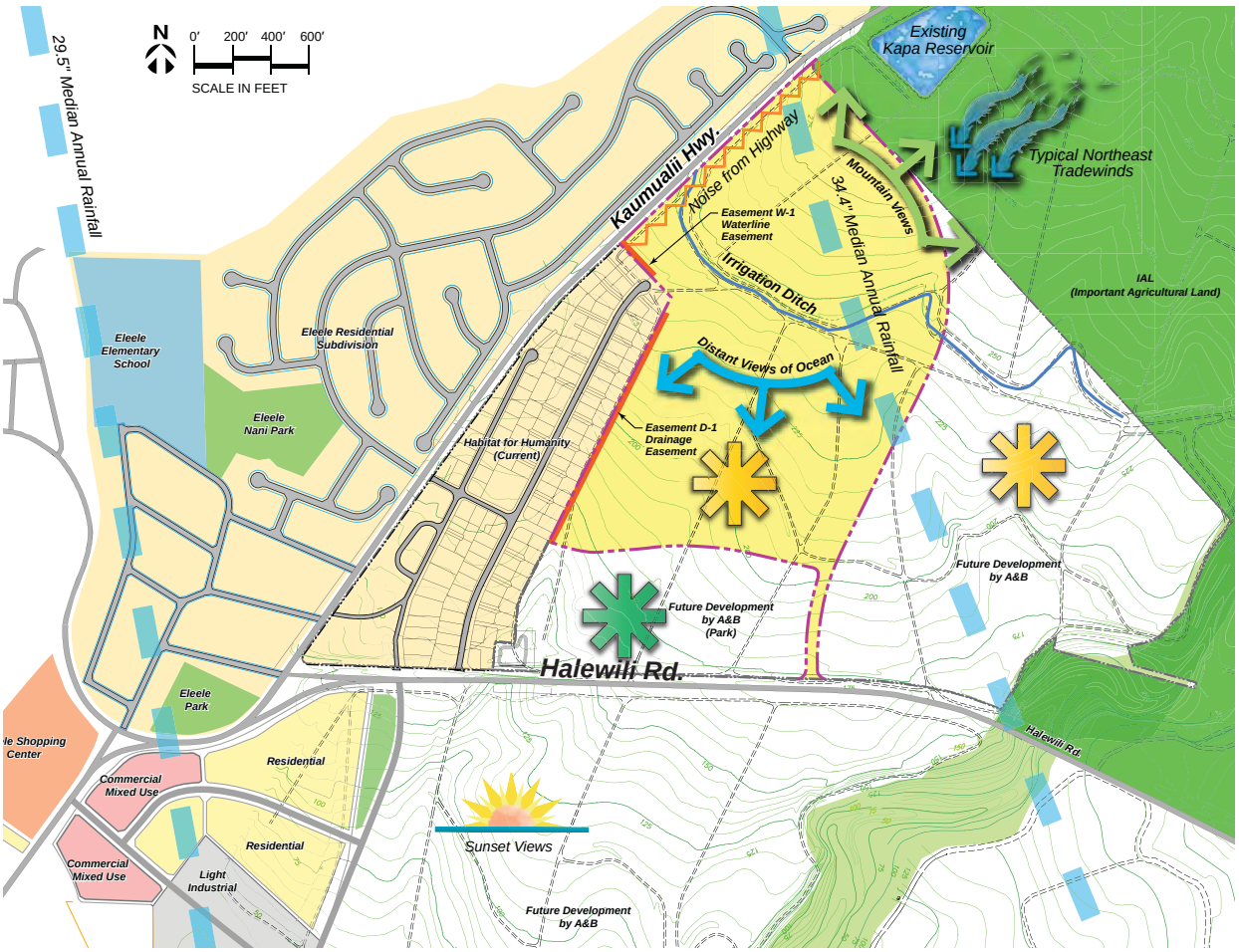
Lima Ola is located on the leeward side of the island which is generally characterized as dry and sunny. The site is located between isohyets where median annual rainfall ranges from 29.5 to 34.4 inches. Northeast tradewinds make up the predominant wind flow. Additional information related to climatic conditions can be found in Chapter 6.

The site has sufficient elevation to offer distant views of the ocean and sunsets over the western horizon, as well as mountain views to the north. Motorists traveling on Kaumuali‘i Highway are familiar with the ocean view as they drive toward ‘Ele‘ele. A mauka-makai view corridor through the community would help to preserve this valuable asset.

There are two constraints along the Kaumuali‘i Highway boundary: noise from passing vehicles and high-voltage overhead electrical lines. A setback and appropriate buffering can mitigate potential adverse impacts. Further makai, along the site’s western

boundary are two utility easements: a 15-foot wide waterline easement and 10-foot wide drainage easement. Both are linear easements that must remain clear of surface encumbrances so that underground pipes can be maintained and repaired, as needed. An above ground irrigation ditch cuts across the site from west to east. The ditch is expected to remain until on-site agricultural operations cease. Kapa Reservoir, which also supports the agricultural irrigation system, lies approximately 300 feet mauka of the Lima Ola site. Disposition of the reservoir is unknown. With the designation of Important Agricultural Lands, ongoing agricultural operations will continue on surrounding lands into the future.

**Figure 5** **Site Analysis**

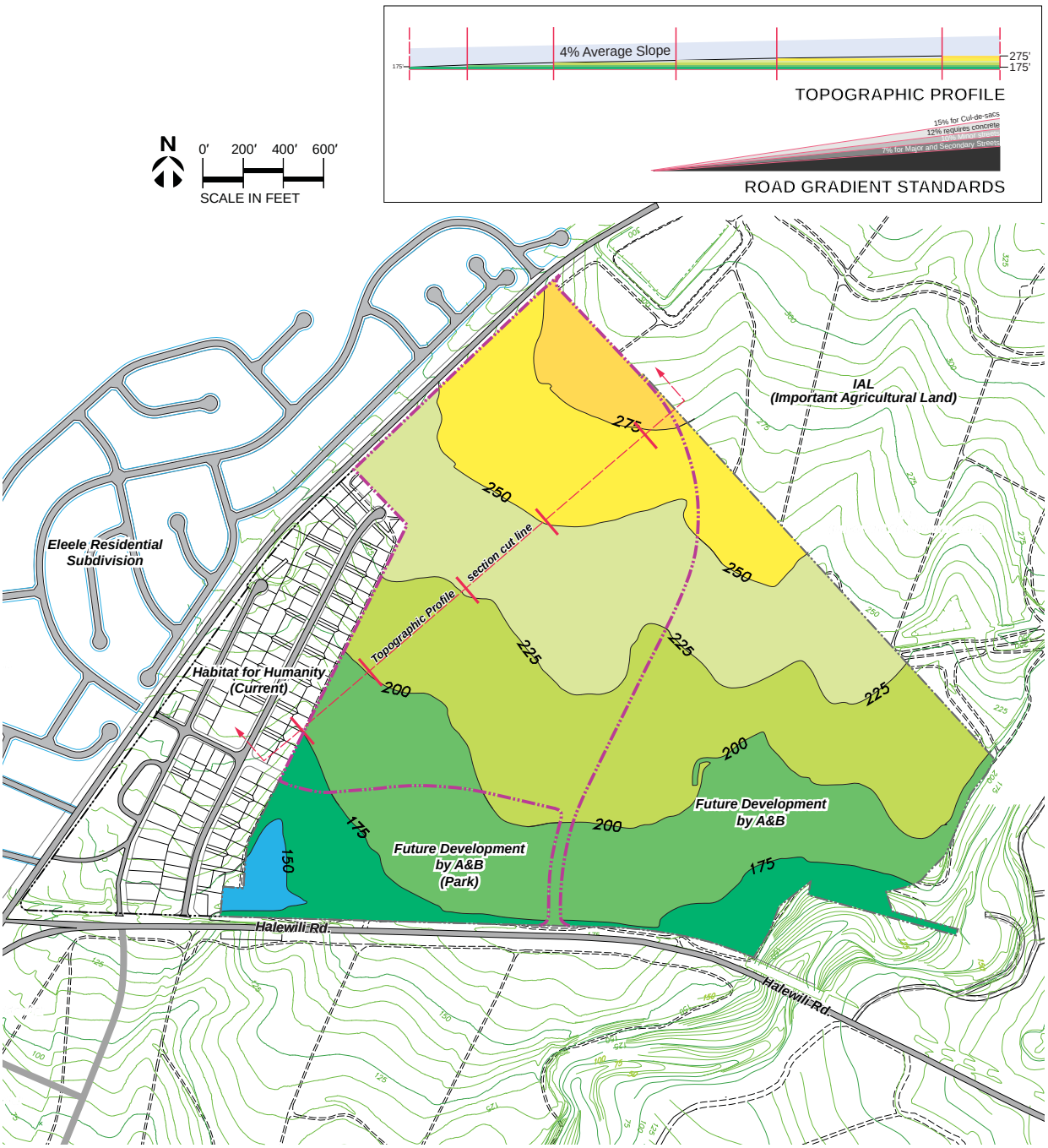


*A portion of the Lima Ola site is currently used for coffee production*

## Topography

Lima Ola is located on a site that slopes gently in the makai direction. As seen in Figure 6, the highest elevation of approximately 275 feet mean sea level is located in the mauka area. The lowest elevation of approximately 175 feet mean sea level is located in the makai area adjacent to Habitat for Humanity. The parcel overall has an average slope of 4 percent. The Americans with Disabilities Act accessibility guidelines specify a maximum slope of 5 percent--higher slopes are allowed with additional accommodations, such as level rest areas and railings. For major and secondary roads, gradients should be 7 percent or less. The Lima Ola site will need to be graded to prepare level house lots, building sites, and road intersections; however, there are no significant topographic constraints.

**Figure 6** **Slope Analysis**



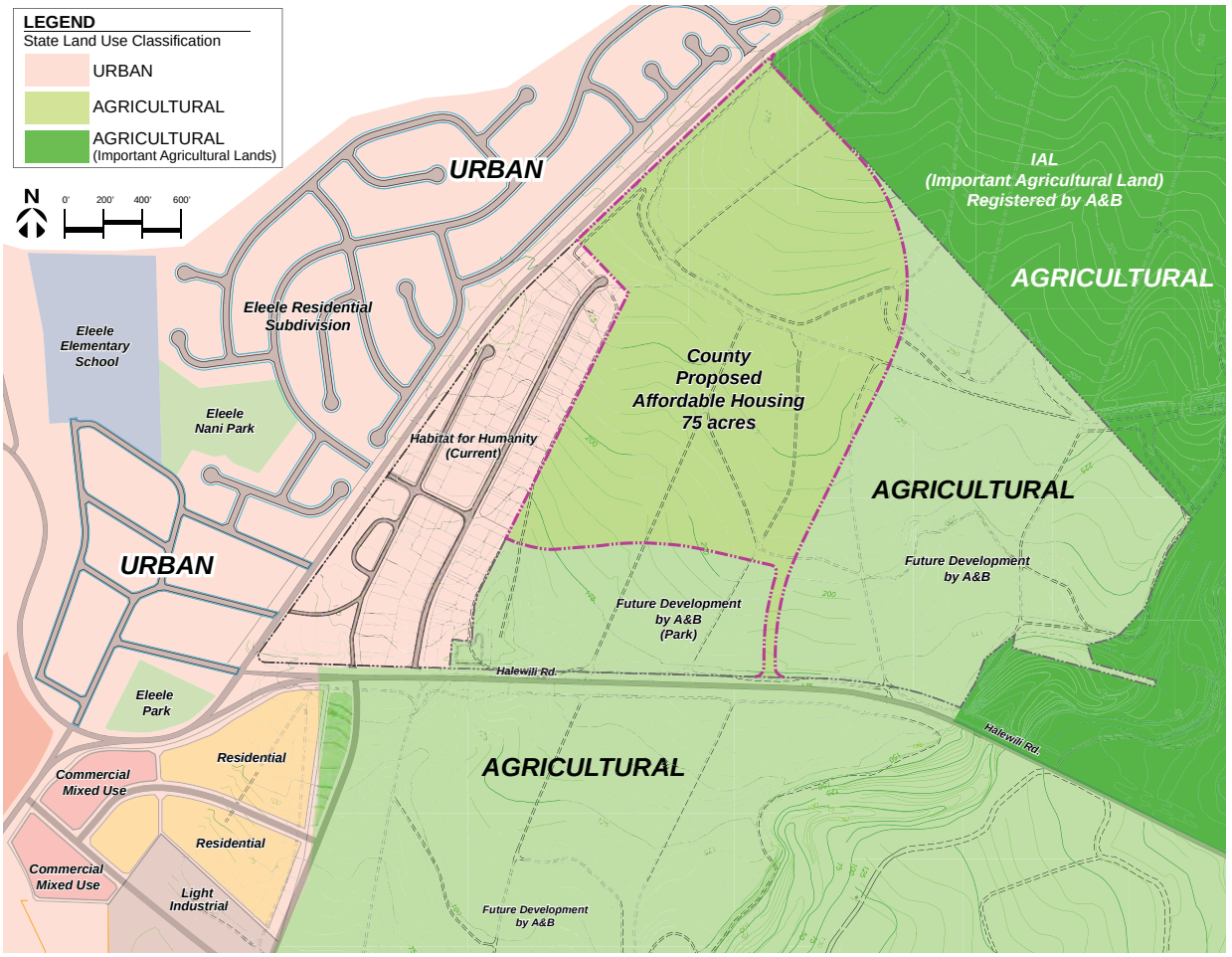
## Land Use Controls

Before development can proceed, the Housing Agency must obtain development entitlements, including amendments to the County general plan and comprehensive zoning ordinance. These changes are processed by the Planning Department and require action by the Planning Commission and County Council.

Figure 7 shows State land use classifications. The Lima Ola site is classified in the Agricultural District, but its western boundary adjoins the Urban District. The Housing Agency must obtain a land use district change from Agricultural to Urban. This process is under the jurisdiction of the State Land Use Commission.

As an affordable housing project, Lima Ola qualifies for expedited processing of some discretionary permits as provided by Section 201H-38, Hawai'i Revised Statutes.

**Figure 7** **Land Use Controls**



# SITE PLAN

## Vision

The plan is a direct response to the goals and objectives, and the site context described previously (Figure 8). Lima Ola will be a residential community supporting 400 households. A variety of attractive and affordable housing products are planned to meet the different needs and preferences of Kaua'i's working households. Respected and valued kūpuna are offered housing options ranging from smaller single family detached units to congregate rental units that maximize their capacity for independent living.

A permanent greenway system will extend throughout the development and interlace a series of cul-de-sac streets. A network of shared use paths, open play spaces, passive leisure parks, and community gardens will enable residents and visitors to integrate physical activity and enjoyment of the outdoors into their everyday life. The circulation system allows efficient vehicular movement, but recognizes the full spectrum of roadway users and incorporates complete street design principles. Children and elderly residents feel safe traveling throughout the community on paths and streets that are pedestrian- and bike-friendly. The centrally located community center provides a lively social hub for the community. With a site plan designed to draw people into the public realm, Lima Ola engenders in its residents a deeper sense of place and community.

## Planning and Design Elements

### Road Network and Road Profiles

**Access to the regional highway system.** The plan includes two connections to Kaumuali'i Highway and one connection to Halewili Road. Kaumuali'i Highway and Halewili Road are state highway facilities. All three intersections are expected to be signalized, although additional traffic analyses are needed to determine if signalization is warranted.

Along the makai boundary of Lima Ola, Mahea Road, which currently services the Habitat for Humanity 'Ele'ele Iluna subdivision, will be extended as a major access road for the new development. The intersection of Mahea Road and Kaumuali'i Highway is planned for signalization. The second signalized connection on Kaumuali'i Highway will be located at Lima Ola's mauka boundary, opposite the mauka end of Laulea Street (in the 'Ele'ele Nani subdivision). The perimeter road on the eastern boundary of Lima Ola will terminate with a connection to Halewili Road, which is also expected to be signalized.

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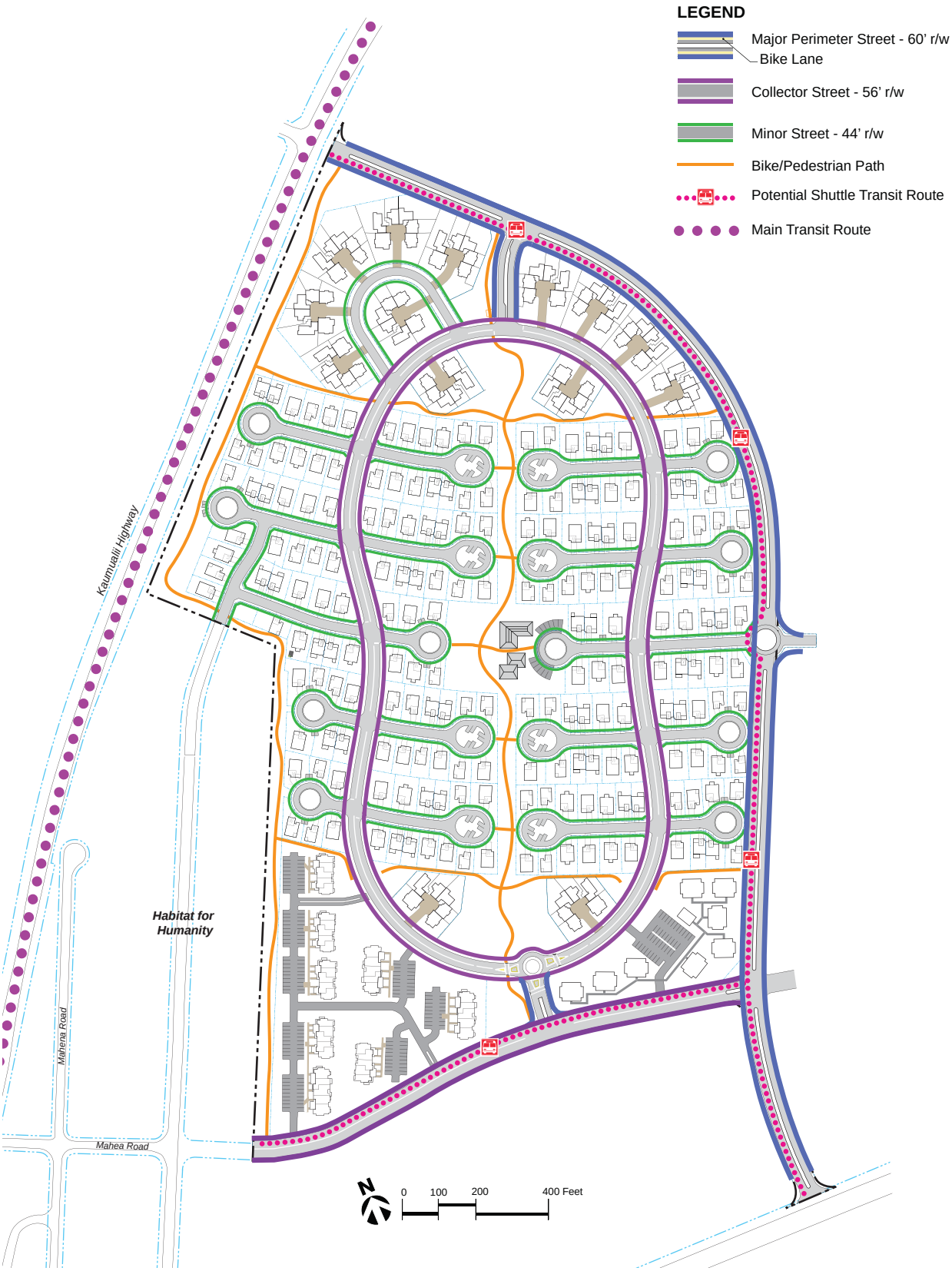
## Figure 8 Network of Pedestrian and Bicycle Paths

Figure 9 shows the circulation system for the Lima Ola plan, which is based on a hierarchy of streets and consists of four levels of roads.

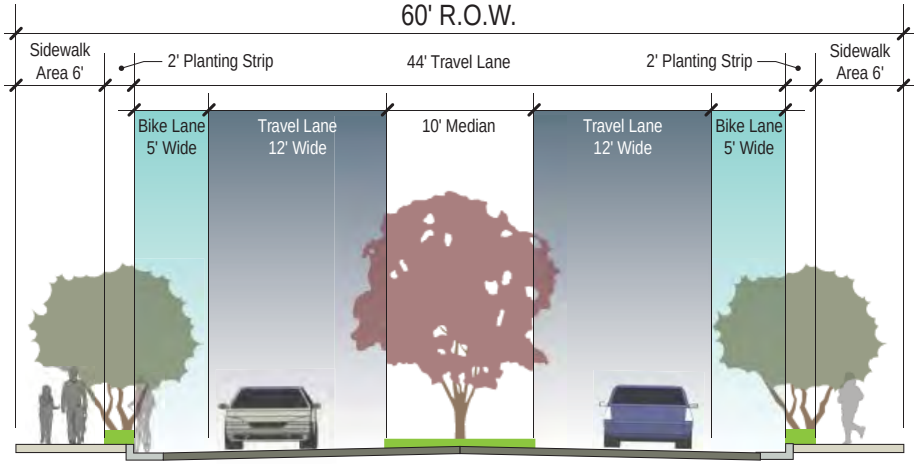
## Figure 9 Street Hierarchy



Circulation patterns within Lima Ola will be critical for establishing a connected, healthy, and sustainable community. The network of streets and paths laid out in the master plan meets the transportation needs of future residents and maximizes their travel mode options. Through the subdivision process, the County will dedicate roadway lots that fix the street layout. Adhering to this layout would ensure that Lima Ola is well-connected regardless of changes in unit counts and product types over the years.

***1. Major perimeter street.*** The road profile for the major perimeter street has a 60-foot wide right-of-way. It has 12-foot wide travel lanes—one lane in each direction—with 5-foot wide bike lanes. Six-foot wide sidewalks are provided on either side of the roadway, with a 2-foot wide planting strip between the bike lane and the sidewalk. A broader, 10-foot wide landscaped median separates the travel lanes. The stately boulevard character of this road profile makes it appropriate for the perimeter road along Lima Ola's mauka and eastern edge.

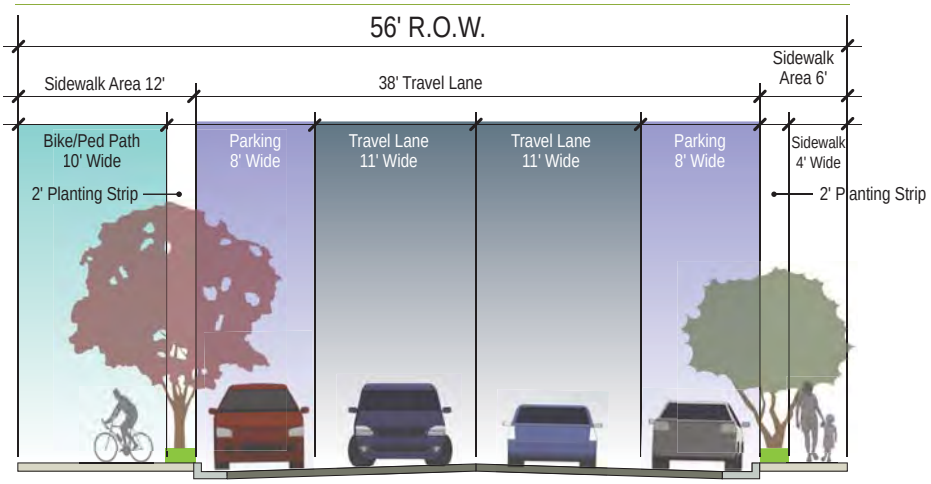
**Major Perimeter Street** **Figure 10**



*Mauka entrance*

***2. Collector streets.*** The collector street has a 56-foot wide right-of-way. This street profile is used for the loop road and the extension of Mahea Road on Lima Ola's makai boundary. Travel lanes are 11 feet wide (one lane in each direction) with an 8-foot wide parking lane on one side of the street. A ten-foot wide shared use path is provided on the inside of the loop for use by pedestrians and bicyclists with an adjoining 2-foot wide planting strip. There is a 4-foot wide sidewalk on the outside of the loop. On the Mahea Road extension, a 10-foot wide shared use path is on the mauka side, and a 4-foot wide sidewalk is on the makai side.

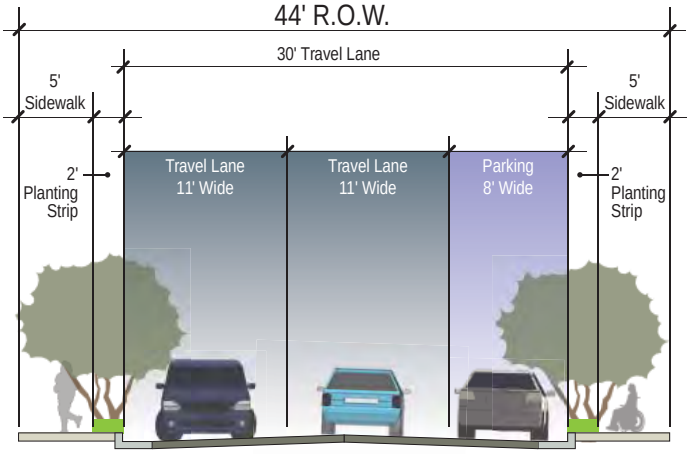
**Collector Street** **Figure 11**




***3. Minor streets.*** Minor streets are the residential streets and cul-de-sacs. They have a 44-foot wide right-of-way. Travel lanes are 11 feet wide (one lane in each direction) with an 8-foot wide parking lane on one side of the street. Five-foot wide sidewalks are provided on both sides of the street with adjoining 2-foot wide planting strips. Dedicated bicycle facilities are not provided on minor streets since vehicular volumes and speeds are low enough for shared use of the roadway, although younger bike riders may prefer to use the sidewalks.

Cul-de-sacs are an integral design component of Lima Ola. Unlike current County design standards, Lima Ola's cul-de-sacs have been designed with a 30-foot inside turning radius to accommodate automated refuse trucks and fire apparatus. The cul-de-sacs have a 20-foot pavement width which allows on-street parking. There is a center landscaped island with rolled curbs to minimize the amount of asphalt common to standard cul-de-sacs. The landscaped island doubles as a bioswale for filtering storm water runoff and, in one design variant, provides parking stalls.

**Minor Street**



The cul-de-sacs foster social interaction among neighbors, increase security, discourage fast-moving through traffic, and promote healthy living by providing direct connections to the central greenway.

*Typical cul-de-sac*

## Pedestrian and Bicycle Facilities

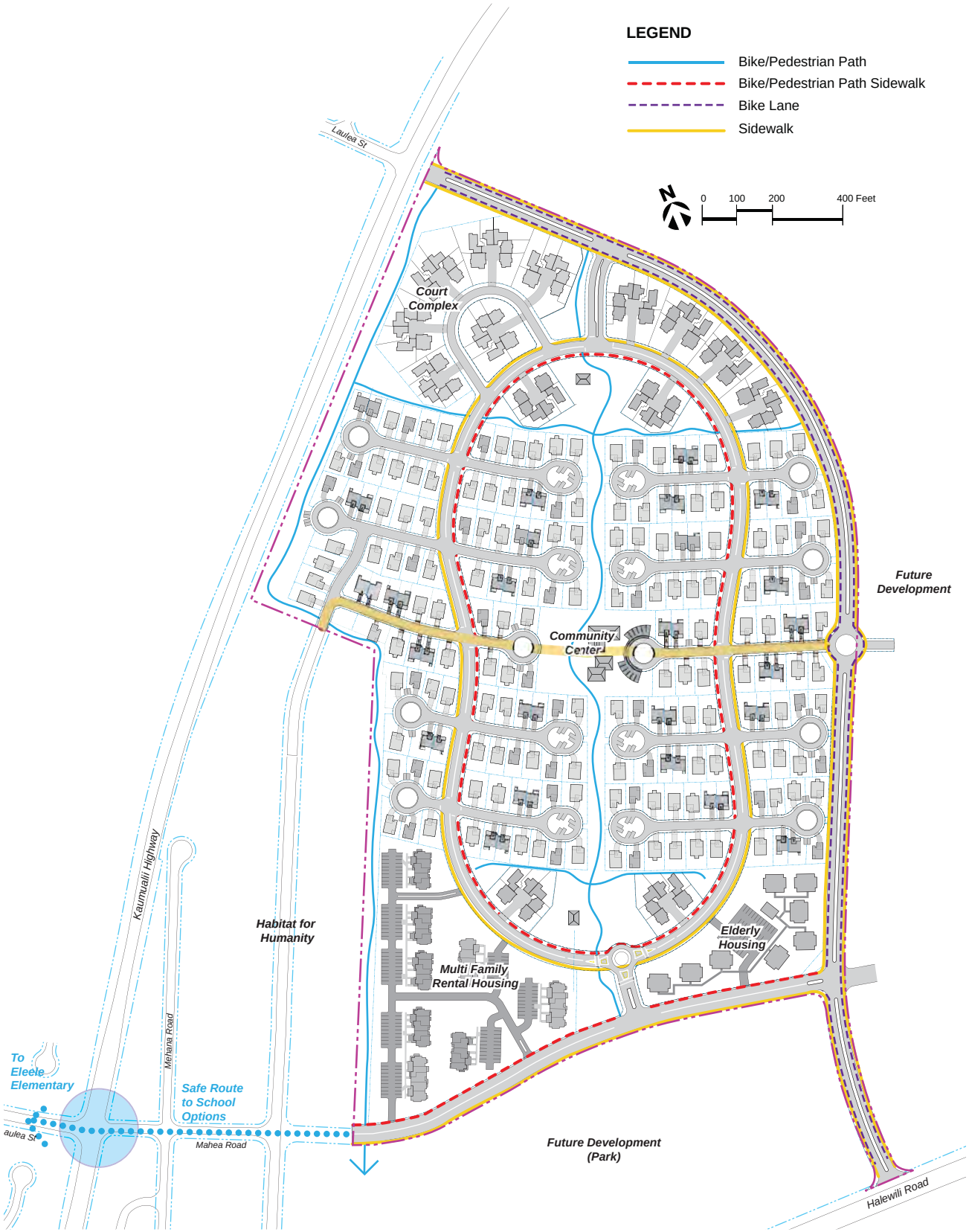
Lima Ola will provide a range of mobility options to residents and visitors. These options will deemphasize personal vehicles and allow for a significant reduction in the use of cars within the development. The combination of compact neighborhoods, links between homes and community facilities, an attractive pedestrian and bikeway system, and convenient transit route, not only expands transportation choices—but in time, residents are likely to find that it's faster and more enjoyable to move around the community on foot or bike!

***1. Network of paths.*** The path network is a key component of a healthy, outdoor-oriented community. When places provide high-quality, dedicated pathways, people tend to use them. Physical separation between vulnerable pedestrians/bicyclists and motor vehicles, and appropriately designed junctions will get more people walking and bicycling. And the more people who walk and bicycle, the safer these activities become.

Figure 13 shows the network of pedestrian and bicycle paths, characterized by the following:

- Comprehensive, with connections throughout the community—to destinations, such as the community center, playgrounds, community gardens, friends' houses—and to connection points outside the neighborhood.
- Direct, without unnecessary circuitousness
- Sufficiently wide so the path is a social amenity where friends or parents and children can walk together and ride together

## Figure 13 Network of Pedestrian and Bicycle Paths



***2. Bike lanes and sidewalks on major and collector streets.*** In addition to the off-road paths, all roadways except minor residential streets and driveways would have bike lanes and sidewalks. On-street facilities, together with the off-road paths, offer pedestrians and bicyclists a fine-grained network of mobility linkages.

*Greenway with path network*

***3. Safe route to school.*** To allow children to walk to school safely, Mahea Road was identified as a safe route from Lima Ola to ʻEleʻele Elementary School. A minimum 5-foot wide sidewalk should be provided on Mahea Road. The sidewalk should continue on Laulea Street to ʻEleʻele Nani Park, where students could use the park's internal path to reach the school.

Three options were proposed to cross Kaumualiʻi Highway: signalized crossing at grade, underground tunnel (underpass), and overhead bridge (overpass). The sidewalk and/or crossing improvements may require land acquisition.

**Figure 14** **Signalized Crossing At-Grade**

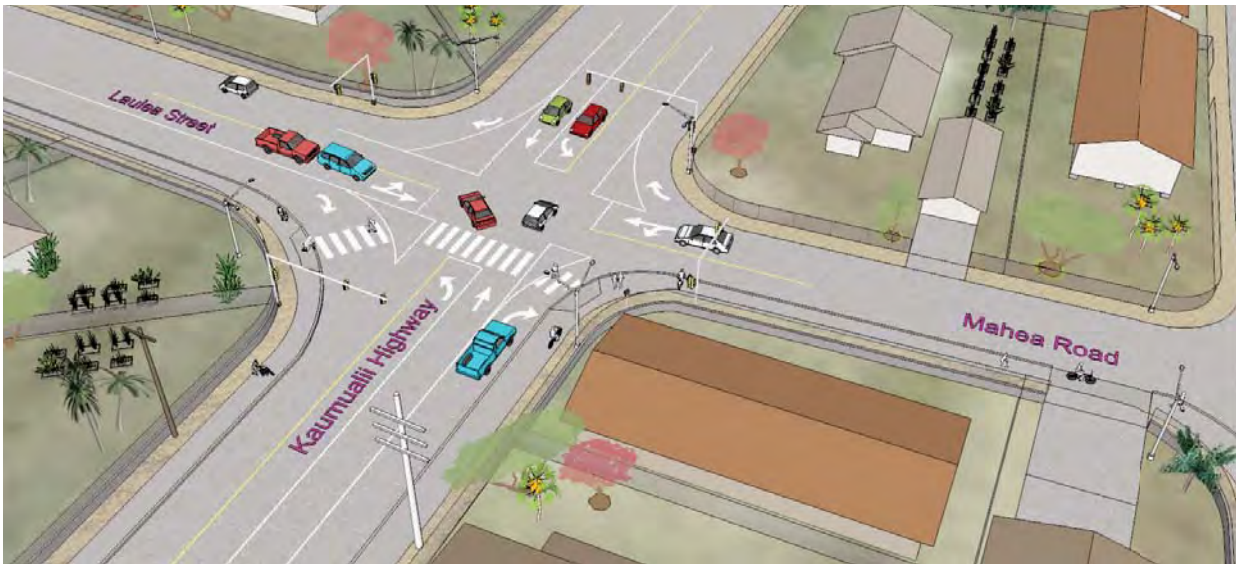


Figure 15 Underground Tunnel at Crossing

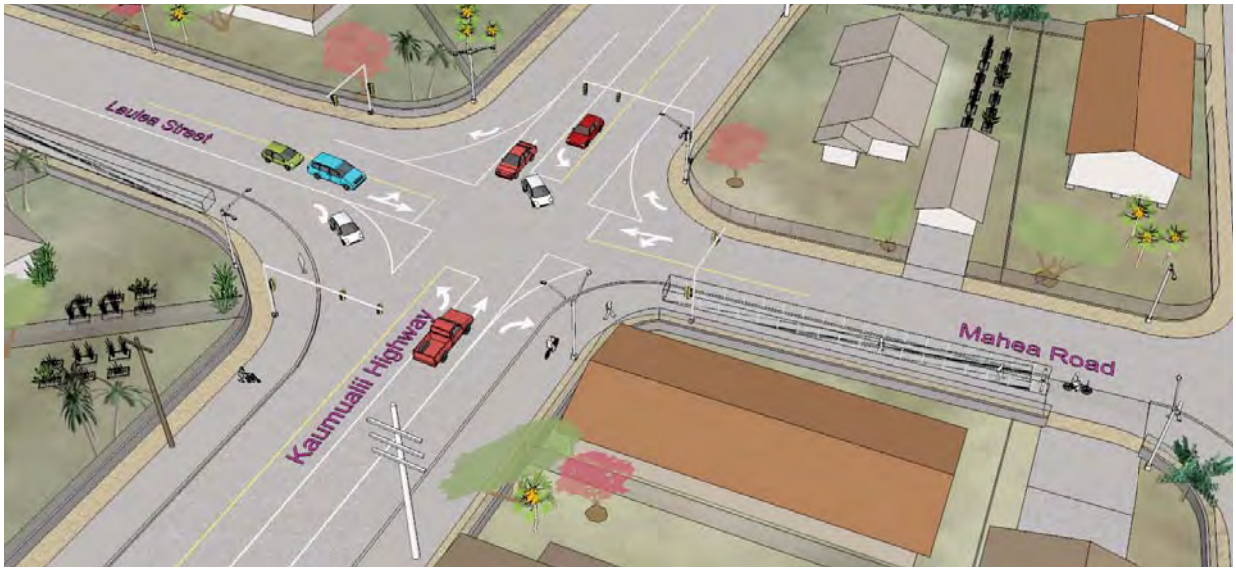
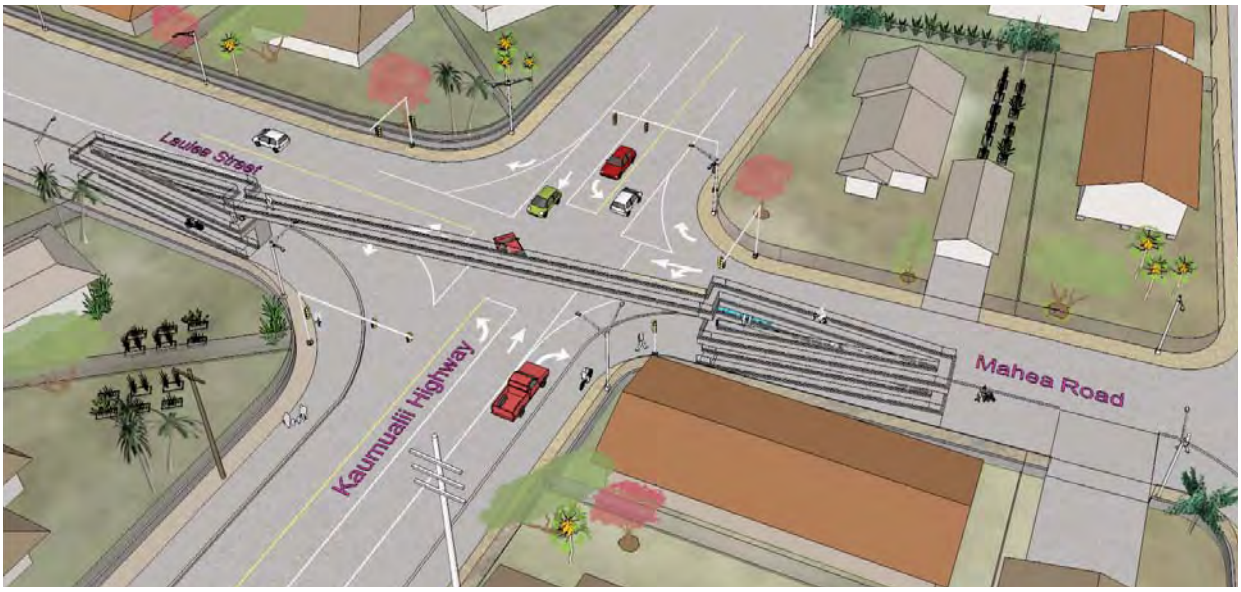



Figure 16 Overhead Bridge at Crossing




The at-grade and underpass options remain under study. The overpass option is not cost effective and has been eliminated from further consideration. Constructing the spiral ramp needed to meet minimum highway clearance at the 5-percent slope necessary to accommodate wheelchair users would result in a massive bridge structure that overwhelms adjacent residences. And, because walking distance would be vastly longer than the actual crossing distance, the overpass is not expected to be well used.

**Concept Cost Estimates for Kaumuali‘i Highway Crossing Options (at Mahea Road)**

Traffic signal and at-grade improvements: $300,000

Underground tunnel: $1.3 million

Overhead bridge: $5.3 million

***4. Transit route.*** The Kaua'i Transportation Agency operates the County's bus transit system. There is existing bus service on Kaumuali'i Highway, along the western boundary of Lima Ola. Figure 9 shows a possible supplemental or shuttle route along the Lima Ola perimeter street and Mahea Road, connecting to Halewili Road. This route would provide convenient service for bus riders from the elderly housing complex. Paratransit service for riders with special accessibility needs will be available for the entire development.

## Traffic Calming

Traffic calming is a system of design and management strategies to balance traffic on streets with other uses. It is based on the idea that streets should help create and preserve a sense of place—for people to walk, stroll, and even play alongside cars, but not be dominated by them. Several roadway features are designed into the plan to ensure that vehicles travel at safe speeds, and extra efforts are not needed retroactively to slow traffic.

***1. Roundabouts.*** Two roundabouts are provided in the roadway network—one at the makai entrance to Lima Ola and another at the intersection of the perimeter road and the street servicing the neighborhood center. Roundabouts are used in lieu of signalized intersections. Streets narrow as they approach the roundabout and cross walks are installed on these approaches. Oncoming vehicles must slow down to enter the roundabout and pedestrians are given a safe, obvious opportunity to cross. Properly designed, roundabouts reduce conflict points, which can lead to fewer collisions. A sloping ramp around the perimeter of the raised center island allows buses, trucks, and other large vehicles to maneuver the continuous curve while still maintaining the lowered speed. The island can be enhanced with landscaping, sculpture, or other public art to become a striking gateway for the community.

*Makai Entrance*

***2. Multi-way stops.*** Stop signs at regular intervals mean that motorists cannot pick up excessive speed. Three- and four-way stops are shown at key intersections—for example, streets serving the community center and near higher density development. A related technique is to reduce the size of the intersection by constructing sidewalk bulb-outs, where the sidewalk pavement extends into the intersection. Bulb-outs improve safety for pedestrians and bicyclists by making the distance to cross the street shorter, thereby reducing the exposure to risk.

***3. Curved roadways and visual cues.*** The major streets, including the perimeter streets and loop road, are designed with curves that help to slow driving speeds. The curved alignments are combined with on-street parking and street trees that enclose spaces and visually cue motorists to slow down.

***4. Mid-block street crossings.*** Street crossings away from intersections are not optimal, but sometimes unavoidable for connectivity of the path network. The following traffic calming tools are available for mid-block crossings:

- Speed tables are road bumps that are flat on top. They are the same width as the street and rise to meet the grade of the path or sidewalk, providing safe and comfortable crossings for pedestrians, bicyclists, and wheelchairs.
- Rumble strip and other surface treatments provide visual and aural cues to alert drivers to areas requiring special attention. Materials with roughened surfaces will create vibration and sound changes that cue drivers to slow down.
- Chicanes are sidewalk extensions that create horizontal curves in the road that encourage motorists to drive more slowly and carefully. Chicanes can be designed so that pedestrians and bicyclists cross the street at an angle making them more aware of oncoming vehicles.

## Land Use

The plan seeks to create neighborhoods that encourage and support diversity in age and income; neighborhoods that are inclusive and accessible. Figure 17 shows the distribution of residential lots by type. The plan includes six categories of residential lots with a total count of 400 units on 43.1 acres. Overall the density level is 5.33 units per gross acre.

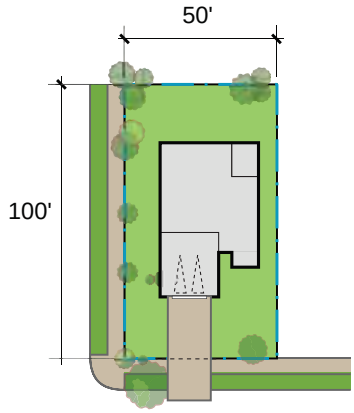
An important planning concept is the integration of single family detached, duplex, and elderly single family detached units. A traditional site plan would separate different types of housing products into distinct zones; however, the objective in Lima Ola is to build a community that celebrates the strengths and assets of diverse households.

| LAND USE | Units | Acres |
|---|---|---|
| Single Family Detached | 124 | 16.6 |
| Duplex | 48 | 5.0 |
| Elderly Single Family Detached | 32 | 3.4 |
| Court Complex<br>6 units/Complex | 84 | 8.6 |
| Multi Family Rental Housing<br>10 units/Complex | 80 | 6.7 |
| Elderly Housing<br>4 units/Complex | 32 | 2.9 |
| Subtotal Housing | 400 | 43.1 |
| Green Space (Community Gardens, Bike and Pedestrian Paths, Mini Parks, Buffer) | | 11.0 |
| Road Right of Way<br>(Paved Area 13.0 acres) | | 20.9 |
| Total | 400 | 75.0 |

## Figure 17 Residential Lots by Type

***1. Single family detached.*** The plan contains 124 single family detached units. The lots are approximately 5,000 square feet. Dwellings may be one or two stories with front entrances oriented toward the street. All units assumed a two-car garage or carport with a minimum 20-foot driveway so that two additional vehicles could be parked in the driveway without blocking the sidewalk.

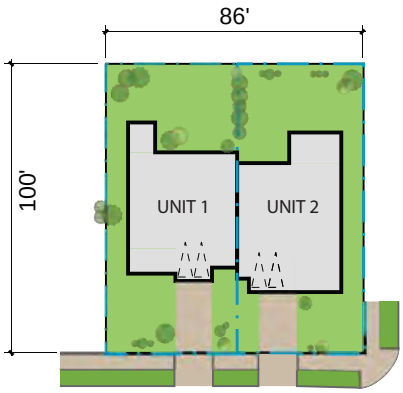
## Single Family Detached




typical center-plot
100' L x 50' W lot
2 stories

***2. Duplex.*** The plan contains 48 duplex units. Throughout this master plan, "duplex" is used to refer to unit types that could include two dwelling units with a shared side wall or single family attached units with zero lot line setback. Average lot size is 8,600 square feet for duplexes, and 4,300 square feet for single family attached units. Like the single family detached units, these units are intended for home ownership. Typically property title is structured to accommodate access to common structural elements for maintenance and repair purposes. Each duplex type unit would have its own driveway, front entrance, and private yard space.

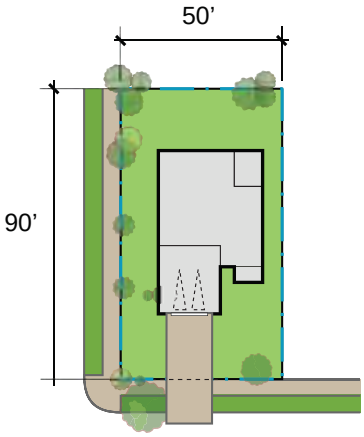
## Duplex




typical duplex
100' L x 86' W
2 stories
2 units

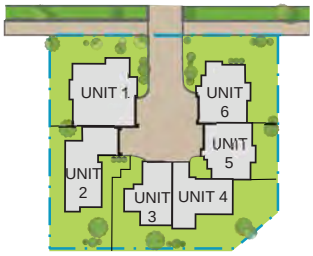
***3. Elderly single family detached.*** The plan contains 32 elderly single family detached units, which are located on smaller parcels, 3,750-4,500 square feet that are intended for older homeowners or empty nesters who are capable of living independently, but require smaller, more affordable homes. The smaller lots target the growing number of seniors who wish to live in the community, but would otherwise find market housing to be "too much house"—both financially and physically in terms of maintenance and upkeep. The elderly single family lots are located throughout the development, again with the objective of integrating households at different stages in the lifecycle.

## Elderly Single Family Detached




***4. Court complex.*** There are 84 court complex housing units, depicted as a cluster of six units sharing a common driveway. The plan assumes a dwelling unit of 1200 - 1800 square feet (includes garage) in size. Each unit would have its owned attached garage, front entrance, and private yard space. The court complex housing units are located at the mauka end of the development and at the mauka and makai ends of the loop road. Units would be owned under a condominium regime because of common elements.

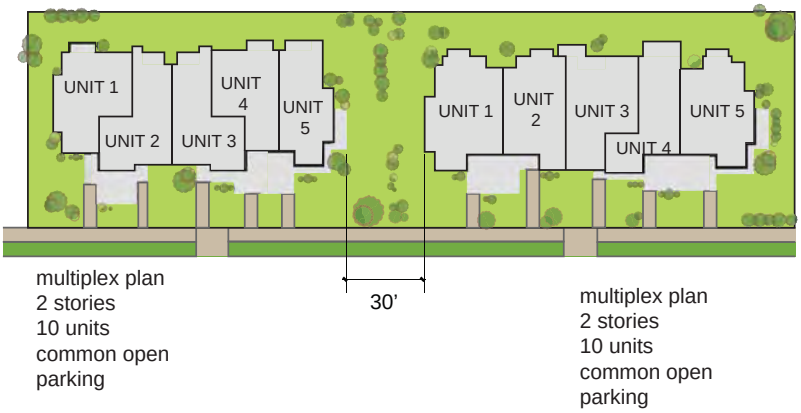
## Court Complex




6-unit Cluster
2 stories
6 units

***5. Multi family rental housing.*** The plan contains 80 multi family rental housing units. The building footprint shown in the plan is based on the Kālepa Village rental housing development in Hanamāʻulu where each two-story building consists of ten dwelling units. Similar to Kālepa Village, there is sufficient land in this sector to provide community facilities, such as a management office, meeting room, and playground. Because demand for rental housing is evident, these units were located at the makai end to facilitate development in an early phase. Higher density housing types are located at the periphery of the development for more efficient traffic management.

## Multi Family Rental Housing




***6. Elderly housing.*** The plan contains 32 elderly housing units. The building footprint shown in the plan is based on Hale Kupuna in Kalāheo where each building consists of four dwelling units. In contrast to the elderly single family detached units discussed above, these elderly housing units are rentals. Besides the residential buildings, the plan shows a community facility that might include a common kitchen, dining room, and recreation space. The elderly housing complex is located in the makai portion of Lima Ola to facilitate development in an early phase.

## Elderly Housing

LEGEND
Green Space (Community Gardens, Bike and Pedestrian Paths, Mini Parks, Buffer)
Laulea St
Court Complex
Community Center
Future Development
Eleele Subdivision
Kaumualii Highway
Habitat for Humanity
Elderly Housing
Multi Family Rental Housing
Melana Road
Mahea Road
Future Development (Park)
Halewili Road
N
0 100 200 400 Feet

## Green Spaces

Approximately 11 acres of Lima Ola are reserved for green space, including the mauka-makai greenway, perimeter buffer area, neighborhood park space, playgrounds, and pocket parks (Figure 18). The green space system is a defining element of the community and is completely integrated with residences. All portions of Lima Ola will have direct connection to the system. Moreover, it is multi-functional, addressing recreational and aesthetic purposes, as well as stormwater management, water quality improvement, irrigation, and other development requirements.

***1. Mauka-makai greenway.*** The greenway is a signature element, extending the entire length of Lima Ola in the mauka-makai direction. It is centrally located, almost equidistant from homes on the east and west sides of the community. The greenway features a meandering shared use path in a landscaped setting. Except for the hardened path surface, the greenway will be permeable and can be designed to incorporate stormwater drainage features. The mauka-makai greenway is accessible to pedestrians, bicyclists, and wheelchair users through openings at the ends of the cul-de-sacs.

The greenway provides a view corridor from the mountains to the sea, thereby orienting the community within the larger environment. Narrower passageways alternate with broad clearings and open spaces that can be used as passive parks, informal ballfields, and playground areas.

***2. Perimeter buffer.*** A green perimeter is planned along the west side of Lima Ola. In the mauka area, the green space serves as a noise buffer between the highway and provides a setback from high-voltage utility lines located along the highway. At the mauka and east boundaries with Habitat for Humanity, there are waterline and drainage easements, where the green space will accommodate utilities, as well as the perimeter path.

***3. Remnant open spaces.*** Interspersed throughout the community are remnant spaces too small for a residential lot. These spaces are available for community gardens or orchards or pocket parks. In some cases, neighboring residents may choose to "adopt" small open areas that become a semi-public space which supports community life on a more intimate scale.

## Community Spaces

The physical form of the community can be instrumental in fostering a strong sense of community. Figure 19 shows the numerous social and recreation places in Lima Ola where public life will be able to flourish.

Laura Carstensen of the Stanford Center on Longevity notes that people are happiest when they feel embedded in something bigger than themselves. In a physical sense, the bigger world lies outside the front door and fence posts of one's home—the block, the neighborhood, the community. For children, seniors, and others facing restricted mobility, the environs around the home are especially important. What activities does this environment enable? Without access to safe and pedestrian-friendly streets, elderly are at risk of becoming disengaged from society, and children below driving age are dependent on adults to chauffeur them from place to place. Streets are not merely conduits for moving vehicles. At the slower speed of non-motorized travel, streets are humanized, becoming places where community-building interactions occur daily.

## Figure 19 Community Spaces

The plan's focus on relatively short cul-de-sacs promotes sociability, safety, and healthy activity:

- **Sociability.** The advantages of cul-de-sacs are well-known. Through traffic is discouraged because there is no outlet, resulting in quieter streets. Homes oriented toward each other promote increased neighborliness.
- **Safety.** The term "eyes on the street" is shorthand for the concept of natural surveillance where the comings and goings of visitors can easily be seen. This can be accomplished by locating paths and other points of access where they are visible from adjacent building windows or within sight of heavily used areas and centers of activity.
- **Healthy activity.** Greenways interlaced between the cul-de-sacs allow direct access to paths for walking and bicycling. Opportunities for exercise—whether a substantial workout or a leisurely stroll—are literally steps away. The plan brings together a convenient physical space and a supportive social structure in which exercise is safe and accessible.

***1. Community center.*** The community center is located at the physical center of the development and envisioned as the heart of community life. The center would be a place for community meetings, enrichment classes, and social gatherings. It is possible that a convenience retail outlet might be allowed within the development, in which case, co-location with the community center would be appropriate. Other potential activities include self-service postal services and a drop-off station for recyclables. The grounds of the community center are large enough for playground equipment and open play field.

***2. Pavilions.*** Pavilions are located inside the loop at the mauka and makai ends of the greenway. The pavilions are conceived as open-sided picnic shelters or rest areas for people using the greenway path.

*Pavilion at Kaumakani Park*

***3. Playgrounds or tot lots.*** Several playground areas or tot lots are distributed within the development. These are intended for use by households in the immediate area, therefore no comfort stations are provided. All playground locations are accessible via the path system.

***4. Community gardens.*** Community gardens give people access to gardening space that might be lacking in their private residential environment. Gardening is seeing resurgent popularity as part of the local food movement, but it's also a social activity. Garden plots may vary in size from 100 to 400 square feet (SF). The plan shows community garden sites in five locations accessible via the path system.

*Pavilion at Hanapēpē Cliffside Park*

On O‘ahu, the City and County of Honolulu administers ten community gardens under its Community Recreational Gardening Program—so named to acknowledge gardening as a social activity that can lift the spirit of community members.

Basic layout guidelines are minimal. Plants are typically grown in rows, so square or rectangular shapes work best. Paths are required so gardeners have access to their plots. Pathways between plots should be at least 3 to 4 feet wide to allow space for wheelbarrows. A simple irrigation system should provide one hose bib or faucet for every four plots. There should also be a gathering space with a community bulletin board where rules, meeting notices, and other important information can be posted. This area could also house a central storage space if there are shared tools and equipment. A bench or picnic table, preferably under shade, would allow gardeners to relax and take a break. Although a composting/recycling area is provided for the agricultural park as a whole, a designated area where gardeners can dispose of their green waste will help keep the gardens tidy.

*Individual community garden plot*

# Community Gardens

## Ala Wai Community Garden Association

Ala Wai Community Garden is one of ten sites in the City and County of Honolulu’s Community Recreational Gardening Program. It is the third largest with 157 plots, each measuring 12 feet by 15 feet (180 SF).

A coordinator is employed by the City, but the facility is largely self-governed through an association and its elected officers. Members are required to follow a set of rules. Garden assignments are revoked after two warnings, issued for “knowingly and continuously breaking rules”:

Produce is not to be sold or put to commercial use.

Four types of fruits or vegetables must be grown; no illegal plants.

Walkways are to be kept clean. Don’t put trash in the common area or garden entrance until clean up day. Gardens must be tended regularly to keep from being overgrown with weeds.

No poisonous pesticides or herbicides are allowed.

Members must attend four meetings per year; one per quarter.

*Storage area for shared gardening equipment*

Members must participate in two garden cleaning parties per year (clean up days are scheduled on two days of each month)

Annual dues are $15.

Water bill is $18.

No excessive watering.

# INFRASTRUCTURE

New development will require a significant investment in infrastructure. Construction of infrastructure and community facilities will occur in response to incremental development and housing build-out. In some cases, third-party residential developers who decide to satisfy affordable housing requirements at Lima Ola may be responsible for increments of infrastructure.

Approaches to community infrastructure will stress water reuse, energy and water conservation, renewable sources of energy supply and innovative stormwater management to maximize opportunities for on-site irrigation and water quality improvement.

## Water System

The proposed development will require an estimated 0.265 million gallons per day (mgd). The existing water system, operated by the County of Kaua‘i, Department of Water (DOW), does not have enough capacity to service Lima Ola. Therefore, off-site improvements to increase capacity will be required. Water will be provided to Lima Ola via connections to an existing 12-inch main on Kaumuali‘i Highway. The on-site water system will be installed within the roads and/or the greenway and will be looped within the development as much as possible. The on-site water lines will be sized according to the current DOW standards.

## Sewer System

The existing ‘Ele‘ele wastewater treatment plant has enough capacity to accommodate Lima Ola. However, the capacity is limited and may not be available when the development is ready to connect to the existing sewer system. The existing sewer connection point for Lima Ola is located on Halewili Road at Mahea Road. The Lima Ola on-site sewer system will consist of pipes and manholes which will convey wastewater from each unit by gravity to the existing connection point. The sewer system will be installed within the on-site roads and/or the greenway.

## Stormwater Drain System

A stormwater drain system will be installed for Lima Ola consisting of underground pipes, manholes, catch basins, inlet boxes, and basins. The storm water runoff collected in the system will be routed through surface detention basins in order to limit the post-development discharge rate to the pre-development discharge rate. Low impact development and sustainable features, such as bioswales and rain gardens, will be incorporated into the design to provide stormwater treatment and reduce the quantity of runoff discharged from the site. The reduction in runoff generated on-site will help reduce the size of the stormwater drain system components. The drainage system will be designed in accordance with the County of Kaua‘i, Department of Public Works Standards.

## Roads

Road grades will be designed to provide accessible sidewalks throughout Lima Ola. Intersections will be flattened to provide ADA compliant ramps and walkways. Between intersections, road grades will not exceed 5 percent.

## Solid Waste

Residential solid waste service will be provided by the County's Refuse Division in accordance with current collection policies. In addition, Lima Ola presents an opportunity to model a proactive waste minimization strategy. Possible actions include a recyclables collection station within the community and the conversion of green waste into mulch that is locally available for residents and community gardeners.

# SUSTAINABLE DEVELOPMENT

One of the priorities of development at Lima Ola is to create a human environment that enhances the assets of land and climate, and conserves natural resources. Healthy living depends, in part, on a built environment that is in balance with the natural environment. The quality of life afforded by Lima Ola is not confined to the interior spaces of homes, but extends to active living out of doors. Taking a responsible development approach that minimizes cumulative environmental impacts will create a more durable and comfortable community that is sustainable from one generation to the next.

Planning for the long-term viability of Lima Ola involves a multi-faceted effort. Strategies in the following focus areas are intended to guide Lima Ola's development. They should be examined and refined as the community evolves.

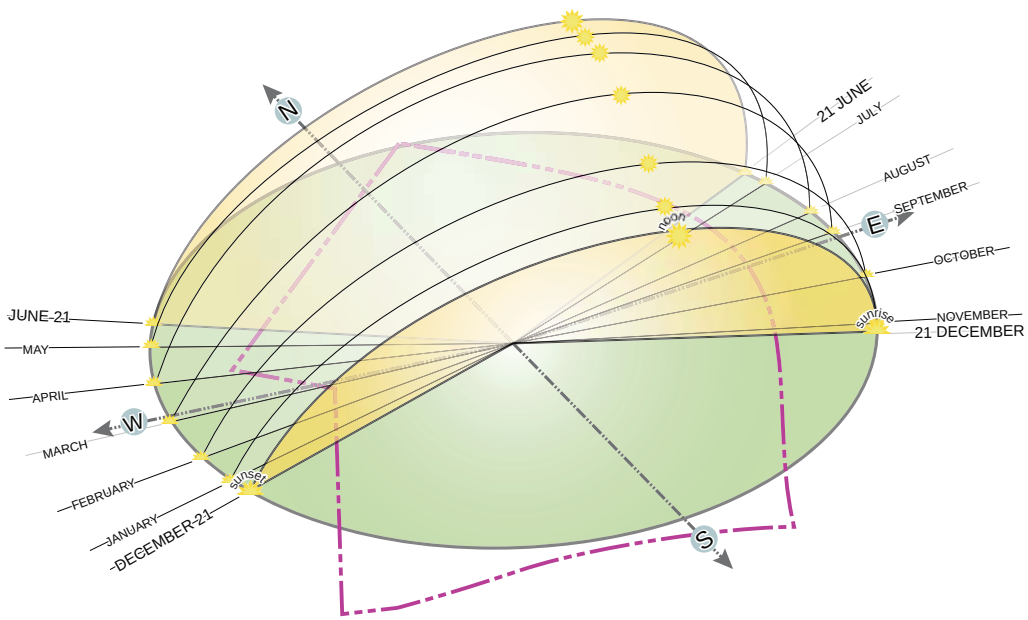
## Permeable Surfaces and Drainage

- Design narrower streets that require less asphalt
- Consider use of porous pavement to facilitate on-site stormwater infiltration and groundwater recharge
- Promote a distributed system of managing stormwater, including landscaped swales, bio-retention, rain gardens, and other collection mechanisms
- Provide a stormwater system that controls erosion and reduces natural and urban pollutants at their source

### Solar Orientation and Energy

- Orient roof surfaces to provide maximum exposure for solar water heating and photovoltaic (PV) systems
- Minimize surfaces facing east and west to control solar exposure and heating of interior spaces
- Provide overhangs and eaves that can offer effective shading and keep the sun's radiant heat from penetrating building walls and windows
- Incorporate skylights or solar tubes for natural day lighting
- Ensure light and air access for neighboring units
- Design outdoor lighting systems using fewer, but more effective lighting fixtures and that require the least amount of energy, including solar-powered lighting
- Encourage homeowners to operate energy efficient appliances to reduce power consumption—and utility bills

**Figure 20** **Solar Path over Lima Ola**

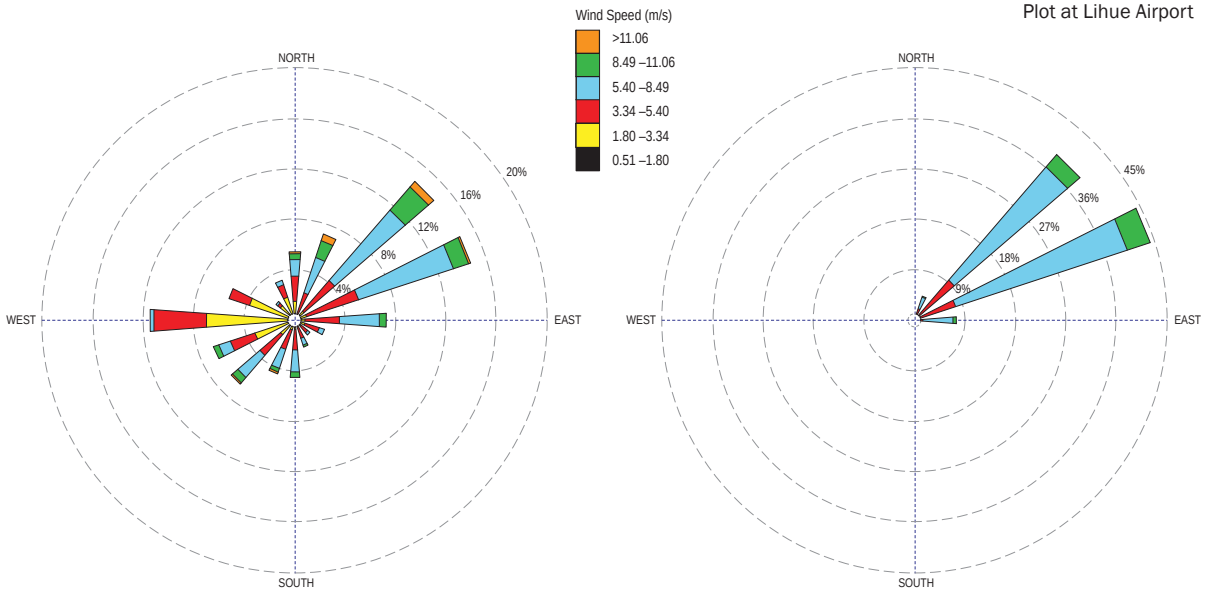


## Natural Ventilation and Shade

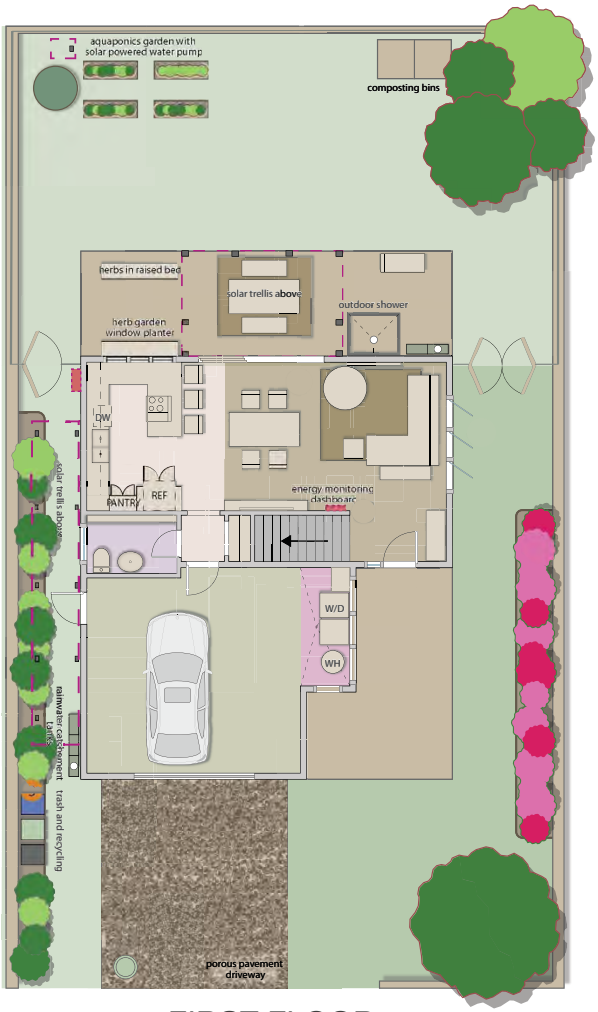
- Advocate construction practices that enable healthy indoor air quality
- Orient residential buildings to take advantage of prevailing tradewinds for best overall distribution of air movement within interior spaces
- Place windows for cross ventilation and select window shapes and types for efficient wind cooling
- Reduce attic temperature through improved ventilation, insulation, and radiant barrier technology
- Reduce heat islands by decreasing the amount of black top (asphalt) paving and by greening the landscape and planting shade trees

**Figure 21** **Wind Rose**

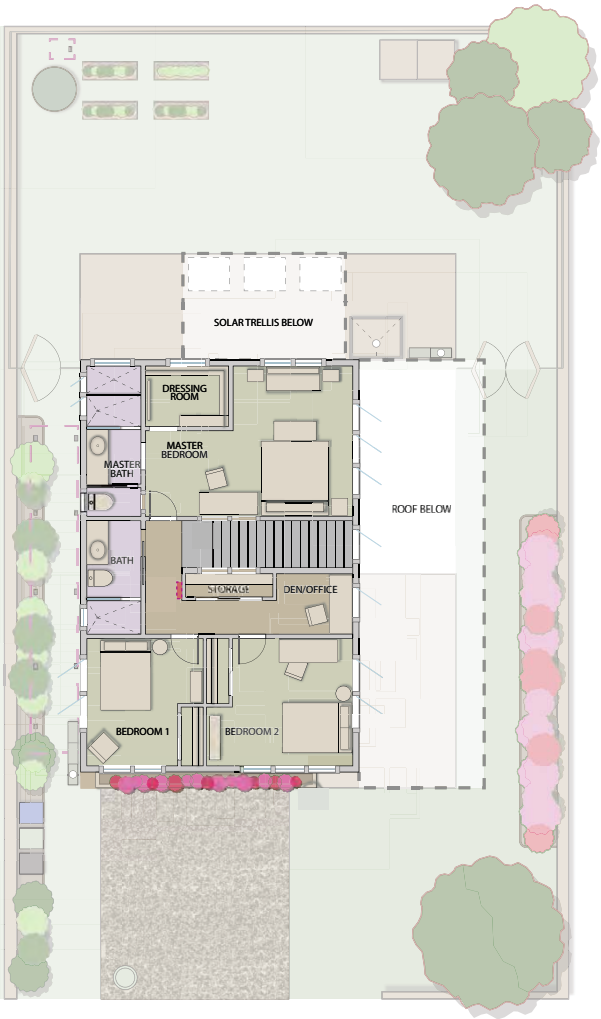
Plot at Lihue Airport




January 1—January 31 July 1—July 31




FIRST FLOOR




SECOND FLOOR

# Modeling

The following are representative strategies that can be put together, as appropriate for the site and building type, to produce a home that uses less energy, has a smaller carbon footprint, and is more benign environmentally than typical construction.

1. Outdoor spaces screened and shaded with a solar trellis
2. Backyard garden
3. Recycling service and composting bins for use in edible gardens
4. Interior and exterior louvers for ventilation
5. Outdoor wash up area
6. Water catchment for irrigation

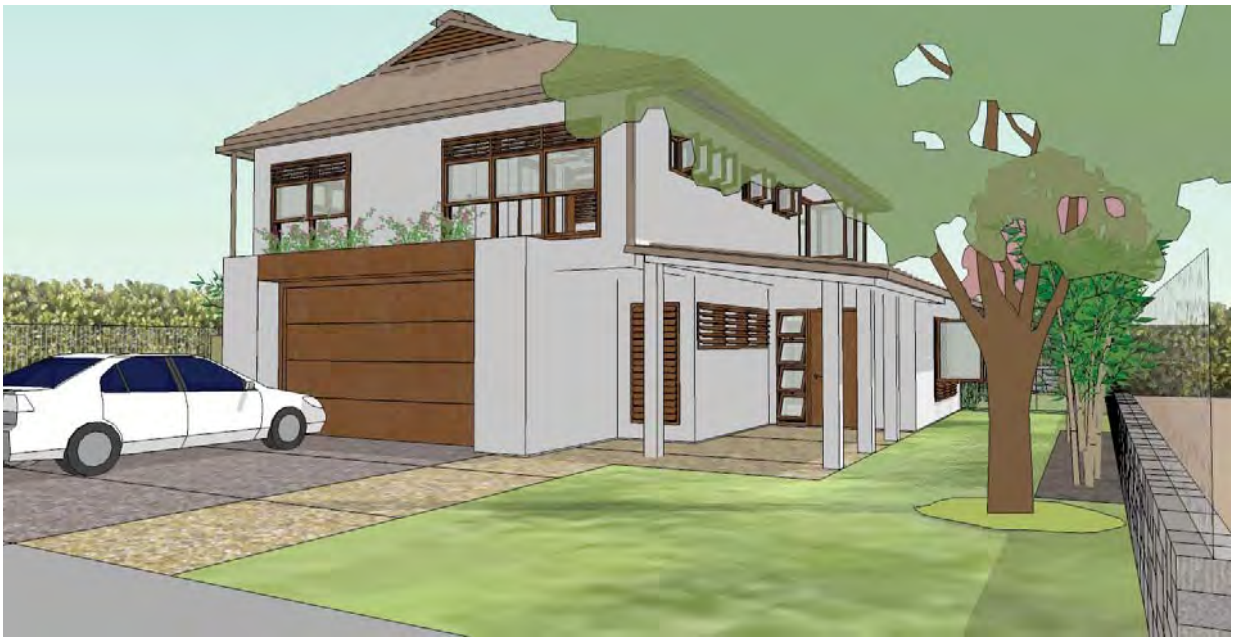
7. Design overhangs to shade house while keeping gutters free of leaves and debris

8. Open floor plan on first floor for air circulation throughout the house

9. Heat generating rooms (kitchen, bath) on leeward (west ) side of house and well-ventilated

10. Control panel to monitor water and electricity use

11. Casement windows to let in prevailing winds



# the Eco-House

### Water Use

- Advocate construction practices that reduce water usage
- Consider water catchment to reuse water for irrigation
- Develop sustainable landscape design guidelines incorporating use of plant materials that are durable and appropriate to Lima Ola's leeward climate, while also being visually appealing and non-invasive

### Solid Waste and Recycling

- Conduct ongoing education and community awareness programs to promote recycling as an important part of the community culture
- Convert green waste into mulch for landscape applications throughout the development
- Encourage on-site residential composting

### Topography Sensitive Design

- Use topography to create continuous green space connectivity, integrating access to views
- Use differences in elevation to increase a sense of privacy between homes
- Ensure that roadway, sidewalk, and path gradients meet ADA access requirements

### Urban Design

- Locate community facilities within walking or biking distance from homes to reduce unnecessary car use
- Design higher residential densities near potential transit stops and major streets
- Design community spaces for flexible use
- Face buildings toward the street to create inviting entrances
- Provide porches, stoops, lanais, and front yards that create a transition area between the public street and the private home—giving residents a place to enjoy the "spectacle of the street" and a space for social interaction

### Sustainable Transportation

- Provide a safe route to school via the greenway to ensure safe walking commutes for children
- Integrate recreation areas into the greenway for easy access from homes
- Integrate paths and sidewalks to promote pedestrian-friendly walkways
- Incorporate bike paths and bike lanes into street design to promote alternative transportation

### Mauka-Makai Views

- Preserve important natural vistas
- Use environmental reference points to reinforce a sense of place and connection to nature

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# IMPLEMENTATION

## Phasing Strategy

Full build-out of the Lima Ola site will likely span several decades. The exact sequence of events over this period cannot be predicted with precision. It will be important, however, to focus development activity in selected subareas and provide improvements and service extensions in a logical and efficient fashion.

Given a relatively large site, early development should occur in a limited number of locations, allowing for concentrations of investments in infrastructure and amenities, and avoiding the need to make expensive site improvements across a large area at one time. Each area of development should facilitate efficient extension of infrastructure and services, by taking advantage of opportunities to build on existing site improvements and utilities.

Early phases should contain a mix of uses and provide a balanced picture of the larger vision for full build-out of the site. These phases should respond to market opportunities and set a precedent for high quality development.

Property improvements made outside of an intended phasing sequence may be appropriate at times, but should not unduly limit future flexibility and should not trigger financial obligations that cannot be reasonably accommodated.

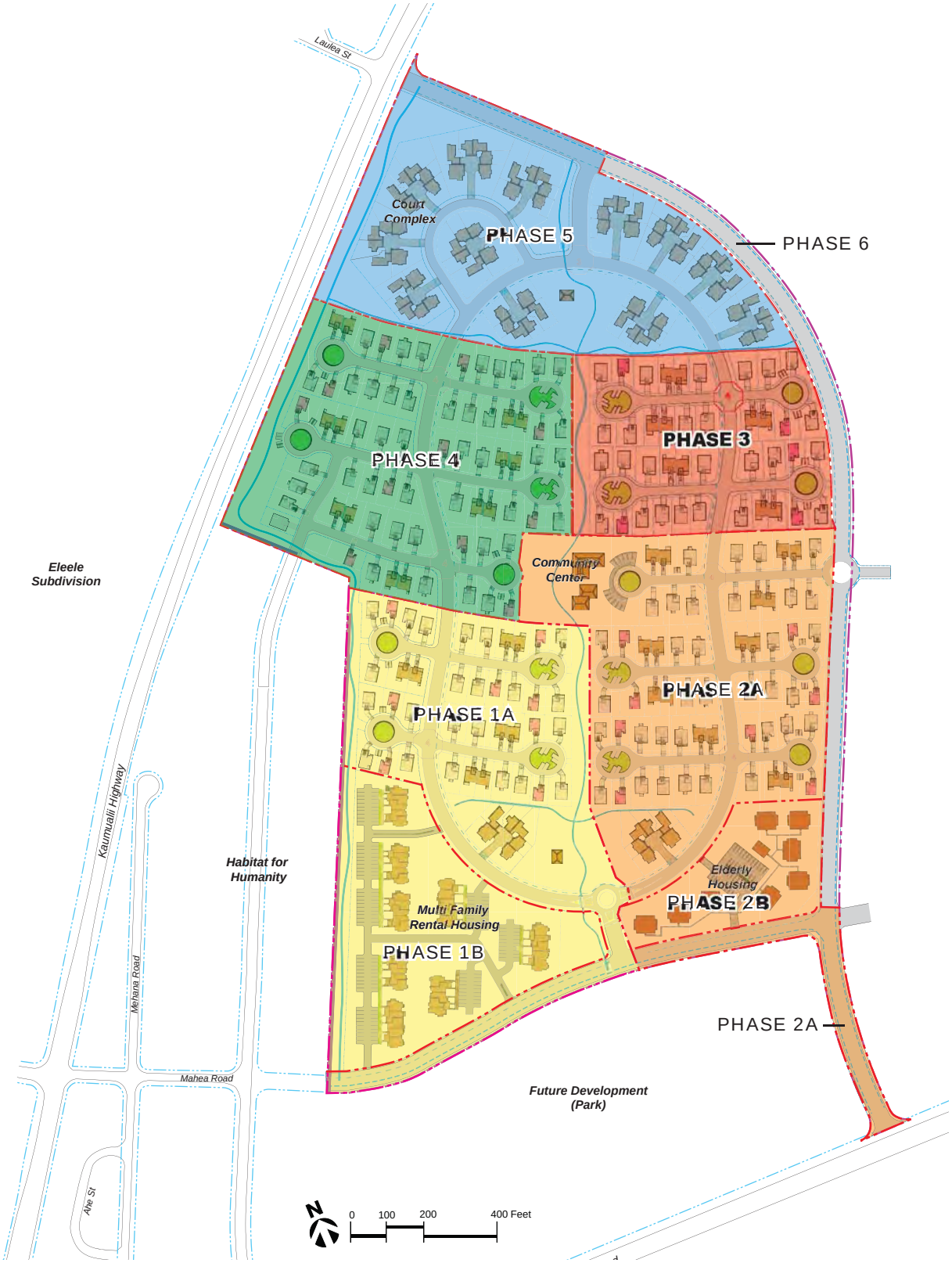
### Land Banking

When the idea for a County-initiated residential development was conceived, policymakers envisioned a multi-pronged approach to development. Some elements would be developed by the County directly. However, other elements would be constructed by third-party developers meeting entitlement conditions for affordable housing. As a land bank, the Lima Ola site would provide land with appropriate zoning and infrastructure service to expedite housing production.

## Phasing Plan

Figure 22 shows a preliminary phasing plan for Lima Ola, subject to change based on engineering recommendations. Primary development activities for each phase are described below.

**Figure 22** **Phasing Plan**



## Phase 1A

***Land Area***: 11.4 acs

***Circulation***

- Extend Mahea Road through Habitat for Humanity development
- Build road mauka of future park, entry drive with roundabout, portion of loop road with cul-de-sacs

***Unit types***

- Mixture of single family lots with single family dwellings, duplexes, and elderly single family lots, plus a six-plex court complex
- Unit counts:
  - Single family: 22
  - Duplex: 8
  - Elderly single family: 8
  - One six-plex court: 6

***Amenities***

- Pavilion
- Common open spaces for recreation and community gardens
- Bike and pedestrian path network

## Phase 1B

***Land Area***: 7.8 acs

***Circulation***

- External roadway built in Phase 1A
- Internal circulation with parking

***Unit types***

- Rental multi-family attached units
- Unit counts:
  - Multi-family units: 80

***Amenities***

- Common open spaces for recreation and community gardens
- Connections to bike and pedestrian path network

## Phase 2A

***Land Area***: 14.9 acs

***Circulation***

- Construct remaining portion of Mahea Road extension and connector to Halewili Road to provide secondary access
- Build loop road with cul-de-sacs

***Unit types***

- Mixture of single family lots with single family dwellings, duplexes, and elderly single family lots, plus a six-plex court complex
- Unit counts:
  - Single family: 34
  - Duplex: 16
  - Elderly single family: 8
  - One six-plex court: 6

***Amenities***

- Community center with adjacent park area
- Common open spaces for recreation and community gardens
- Bike and pedestrian path network

## Phase 2B

***Land Area***: 3.0 acs

***Circulation***

- External roadway already built in Phase 2A
- Internal circulation with parking

***Unit types***

- Elderly housing development (attached units)
- Unit counts:
  - Attached units: 32
  - Administrative office/community room

***Amenities***

- Common open spaces for recreation and community gardens
- Connection to bike and pedestrian path network

## Phase 3

***Land Area***: 7.6 acs

***Circulation***

- Extend loop road with cul-de-sacs

***Unit types***

- Mixture of single family lots with single family dwellings, duplexes, and elderly single family lots
- Unit counts:
  - Single family: 25
  - Duplex: 10
  - Elderly single family: 5

***Amenities***

- Connection to common open spaces for recreation and community gardens
- Bike and pedestrian path network

## Phase 4

***Land Area***: 13.0 acs

***Circulation***

- Extend loop road with cul-de-sacs
- Connect to Iluna Road

***Unit types***

- Mixture of single family lots with single family dwellings, duplexes, and elderly single family lots
- Unit counts:
  - Single family: 43
  - Duplex: 14
  - Elderly single family: 11

***Amenities***

- Connection to common open spaces for recreation and community gardens
- Bike and pedestrian path network

### Phase 5

***Land Area***: 13.4 acs

***Circulation***

- Extend loop road in Phase 5
- Build new mauka entry off Kaumuali‘i Highway and segment of perimeter road

***Unit types***

- Six-plex court complex
- Unit counts:
  - 12 court complexes: 72 units

***Amenities***

- Connection to common open spaces for recreation and community gardens
- Bike and pedestrian path network

**Table 4**

**Summary of Acreage/Units Developed by Phase**

| Phase | Acres | Units |
|---|---|---|
| 1A | 11.4 | 44 |
| 1B | 7.8 | 80 |
| 2A | 14.9 | 64 |
| 2B | 3.0 | 32 |
| 3 | 7.6 | 40 |
| 4 | 13.0 | 68 |
| 5 | 13.4 | 72 |

### Phase 6

Complete perimeter road in conjunction with future area development

## Future Action Items

Priorities for implementing future development at Lima Ola include the following.

### Planning and Design

- Prepare development standards and design guidelines to ensure consistency in the procurement process and overall quality of phased outcomes. The standards and guidelines should be adopted for the entire project area through a process that includes provisions for review and amendment.
- Prepare plans for water source, transmission, and storage, in coordination with the Department of Water
- Initiate planning for intersection improvements at Kaumuali‘i Highway and Mahea Road, in coordination with the State Department of Transportaion

### Environmental Review and Entitlements

- Complete necessary environmental studies and commence the environmental review process
- Amend County general plan
- Amend State land use district
- Adopt master rezoning ordinance
- Adopt subdivision plan

### Financing

- Develop initial infrastructure funding mechanism

### Management Structure

- Evaluate common area management strategies and potential landscape assessment
- Define character and role of possible community management association

## Conclusion

This master plan presents an approach to community development that is new to Kaua'i, but within the capacity of the county to achieve. Lima Ola is foremost a planned residential community offering to Kaua'i's working and retired households a diverse range of housing types, including rental and ownership opportunities. Affordable housing typically means constraints on residential lot and yard sizes. However, at Lima Ola, smaller private space is balanced with ready access to safe and lively public spaces.

From community gardens to playgrounds and open green space, Lima Ola will offer a variety of public spaces that can accommodate a wide range of uses for personal enjoyment and socialization. The development has been planned with a design strategy that encourages residents to interact positively with their environment on a daily basis. Lima Ola will promote healthy living through a set of interrelated design features:

- New dwellings designed to be close to user-friendly pedestrian and bicycle paths to promote active lifestyles and avoid social isolation
- Compact neighborhoods with connectivity to key local destinations
- A legible street network that is clear and easy to navigate
- Open spaces that provide a range of shade, shelter, and seating
- Access to healthy foods through community gardening
- Building design that maximizes natural interaction and active street frontages
- Enriching public spaces that can promote neighborliness and a sense of community

# APPENDIX B: COMMENT LETTERS AND RESPONSES

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Kealoha Takahashi
Executive on Aging, County of Kaua‘i Agency on Elderly Affairs
4444 Rice Street, Suite 330
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Takahashi:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Center Director
U.S. Geological Survey, Pacific Islands Water Science Center
677 Ala Moana Boulevard, Suite 415
Honolulu, Hawai‘i 96813

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Dr. Loyal Mehrhoff
Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai‘i 96850

Subject: Section 7 National Historic Preservation Act Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Dr. Mehrhoff:

Community Planning and Engineering (CP&E) is acting on behalf of the Kaua‘i County Housing Agency to prepare an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project. As part of the environmental review process, and in accordance with Section 7 of the Endangered Species Act (ESA), we are requesting consultation to determine if special status or endangered species exist at, or within close proximity to the subject parcel. Consultation under Section 7 of the ESA is triggered due to potential funding from the United States Department of Housing and Urban Development (HUD). The County of Kaua‘i represents HUD as the responsible federal agency requesting a determination.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. We are enclosing the following reference documents to assist with your review; a site location map, a site plan and a biological study that was conducted for the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012. All response letters can be sent to the following address:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

# United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
2015-TA-0092

DEC 2 4 2014

Max Solmssen
Community Planning and Engineering
1286 Queen Emma Street
Honolulu, Hawaii 96813

Subject: Technical Assistance for Lima Ola Affordable Housing Development, Kauai

Dear Mr. Solmssen:

The U.S. Fish and Wildlife Service (Service) received your letter, dated December 3, 2014, requesting a list of federally threatened and endangered species, candidate species, plants and animals of special concern, and critical habitats in the vicinity of the proposed projects. The County of Kauai (County) proposes to construct a multiphase housing development on approximately 75 acres (TMK 4-2-1-001:027), located in Eleele on the island of Kauai. The housing development involves construction of approximately 550 residential and single family and multi-family units including associated facilities and infrastructure. The proposed project may potentially be funded by the Unites States Department of Housing and Urban Development (HUD). Community Planning and Engineering, on behalf of the County of Kauai, is preparing a draft Environmental Assessment (EA), in accordance with Hawaii Revised Statutes 343 and the National Environmental Policy Act. The following comments are provided in accordance with the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C 1531 *et seq.*).

We reviewed the information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Program, as it pertains to federally listed species and designated critical habitat. The following species are known to occur or transit through the proposed project area: the endangered Hawaiian black-necked stilt (*Himantopus mexicanus knudseni)*, Hawaiian moorhen (*Gallinula chloropus sandvicensis*), Hawaiian coot (*Fulica alai*), Hawaiian duck (*Anas wyvilliana*) (hereafter collectively referred to as Hawaiian waterbirds); the endangered Hawaiian goose (*Branta sandvicensis*); the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus)*; and the endangered Hawaiian petrel (*Pterodroma sandwichensis*), the threatened Newell's shearwater (*Puffinus auricularis newelli*), and a candidate for listing the band-rumped storm-petrel (*Oceanodroma castro*) (hereafter collectively referred to as seabirds). There is no designated critical habitat within the vicinity of the proposed

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project area. We provide the following recommendations to avoid and minimize project impacts to listed species and candidate species.

*Hawaiian Waterbirds*
Our information suggests that your project may result in standing water or creation of open water, thus attracting Hawaiian waterbirds to the site. In particular, the Hawaiian stilt is known to nest in sub-optimal locations (e.g., any ponding water) if water is present. Hawaiian waterbirds attracted to sub-optimal habitat may suffer adverse impacts, such as predation and reduced reproductive success, and thus the project may create an attractive nuisance. Additional details on the proposed construction activities and infrastructure, including the potential reservoir, is necessary to assess potential impacts to Hawaiian waterbirds. Therefore, we recommend you work with our office during project planning so that we may assist you in developing measures to avoid impacts to listed species (e.g., fencing, vegetation control, predator management).

*Hawaiian Goose*
In order to avoid impacts to Hawaiian geese, we recommend a biologist familiar with the nesting behavior of the Hawaiian goose survey the area prior to the initiation of any work, or after any subsequent delay in work of three or more days (during which birds may attempt nesting). If a nest is discovered, work should cease immediately and our office should be contacted for further guidance. Furthermore, all on-site project personnel should be apprised that Hawaiian geese may be in the vicinity of the project at any time during the year. If a Hawaiian goose (or geese) appears within 100 feet of ongoing work, all activity should be temporarily suspended until the Hawaiian goose (or geese) leaves the area of its own accord.

*Hawaiian Hoary Bat*
The Hawaiian hoary bat roosts in both exotic and native woody vegetation and, while foraging, will leave young unattended in "nursery" trees and shrubs when they forage. If trees or shrubs suitable for bat roosting are cleared during the breeding season, there is a risk that young bats could inadvertently be harmed or killed. To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet tall should not be disturbed, removed, or trimmed during the bat birthing and pup rearing season (June 1 through September 15). Site clearing should be timed to avoid disturbance to Hawaiian hoary bats in the project area.

*Seabirds*
Seabirds, including the Newell's shearwater, Hawaiian petrel, and band-rumped storm petrel fly at night and are attracted to artificially-lighted areas resulting in disorientation and subsequent fallout due to exhaustion. Seabirds are also susceptible to collision with objects that protrude above the vegetation layer, such as utility lines, guy-wires, and communication towers. Additionally, once grounded, they are vulnerable to predators and are often struck by vehicles along roadways. Construction activities should only occur during daylight hours. We also recommend the lighting in the project area be fully shielded or full cut-off luminary fixtures, such that the bulb can only be seen from below using the lowest wattage bulbs possible. Any increase in the use of nighttime lighting, particularly during peak fallout period (September 15 through December 15), could result in additional seabird injury or mortality.

If it is determined that the proposed project may affect federally listed species, we recommend you contact our office early in the planning process so that we may assist you with the ESA compliance. Additionally, we recommend you incorporate the attached best management practices into your project description to avoid and minimize impacts to water resources that have the potential to occur during construction activities.

We appreciate your efforts to conserve endangered species. Please contact Adam Griesemer, Endangered Species Biologist (phone: 808-285-8261, email: adam_griesemer@fws.gov) should you have any questions pertaining to this response.

Sincerely,

for, Aaron Nadig
Assistant Field Supervisor:
Oahu, Kauai, NWHI, Am.Samoa

**U.S. Fish and Wildlife Service**
**Recommended Standard Best Management Practices**

The U.S. Fish and Wildlife Service recommends that the measures below be incorporated into projects to minimize the degradation of water quality and minimize the impacts to fish and wildlife resources.

1. Turbidity and siltation from project-related work shall be minimized and contained within the vicinity of the site through the appropriate use of effective silt containment devices and the curtailment of work during adverse tidal and weather conditions.

2. Dredging/filling in the marine environment shall be scheduled to avoid coral spawning and recruitment periods and sea turtle nesting and hatching periods.

3. Dredging and filling in the marine/aquatic environment shall be designed to avoid or minimize the loss special aquatic site habitat (beaches, coral reefs, wetlands, etc.) and the function of such habitat shall be replaced.

4. All project-related materials and equipment (dredges, barges, backhoes, etc.) to be placed in the water shall be cleaned of pollutants prior to use.

5. No project-related materials (fill, revetment rock, pipe, etc.) should be stockpiled in the water (intertidal zones, reef flats, stream channels, wetlands, etc.) or on beach habitats.

6. All debris removed from the marine/aquatic environment shall be disposed of at an approved upland or ocean dumping site.

7. No contamination (trash or debris disposal, non-native species introductions, attraction of non-native pests, etc.) of adjacent habitats (reef flats, channels, open ocean, stream channels, wetlands, beaches, forests, etc.) shall result from project-related activities. This shall be accomplished by implementing a litter-control plan and developing a Hazard Analysis and Critical Control Point Plan (HACCP – see http://www.haccpnrm.org/Wizard/default.asp) to prevent attraction and introduction of non-native species.

8. Fueling of project-related vehicles and equipment should take place away from the water and a contingency plan to control petroleum products accidentally spilled during the project shall be developed. Absorbent pads and containment booms shall be stored onsite, if appropriate, to facilitate the clean-up of accidental petroleum releases.

9. Any under-layer fills used in the project shall be protected from erosion with stones (or core-loc units) as soon after placement as practicable.

10. Any soil exposed near water as part of the project shall be protected from erosion (with plastic sheeting, filter fabric etc.) after exposure and stabilized as soon as practicable (with native or non-invasive vegetation matting, hydroseeding, etc.).

Community Planning and Engineering, Inc.

December 3, 2014

Director
USDA Natural Resources Conservation Service
Pacific Island Contact Office
P.O. Box 50003
Honolulu, Hawai‘i 96850

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

USDA
United States Department of Agriculture

December 19, 2014

Max Solmssen
Project Manager
CP&E
1288 Queen Emma Street
Honolulu, HI 96813

**Subject:** USDA-NRCS Review of the Environmental Assessment (EA) for the Lima Ola Work Force Housing Development Project.

Dear Mr. Solmssen,

Thank you for providing the NRCS the opportunity to review and comment on the proposed Lima Ola workforce housing development project. Please find enclosed NRCS maps identifying areas of Agricultural Lands Important to the State of Hawaii (ALISH), as well as selected soil reports.

The area proposed for the housing development is classified by ALISH as "Prime Agricultural Lands" (see attached map).

As defined by "Agricultural Lands of Importance to the State of Hawaii Revised" (State Department of Agriculture, November 1977), "Prime Agricultural Land" is:

> *"...land best suited for the production of food, feed, forage and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods."*

Typically, a Farmland Impact Conversion Rating Form (AD-1006) is needed on projects that convert farmlands into non-farmland uses, and have "federal programs" attached to the project. Federal programs include activities or responsibilities of a Federal agency that involve undertaking, financing, or assisting construction or improvement projects, or acquiring, managing, or disposing of Federal lands and facilities. See the website link below for more information on the Farmland Protection Policy Act and a copy of the AD-1006 form with instructions.

NRCS - Farmland Protection Policy Act Website:
http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/landuse/fppa/

Natural Resources Conservation Service
Pacific Islands Area
P.O. Box 50004 Rm. 4-118
Honolulu, HI 96850-0050
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There are no hydric soils mapped within the Project Area, though this does not mean that they do not exist. If wetlands do exist, any proposed impacts to these wetlands would need to demonstrate compliance with the Clean Water Act and may need an Army Corp of Engineers 404 permit.

The enclosed map identifies areas designated as prime farmland. Also included are map unit descriptions and interpretations (*Roads and Streets, Shallow Excavations, and Lawns and Landscaping*) for the soils mapped within the project area.

The NRCS Soil Survey is a general planning tool and does not eliminate the need for an onsite investigation. If you have any questions concerning the soils or interpretations for this project, please contact Tony Rolfes, State Soil Scientist, at (808) 541-2600, x119, or by email at Tony.Rolfes@hi.usda.gov.

Sincerely,

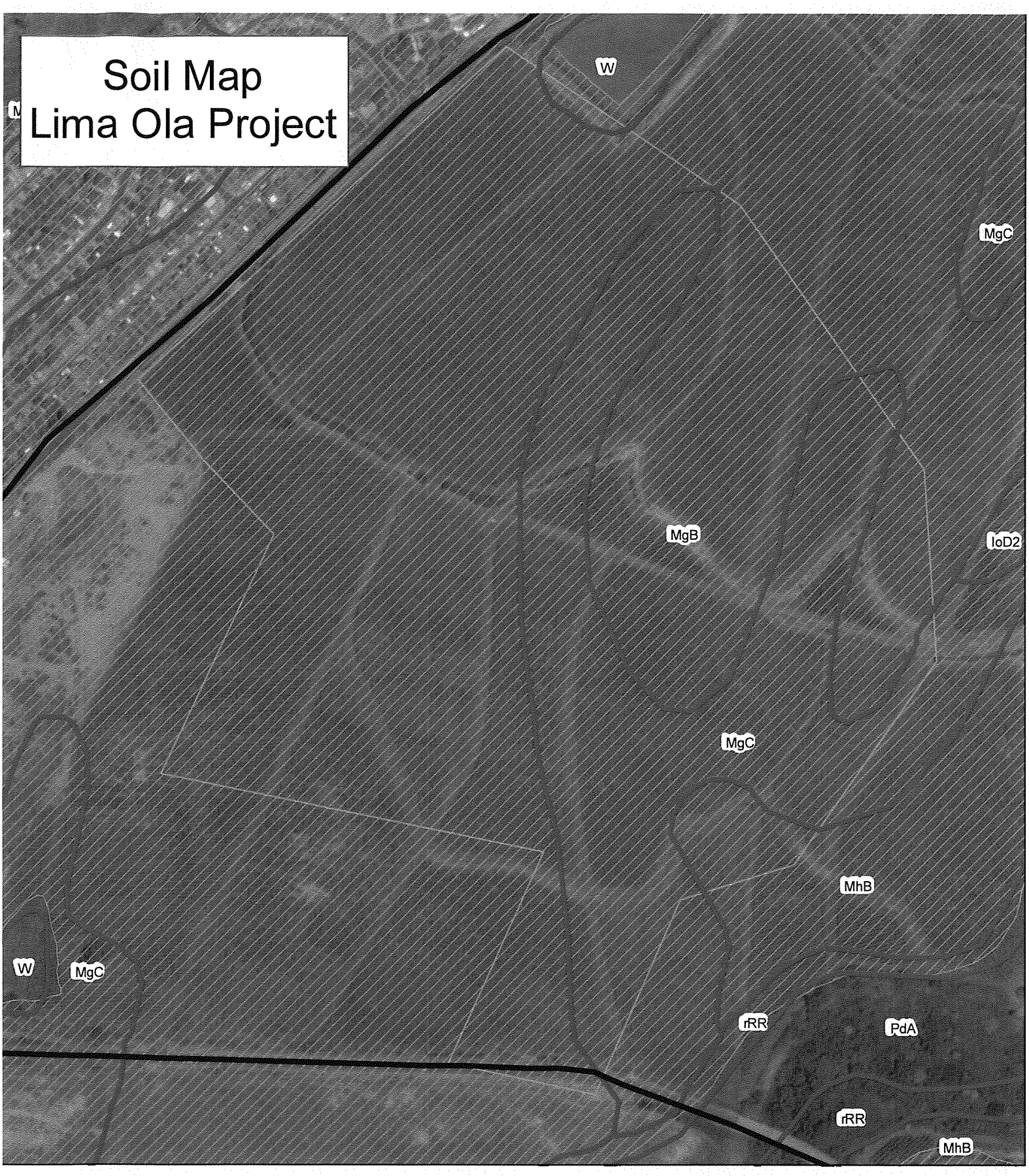
CRAIG DERICKSON
Acting Director
Pacific Islands Area

Enclosures: (4)

ALISH/Soil Map
Map Unit Descriptions
Roads and Streets, Shallow Excavations, and Lawns and Landscaping
Dwellings and Small Commercial Buildings

Cc: Tony Rolfes, Assistant Director for Soil Science and Natural Resource Assessments, Pacific Islands Area State Office, Honolulu, HI

# Soil Map
# Lima Ola Project




Major Roads

Soil survey

Lima Ola Work Force Housing Development

**ALISH**

Prime Lands

Map is shown at a scale of 1:5,000. Soil maps were created at a scale of 1:24,000. The scale of the map does not in any way improve the detail or precision of the original soil map.

1:5,000

USDA NRCS

United States Department of Agriculture
Natural Resources Conservation Service

# Map Unit Description (HI)

Island Of Kauai, Hawaii

## MgB - Makaweli silty clay loam, 0 to 6 percent slopes

*Mean annual precipitation:* 20 to 35 inches
*Mean annual air temperature* 72 to 75 degrees F
*Frost-free period:* 365 days
*Farmland class:* Prime farmland if irrigated

## Makaweli and similar soils

*Extent:* about 100 percent
*Landform(s):*
*Slope gradient:* 0 to 6 percent
*Parent material:* basic igneous rock
*Restrictive feature(s):* none
*Seasonal high water table:* greater than 60 inches
*Flooding frequency* none
*Ponding frequency:* none

*Soil loss tolerance (T factor):* 5
*Wind erodibility group (WEG):* 7
*Wind erodibility index (WEI):* 38
*Land capability subclass, nonirrigated:* 4c
*Land capability subclass, irrigated:* 2e
*Drainage class:* well drained
*Hydric soil class:* no
*Hydrologic group:* B

*Representative soil profile:*

| | | Texture | Saturated Hydraulic Conductivity | Available water capacity | pH | Kw | Kf |
|---|---|---|---|---|---|---|---|
| H1 -- | 0 to 12 in | Silty clay loam | high | 1.7 to 1.9 in | 6.1 to 6.5 | .17 | .17 |
| H2 -- | 12 to 25 in | Silt loam | high | 1.9 to 2.1 in | 6.6 to 7.3 | .17 | .17 |
| H3 -- | 25 to 60 in | Silty clay loam | moderately high | 4.9 to 5.5 in | 6.6 to 7.3 | .17 | .17 |

*Ecological site:*

*Minor Components*

# Map Unit Description (HI)

Island Of Kauai, Hawaii

## MgC - Makaweli silty clay loam, 6 to 12 percent slopes

*Mean annual precipitation:* 20 to 35 inches
*Mean annual air temperature* 72 to 75 degrees F
*Frost-free period:* 365 days
*Farmland class:* Prime farmland if irrigated

## Makaweli and similar soils

*Extent:* about 100 percent
*Landform(s):*
*Slope gradient:* 6 to 12 percent
*Parent material:* basic igneous rock
*Restrictive feature(s):* none
*Seasonal high water table:* greater than 60 inches
*Flooding frequency* none
*Ponding frequency:* none

*Soil loss tolerance (T factor):* 5
*Wind erodibility group (WEG):* 7
*Wind erodibility index (WEI):* 38
*Land capability subclass, nonirrigated:* 4e
*Land capability subclass, irrigated:* 3e
*Drainage class:* well drained
*Hydric soil class:* no
*Hydrologic group:* B

*Representative soil profile:*

| | | Texture | Saturated Hydraulic Conductivity | Available water capacity | pH | Kw | Kf |
|---|---|---|---|---|---|---|---|
| H1 -- | 0 to 12 in | Silty clay loam | high | 1.7 to 1.9 in | 6.1 to 6.5 | .17 | .17 |
| H2 -- | 12 to 25 in | Silt loam | high | 1.9 to 2.1 in | 6.6 to 7.3 | .17 | .17 |
| H3 -- | 25 to 60 in | Silty clay loam | moderately high | 4.9 to 5.5 in | 6.6 to 7.3 | .17 | .17 |

*Ecological site:*

*Minor Components*

## MhB - Makaweli stony silty clay loam, 0 to 6 percent slopes

*Mean annual precipitation:* 20 to 35 inches
*Mean annual air temperature* 72 to 75 degrees F
*Frost-free period:* 365 days
*Farmland class:* Prime farmland if irrigated

## Makaweli and similar soils

*Extent:* about 100 percent
*Landform(s):*
*Slope gradient:* 0 to 6 percent
*Parent material:* basic igneous rock
*Restrictive feature(s):* none
*Seasonal high water table:* greater than 60 inches
*Flooding frequency* none
*Ponding frequency:* none

*Soil loss tolerance (T factor):* 5
*Wind erodibility group (WEG):* 7
*Wind erodibility index (WEI):* 38
*Land capability subclass, nonirrigated:* 4s
*Land capability subclass, irrigated:* 2e
*Drainage class:* well drained
*Hydric soil class:* no
*Hydrologic group:* B

*Representative soil profile:*

| | | Texture | Saturated Hydraulic Conductivity | Available water capacity | pH | Kw | Kf |
|---|---|---|---|---|---|---|---|
| H1 -- | 0 to 12 in | Stony silty clay loam | high | 1.4 to 1.7 in | 6.1 to 6.5 | .15 | .17 |
| H2 -- | 12 to 25 in | Silt loam | high | 1.9 to 2.1 in | 6.6 to 7.3 | .17 | .17 |
| H3 -- | 25 to 60 in | Silty clay loam | moderately high | 4.9 to 5.5 in | 6.6 to 7.3 | .17 | .17 |

*Ecological site:*

*Minor Components*

# Roads and Streets, Shallow Excavations, and Lawns and Landscaping

Island of Kauai, Hawaii

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

| Map symbol and soil name | Pct. of map unit | Local roads and streets | | Shallow excavations | | Lawns and landscaping | |
|---|---|---|---|---|---|---|---|
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| MgB: | | | | | | | |
| Makaweli | 100 | Very limited | | Somewhat limited | | Somewhat limited | |
| | | Low strength | 1.00 | Dusty | 0.50 | Dusty | 0.50 |
| | | | | Unstable excavation walls | 0.01 | | |
| MgC: | | | | | | | |
| Makaweli | 100 | Very limited | | Somewhat limited | | Somewhat limited | |
| | | Low strength | 1.00 | Dusty | 0.50 | Dusty | 0.50 |
| | | Slope | 0.04 | Slope | 0.04 | Slope | 0.04 |
| | | | | Unstable excavation walls | 0.01 | | |
| MhB: | | | | | | | |
| Makaweli | 100 | Very limited | | Somewhat limited | | Somewhat limited | |
| | | Low strength | 1.00 | Dusty | 0.50 | Large stones content | 0.68 |
| | | | | Unstable excavation walls | 0.01 | Dusty | 0.50 |

# Dwellings and Small Commercial Buildings

Island of Kauai, Hawaii

[The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the potential limitation. The columns that identify the rating class and limiting features show no more than five limitations for any given soil. The soil may have additional limitations. This report shows only the major soils in each map unit]

| Map symbol and soil name | Pct. of map unit | Dwellings without basements | | Dwellings with basements | | Small commercial buildings | |
|---|---|---|---|---|---|---|---|
| | | Rating class and limiting features | Value | Rating class and limiting features | Value | Rating class and limiting features | Value |
| MgB: | | | | | | | |
| Makaweli | 100 | Not limited | | Not limited | | Not limited | |
| MgC: | | | | | | | |
| Makaweli | 100 | Somewhat limited | | Somewhat limited | | Very limited | |
| | | Slope | 0.04 | Slope | 0.04 | Slope | 1.00 |
| MhB: | | | | | | | |
| Makaweli | 100 | Not limited | | Not limited | | Not limited | |

Community Planning and Engineering, Inc.

December 3, 2014

Chief, Regulatory Branch
U.S. Army Corps of Engineers Honolulu District
Building 525, Suite 300
Fort Shafter, Hawai‘i 96858

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

**DEPARTMENT OF THE ARMY**
**HONOLULU DISTRICT, U.S. ARMY CORPS OF ENGINEERS**
**FORT SHAFTER, HAWAII 96858-5440**

DECEMBER 31, 2014

SUBJECT: Review of Proposed Lima Ola Workforce Housing Development, 'Ele'ele, Kaua'i, Hawaii, DA File No. POH-2014-00228

Max Solmssen
CP&E
1286 Queen Emma Street
Honolulu, HI 96813

Dear Mr. Solmssen:

The U.S. Army Corps of Engineers (Corps) has received information for the proposed Lima Ola Workforce Housing Development. The project is located in 'Ele'ele, Kaua'i, Hawaii. . Your project has been assigned Corps No. POH-2014-00228. Please refer to this number in all correspondence.

Under Section 404 of the Clean Water Act (CWA), the Corps has authority to issue permits for the placement of dredged or fill material into waters of the United States, including wetlands. The term "waters of the United States" also includes the territorial seas and tidally influenced waters where the limits of our jurisdiction under Section 404 extend landward to the high tide line. "Waters" also include all other waters that are part of a surface tributary system to and including navigable (non-tidal) waters of the United States. The limits of our jurisdiction extend landward up to the ordinary high water mark. Wetlands adjacent to these waters are also "waters of the United States."

The proposed work may require a Department of the Army permit under Section 404 of the CWA. We have also enclosed a permit application form for your convenience (Enclosure 1).

If you have any questions regarding our regulatory authority or need additional information, please contact Shelly Lynch at telephone (808) 835-4300, or email *Michelle.R.Lynch@usace.army.mil.*

Sincerely,

Michelle Lynch
Chief, Regulatory Office

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COMMUNITY PLANNING AND ENGINEERING INC.

U.S. ARMY CORPS OF ENGINEERS

# APPLICATION FOR DEPARTMENT OF THE ARMY PERMIT

*(33 CFR 325)*

OMB APPROVAL NO. 0710-0003
EXPIRES: 31 AUGUST 2012

Public reporting for this collection of information is estimated to average 11 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of the collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters, Executive Services and Communications Directorate, Information Management Division and to the Office of Management and Budget, Paperwork Reduction Project (0710-0003). Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to any penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number. Please DO NOT RETURN your form to either of those addresses. Completed applications must be submitted to the District Engineer having jurisdiction over the location of the proposed activity.

PRIVACY ACT STATEMENT

Authorities: Rivers and Harbors Act, Section 10, 33 USC 403; Clean Water Act, Section 404, 33 USC 1344; Marine Protection, Research, and Sanctuaries Act, Section 103, 33 USC 1413; Regulatory Programs of the Corps of Engineers; Final Rule 33 CFR 320-332. Principal Purpose: Information provided on this form will be used in evaluating the application for a permit. Routine Uses: This information may be shared with the Department of Justice and other federal, state, and local government agencies, and the public and may be made available as part of a public notice as required by Federal law. Submission of requested information is voluntary, however, if information is not provided the permit application cannot be evaluated nor can a permit be issued. One set of original drawings or good reproducible copies which show the location and character of the proposed activity must be attached to this application (see sample drawings and/or instructions) and be submitted to the District Engineer having jurisdiction over the location of the proposed activity. An application that is not completed in full will be returned.

**(ITEMS 1 THRU 4 TO BE FILLED BY THE CORPS)**

| 1. APPLICATION NO. | 2. FIELD OFFICE CODE | 3. DATE RECEIVED | 4. DATE APPLICATION COMPLETE |
|---|---|---|---|
| | | | |

***(ITEMS BELOW TO BE FILLED BY APPLICANT)***

| | |
|---|---|
| 5. APPLICANT'S NAME<br>First - Middle - Last -<br>Company -<br>E-mail Address - | 8. AUTHORIZED AGENT'S NAME AND TITLE (agent is not required)<br>First - Middle - Last -<br>Company -<br>E-mail Address - |
| 6. APPLICANT'S ADDRESS:<br>Address-<br>City - State - Zip - Country - | 9. AGENT'S ADDRESS:<br>Address-<br>City - State - Zip - Country - |
| 7. APPLICANT'S PHONE NOs. w/AREA CODE<br>a. Residence b. Business c. Fax | 10. AGENTS PHONE NOs. w/AREA CODE<br>a. Residence b. Business c. Fax |

**STATEMENT OF AUTHORIZATION**

11. I hereby authorize, _____ to act in my behalf as my agent in the processing of this application and to furnish, upon request, supplemental information in support of this permit application.

_____ SIGNATURE OF APPLICANT _____ DATE

**NAME, LOCATION, AND DESCRIPTION OF PROJECT OR ACTIVITY**

12. PROJECT NAME OR TITLE (see instructions)

| | |
|---|---|
| 13. NAME OF WATERBODY, IF KNOWN (if applicable) | 14. PROJECT STREET ADDRESS (if applicable)<br>Address<br>City - State- Zip- |
| 15. LOCATION OF PROJECT<br>Latitude: °N Longitude: °W | |

16. OTHER LOCATION DESCRIPTIONS, IF KNOWN (see instructions)

State Tax Parcel ID Municipality

Section - Township - Range -

17. DIRECTIONS TO THE SITE

18. Nature of Activity (Description of project, include all features)

19. Project Purpose (Describe the reason or purpose of the project, see instructions)

**USE BLOCKS 20-23 IF DREDGED AND/OR FILL MATERIAL IS TO BE DISCHARGED**

20. Reason(s) for Discharge

21. Type(s) of Material Being Discharged and the Amount of Each Type in Cubic Yards:

| Type<br>Amount in Cubic Yards | Type<br>Amount in Cubic Yards | Type<br>Amount in Cubic Yards |
|---|---|---|

22. Surface Area in Acres of Wetlands or Other Waters Filled (see instructions)

Acres

or

Linear Feet

23. Description of Avoidance, Minimization, and Compensation (see instructions)

24. Is Any Portion of the Work Already Complete? ☐ Yes ☐ No IF YES, DESCRIBE THE COMPLETED WORK

25. Addresses of Adjoining Property Owners, Lessees, Etc., Whose Property Adjoins the Waterbody (if more than can be entered here, please attach a supplemental list).

a. Address-

City - State - Zip -

b. Address-

City - State - Zip -

c. Address-

City - State - Zip -

d. Address-

City - State - Zip -

e. Address-

City - State - Zip -

26. List of Other Certificates or Approvals/Denials received from other Federal, State, or Local Agencies for Work Described in This Application.

| AGENCY | TYPE APPROVAL* | IDENTIFICATION NUMBER | DATE APPLIED | DATE APPROVED | DATE DENIED |
|---|---|---|---|---|---|
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

* Would include but is not restricted to zoning, building, and flood plain permits

27. Application is hereby made for permit or permits to authorize the work described in this application. I certify that this information in this application is complete and accurate. I further certify that I possess the authority to undertake the work described herein or am acting as the duly authorized agent of the applicant.

SIGNATURE OF APPLICANT DATE SIGNATURE OF AGENT DATE

The Application must be signed by the person who desires to undertake the proposed activity (applicant) or it may be signed by a duly authorized agent if the statement in block 11 has been filled out and signed.

18 U.S.C. Section 1001 provides that: Whoever, in any manner within the jurisdiction of any department or agency of the United States knowingly and willfully falsifies, conceals, or covers up any trick, scheme, or disguises a material fact or makes any false, fictitious or fraudulent statements or representations or makes or uses any false writing or document knowing same to contain any false, fictitious or fraudulent statements or entry, shall be fined not more than $10,000 or imprisoned not more than five years or both.

## Instructions for Preparing a Department of the Army Permit Application

**Blocks 1 through 4.** To be completed by Corps of Engineers.

**Block 5. Applicant's Name.** Enter the name and the E-mail address of the responsible party or parties. If the responsible party is an agency, company, corporation, or other organization, indicate the name of the organization and responsible officer and title. If more than one party is associated with the application, please attach a sheet with the necessary information marked Block 5.

**Block 6. Address of Applicant.** Please provide the full address of the party or parties responsible for the application. If more space is needed, attach an extra sheet of paper marked Block 6.

**Block 7. Applicant Telephone Number(s).** Please provide the number where you can usually be reached during normal business hours.

**Blocks 8 through 11.** To be completed, if you choose to have an agent.

**Block 8. Authorized Agent's Name and Title.** Indicate name of individual or agency, designated by you, to represent you in this process. An agent can be an attorney, builder, contractor, engineer, or any other person or organization. Note: An agent is not required.

**Blocks 9 and 10. Agent's Address and Telephone Number.** Please provide the complete mailing address of the agent, along with the telephone number where he / she can be reached during normal business hours.

**Block 11. Statement of Authorization.** To be completed by applicant, if an agent is to be employed.

**Block 12. Proposed Project Name or Title.** Please provide name identifying the proposed project, e.g., Landmark Plaza, Burned Hills Subdivision, or Edsall Commercial Center.

**Block 13. Name of Waterbody.** Please provide the name of any stream, lake, marsh, or other waterway to be directly impacted by the activity. If it is a minor (no name) stream, identify the waterbody the minor stream enters.

**Block 14. Proposed Project Street Address.** If the proposed project is located at a site having a street address (not a box number), please enter it here.

**Block 15. Location of Proposed Project.** Enter the latitude and longitude of where the proposed project is located. If more space is required, please attach a sheet with the necessary information marked Block 15.

**Block 16. Other Location Descriptions.** If available, provide the Tax Parcel Identification number of the site, Section, Township, and Range of the site (if known), and / or local Municipality that the site is located in.

**Block 17. Directions to the Site.** Provide directions to the site from a known location or landmark. Include highway and street numbers as well as names. Also provide distances from known locations and any other information that would assist in locating the site. You may also provide description of the proposed project location, such as lot numbers, tract numbers, or you may choose to locate the proposed project site from a known point (such as the right descending bank of Smith Creek, one mile downstream from the Highway 14 bridge). If a large river or stream, include the river mile of the proposed project site if known

**Block 18. Nature of Activity.** Describe the overall activity or project. Give appropriate dimensions of structures such as wing walls, dikes (identify the materials to be used in construction, as well as the methods by which the work is to be done), or excavations (length, width, and height). Indicate whether discharge of dredged or fill material is involved. Also, identify any structure to be constructed on a fill, piles, or float-supported platforms.

The written descriptions and illustrations are an important part of the application. Please describe, in detail, what you wish to do. If more space is needed, attach an extra sheet of paper marked Block 18.

**Block 19. Proposed Project Purpose.** Describe the purpose and need for the proposed project. What will it be used for and why? Also include a brief description of any related activities to be developed as the result of the proposed project. Give the approximate dates you plan to both begin and complete all work.

**Block 20. Reasons for Discharge.** If the activity involves the discharge of dredged and/or fill material into a wetland or other waterbody, including the temporary placement of material, explain the specific purpose of the placement of the material (such as erosion control).

**Block 21. Types of Material Being Discharged and the Amount of Each Type in Cubic Yards.** Describe the material to be discharged and amount of each material to be discharged within Corps jurisdiction. Please be sure this description will agree with your illustrations. Discharge material includes: rock, sand, clay, concrete, etc.

**Block 22. Surface Areas of Wetlands or Other Waters Filled.** Describe the area to be filled at each location. Specifically identify the surface areas, or part thereof, to be filled. Also include the means by which the discharge is to be done (backhoe, dragline, etc.). If dredged material is to be discharged on an upland site, identify the site and the steps to be taken (if necessary) to prevent runoff from the dredged material back into a waterbody. If more space is needed, attach an extra sheet of paper marked Block 22.

**Block 23. Description of Avoidance, Minimization, and Compensation.** Provide a brief explanation describing how impacts to waters of the United States are being avoided and minimized on the project site. Also provide a brief description of how impacts to waters of the United States will be compensated for, or a brief statement explaining why compensatory mitigation should not be required for those impacts.

**Block 24. Is Any Portion of the Work Already Complete?** Provide any background on any part of the proposed project already completed. Describe the area already developed, structures completed, any dredged or fill material already discharged, the type of material, volume in cubic yards, acres filled, if a wetland or other waterbody (in acres or square feet). If the work was done under an existing Corps permit, identity the authorization, if possible.

**Block 25. Names and Addresses of Adjoining Property Owners, Lessees, etc., Whose Property Adjoins the Project Site.** List complete names and full mailing addresses of the adjacent property owners (public and private) lessees, etc., whose property adjoins the waterbody or aquatic site where the work is being proposed so that they may be notified of the proposed activity (usually by public notice). If more space is needed, attach an extra sheet of paper marked Block 24.

**Information regarding adjacent landowners is usually available through the office of the tax assessor in the county or counties where the project is to be developed.**

**Block 26. Information about Approvals or Denials by Other Agencies.** You may need the approval of other federal, state, or local agencies for your project. Identify any applications you have submitted and the status, if any (approved or denied) of each application. You need not have obtained all other permits before applying for a Corps permit.

**Block 27. Signature of Applicant or Agent.** The application must be signed by the owner or other authorized party (agent). This signature shall be an affirmation that the party applying for the permit possesses the requisite property rights to undertake the activity applied for (including compliance with special conditions, mitigation, etc.).

## DRAWINGS AND ILLUSTRATIONS

**General Information.**

Three types of illustrations are needed to properly depict the work to be undertaken. These illustrations or drawings are identified as a Vicinity Map, a Plan View or a Typical Cross-Section Map. Identify each illustration with a figure or attachment number.

Please submit one original, or good quality copy, of all drawings on 8½ x11 inch plain white paper (electronic media may be substituted). Use the fewest number of sheets necessary for your drawings or illustrations.

Each illustration should identify the project, the applicant, and the type of illustration (vicinity map, plan view, or cross-section). **While illustrations need not be professional (many small, private project illustrations are prepared by hand), they should be clear, accurate, and contain all necessary information.**

# Department of the Army Permit Application
# SUPPLEMENTAL QUESTIONNAIRE

A complete Department of the Army Permit Application consists of the application form (ENG Form 4345, *http://usace.army.mil/CECW/Documents/cecwo/reg/eng4345a.pdf*), drawings and environmental information necessary to determine a project's probable impact on the public interest (33 CFR Part 325.1 (d)(1) and Part 325.3(a)). Based on our experience, the environmental information necessary to make the public interest determination is often inadequate when only the ENG Form 4345 form is submitted by applicants. Project managers must then request additional information from applicants, resulting in delays in project evaluation. In order to provide more efficient processing of your application, this questionnaire has been developed to supplement the information required in ENG Form 4345 and to simplify your submittal of environmental assessment information.

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**A. LOCATION** (supplement to Blocks 15-16 of ENG Form 4345):

1. Please provide the Tax Map Key number(s) for the project site:_____
2. Please provide the Latitude _____ and Longitude_____.
3. Please provide the watershed in which work is proposed:_____

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**B. PROPOSED ACTION** (supplement to Block 18 of ENG Form 4345)

1. Please provide a detailed description of the scope of work, especially those activities that may adversely impact the aquatic environment, including the following pertinent information:
   a. Construction method(s) highlighting those methods requiring in-water work
   b. Machinery/equipment necessary to complete construction
   c. Staging/Access requirements
   d. Construction sequence
   e. Construction scheduling (begin & end dates)
   f. Location of stockpiling of material. (Be advised, stockpiling of materials in waters of the U.S. is discouraged. If unavoidable, stockpiling of materials in waters of the U.S. will require prior authorization from this office as it constitutes a temporary discharge of fill material.)
2. Please provide the location of borrow and upland disposal sites for construction materials and any excess materials not utilized to complete the project
3. Please provide a description of Best Management Practices i.e., silt fence/curtain, sheet pile, sandbags, etc., proposed for implementation throughout the project site as a measure to prevent degradation of the aquatic environment. Include a diagram showing placement of BMPs relative to the project site with the

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**C. DISCHARGE OF DREDGED AND/OR FILL MATERIAL** (supplement to Blocks 20-22 of ENG Form 4345).

1. State the source of the dredged or fill material.*
2. State the method of discharge. Provide type of equipment/machinery required.
3. Indicate the location of the discharge within the project site. This is best accomplished through a plan view drawing of the site that shows the footprint of the filled area (discharge). A cross-sectional view with existing and proposed contours (elevations) also provides necessary information on the scope of proposed work.** The cross-sectional view should clearly demarcate either the Mean High Water Mark or the Mean Higher High Water Mark/High Tide Line for tidal waters or the Ordinary High Water Mark for non-tidal waters. Definitions of these limits of jurisdiction are available at, *http://gpo.gov/fdsys/pkg/CFR-2011-title33-vol3/pdf/CFR-2011-title33-vol3-part328.pdf.* Be advised, the Corps has sole authority to assert jurisdiction over a water body.
4. What types of structures or facilities would be constructed on the fill area? (Show on drawings their dimensions, layout, etc.)

*Note that Blocks 21 and 22 of ENG Form 4345 require both the volume (usually given in cubic yards) *and* surface area (square feet, acres, etc.) of fill.
**Please submit any drawings on 8 ½" x 11" paper.

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**D. DREDGING PROJECTS**

1. Please provide plans showing the dredging footprint within the project site. Include cross-sectional views depicting the existing and proposed contours. Also include a location/vicinity map and plan view (if appropriate) of the area(s) where dredge spoil will be stockpiled, processed, and disposed.
2. What is the type and composition of the material to be dredged?
3. How much time will be required to complete the dredging (construction window)? Will the dredging project be accomplished in phases? If so, please describe. Is maintenance dredging proposed, and, if so, what is the timeframe of the dredging cycle?
4. How much material will be dredged?
   a. Volume:
   b. Surface area:
5. State what dredging method(s) will be used, and indicate why that method(s) is proposed.
6. Where will the dredged material be de-watered?
7. Do you plan to transport dredged material for the purpose of disposing it in the ocean?
   a. Where do you plan to dispose of the dredged material?
   b. How much material (volume) will be disposed?
   c. What is the type and composition of the material?
   d. How long do you plan to dispose of the material?
   e. How will you transport the material to the ocean dump site?

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## E. STRUCTURES IN NAVIGABLE WATERS

Be advised that the Corps considers and as such, regulates, some BMPs as structures.

1. What specific structures will be constructed (type and size) and with what machinery and/or equipment?
2. Is in-water work required? If yes, describe.
3. What will the structures be used for?
4. Describe support and/or anchoring systems, where applicable.

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## F. EXISTING ENVIRONMENT

**Please submit photos when possible!**

1. PHYSICAL ENVIRONMENT

   a. How would you generally describe the project area and surrounding area?
      (1) Level of development:
      (2) Existing land and water use:
      (3) Other general features:
   b. What kind of substrate (i.e., rock, rubble, soil, etc.) is found at the project site?
   c. What is the range of water levels which occur (during normal tides and during storm of flood periods)?
   d. Describe the water currents and water circulation patterns at the project site.
   e. What is the salinity (salt, brackish, or fresh) of the water at the project site?
   f. What is the quality of the water at the project site? For instance, in Hawaii a stream may be listed as a 303(d) Impaired Water by the State Department of Health (DOH).
   g. Is this area a groundwater recharge area?
   h. What is the history or possibility of contaminants/pollutants in the substrate (soil) at the source of fill material?
   i. Have there been problems with erosion at or near the project site?
   j. Is the project site located in or near a drainage way or flood plain? If yes, describe.
   k. What is the quality of the air at the project site? Will the proposed project have an adverse, or insignificant, effect on air quality at the site? Will the impacts to air quality be temporary or permanent?
   l. What are the existing noise levels at the project site? Will the proposed project have an adverse, or insignificant, effect on noise levels at the site? Will the impacts to noise levels be temporary or permanent?

2. BIOLOGICAL ENVIRONMENT (attach biological survey reports if available)

   a. Biological survey reports from a qualified environmental professional can provide much of the necessary information for evaluating a project's potential to impact aquatic resources. If not available, a general characterization of the plants and animals at the site should be provided.

b. Please list any plants and animals found within or near the project area that are listed as threatened or endangered under the Endangered Species Act of 1973. *http://fws.gov/pacificislands/teslist.html.*

3. SPECIAL AQUATIC SITES
Is the project site located at or adjacent to any of the following areas? (Show on vicinity drawings the extent of the special sites, if they are present, clearly labeling each type.) Are any of these sites proposed for impact as a result of this project?

| Special Aquatic Site: | Dredge Site | Discharge Site | Construction Site |
|---|---|---|---|
| Wetlands (swamps, marshes, bogs) | | | |
| Mudflats | | | |
| Vegetated Shallows/Seagrass beds | | | |
| Coral Reefs | | | |
| Riffle & Pool Complexes (streams) | | | |

4. PUBLIC INTEREST REVIEW

a. What is the existing land use zoning for the site and its vicinity?
b. What is on the land (including dwellings, facilities, etc.) at or near the site?
c. Do any of the following occur at or near the site?

| Characteristic | Dredge Site | Discharge Site | Construction Site |
|---|---|---|---|
| Local fresh water supply | | | |
| Fishing (recreational, commercial) | | | |
| Scenic areas | | | |
| Agriculture (type) | | | |
| Aquaculture (type) | | | |
| Historic sites (type) | | | |
| Other cultural resources (type) | | | |
| Parks, monuments, preserves, etc. | | | |
| Other (type) | | | |

## G. ENVIRONMENTAL EFFECTS OF PROPOSED PROJECT

Briefly describe the environmental effects which may be expected as a result of your proposal, referring to the items listed in Section F above. Please don't answer "none"..all projects have some effects.

1. Physical environment (effects on land, water, air, soil, etc.)
2. Biological environment (effects on plants, animals, and habitats)
3. Special aquatic sites (effects on wetlands, coral reefs, etc.)
4. Human use (how existing human activities would be affected)
5. Historical/Cultural resources. The Corps must evaluate permit applications pursuant to Section 106 of the National Historic Preservation Act. In many cases, the Corps must coordinate its determination of a project's potential to adversely affect historic sites with the

local Historic Preservation Officer. The Corps encourages applicants to contact their local Historic Preservation Officer as soon as possible in the project planning process to address any issues relevant to Section 106.

   a. The State of Hawaii's Historic Preservation Office can be found at, *http://hawaii.gov/dlnr/hpd/hpgreeting.htm.*
   b. The Guam Historic Preservation Office can be found at, *http://historicguam.org/index.htm*

6. Indirect impacts (will the project eventually encourage or discourage residential, agricultural, urban, industrial or resort activities?)
7. Cumulative impacts (Is this project similar in purpose, characteristics, and location compared to previous projects? Will this project lead to or be followed by similar projects? Are there other activities in the area similar to your proposed activity?)
8. Other impacts

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**ALTERNATIVES to Activities Conducted in Aquatic Areas**

1. List other sites which may be suitable for this proposal and indicate whether these are or could become available to you. If none, explain why.
2. If your project involves the discharge of fill material to convert wetlands or submerged areas to upland (dry land), list any existing upland sites which are or could become available to you. If none, clearly explain why.
3. List other methods or project designs which would fulfill the basic purpose of your proposal. Which ones are reasonable for you? If none, explain why.
4. If your permit application were denied, what other alternatives would you have?
5. What can you do to avoid or minimize adverse effects of your proposal on the environment? For instance, a project might be relocated to a non-aquatic site, the footprint of fill or dredging can be minimized to only that which is necessary to achieve project purpose, a project footprint might be moved within a site to avoid aquatic resources, and/or different construction methods that do not require in-water work could be used.

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Please see the Honolulu District's Compensatory Mitigation and Monitoring Guidelines on-line on our web site (*http://poh.usace.army.mil/regulatory.asp*), or contact the Corps office listed below to request a hard copy. Thank you for your cooperation in this manner. If you have any questions, please contact the Corps of Engineers, Regulatory Branch at (808) 438-9258 in Honolulu or at (671) 339-2108 in Guam.

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Jessica Wooley
Director
State of Hawai‘i Department of Health
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu, Hawai‘i 96813

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Wooley:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Daniel E. Orodenker
Executive Officer
State of Hawai‘i Land Use Commission
235 S. Beretania Street, #406
Honolulu, Hawai‘i 96813

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Orodenker:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project. The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Karen Ikemoto
Librarian
Hanapēpē Public Library
P.O. Box 2360
Hanapēpē, Hawai‘i 96716

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Ikemoto:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Raymond J. McCormick, P.E.
District Engineer
State of Hawai‘i Department of Transportation – Kaua‘i District
1720 Haleukana Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. McCormick:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project. The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Alvin Takeshita, P.E.
Highways Administrator
HDOT Highways Division
869 Punchbowl Street, Room 513
Honolulu, Hawai‘i 96813

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Takeshita:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project. The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

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In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

DAVID Y. IGE
GOVERNOR

FORD N. FUCHIGAMI
DIRECTOR

DEPUTY DIRECTOR
ROSS M. HIGASHI

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

IN REPLY REFER TO:
HWY-1996
HWY-PS 2.8605

December 19, 2014

Mr. Max Solmssen
Project Manager
Community Planning and Engineering, Inc.
1286 Queen Emma Street
Honolulu, Hawaii 96813

Dear Mr. Solmssen:

Subject: Consultation for HRS 343 and NEPA Environmental Assessment
Lima Ola Workforce Housing Development
Eleele, Kauai, TMK: (4) 2-1-001:054

The proposed project is planned to provide affordable housing for elderly residents and workforce housing for families. It will consist of approximately 550 dwelling units, of various types, on 75 acres and will include a community center and park, bike and pedestrian paths, and vegetation buffers. Access to the development will be primarily from up to two points (extensions of Laulea Street and Mahea Road) along Kaumualii Highway, State Route 50 with a future access via Halewili Road, State Route 540.

A Traffic Assessment (TA) shall be prepared and submitted to the Department of Transportation for review and acceptance. The TA shall evaluate the project access intersections to Kaumualii, determine impacts, and propose mitigation as needed for those impacts. The TA shall also evaluate intersections along Kaumualii to the east to its junction with Halewili Road, and to the west up to Moi Road to determine whether project traffic has unacceptable impacts to Kaumualii Highway and provide mitigation as needed. The project shall mitigate its traffic impacts at no cost to the State.

It is assumed that the future access to Halewili Road shown on the conceptual master plan will not be implemented during the project timeline; however if it is implemented the impacts to Halewili Road, and intersections along its length, will have to be determined and mitigation, as needed, provided at no cost to the State.

If there are any questions, please contact Ken Tatsuguchi, Engineering Program Manager, Highways Planning Branch, at 587-1830. Please reference file review number PS 2014-261 in all contacts and correspondence regarding these comments.

Very truly yours,

for Alvin A. Takeshita
Highway Administrator

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Bill Arakaki
State of Hawai‘i Department of Education
3060 Eiwa Street, Suite 305
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Arakaki:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Chairperson William J. Aila Jr.
State of Hawaii Department of Land and Natural Resources

Attention: Ms. Theresa Donham
Deputy State Historic Preservation Officer
601 Kamokila Boulevard, Suite 555
Kapolei, Hawai‘i 96707

Subject: Section 106 National Historic Preservation Act Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Donham:

Community Planning and Engineering, Inc., on behalf of the Kaua‘i County Housing Agency is in the process of preparing an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project. As part of the environmental review process, and in accordance with Section 106 of the National Historic Preservation Act (NHPA), we are requesting a determination if any documented historic or culturally significant resources exist at, or within close proximity to the subject parcel. Section 106 consultation under the NHPA is triggered due to potential project funding from the United States Department of Housing and Urban Development (HUD). The County of Kaua‘i represents HUD as the responsible federal agency requesting consultation under Section 106 of the NHPA.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. We are enclosing the following reference documents to assist with your review; a site location map which includes the Area of Potential Effect (APE), a site plan and an archaeological survey and cultural impact assessment that were conducted for the proposed project and submitted to your office by Scientific Consultant Services, Inc. in July, 2014.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012. All response letters can be sent to the following address:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

State of Hawai‘i Office of Hawaiian Affairs-Kaua‘i Office
4405 Kukui Grove Street, Suite 103
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

To Whom It May Concern:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

An archaeological survey and cultural impact assessment were completed at the proposed project site and is attached for your review. In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Brian Baligad
Plant Supervisor
Oceanic Time Warner
3022 Peleke Street, Suite 8
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Baligad:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Kaua‘i Postmaster
Līhu‘e Post Office
4441 Rice Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. David Bissell
President & CEO
Kaua‘i Island Utility Cooperative
4463 Pahe‘e Street, Suite 1
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Bissell:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Clisson Kunane Aipolani, Chair
Kaua‘i/Ni‘ihau Burial Council
P.O. Box 433
Kekaha, Hawai‘i 96752

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Chairperson Aipolani:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Kaua‘i Historical Preservation Commission
Pi‘ikoi Building
4444 Rice Street, Suite A47
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

COUNTY OF KAUAI
PLANNING DEPARTMENT
4444 RICE STREET, SUITE A473
LIHUE, KAUAI, HAWAII 96766

Phone: 808-241-4050
Fax: 808-241-6699

| | |
|---|---|
| TO: | MAX SOLMSSN<br>Community Planning and Engineering, Inc |
| FAX: | (808)526-2476 |
| # OF PAGES: | 3 (Including cover) |
| FROM: | SHANLEE JIMENEZ |
| DATE: | 12/30/14 |
| SUBJECT: | **Letter (12/3/14) requesting input to identify potential environmental and/or social and economic impacts associated with the Lima Ola Workforce Housing Development Project, TMK: 2-1-001:054, Eleele, Kauai, Hawai'i for the purpose of preparing a Chapter 343 Hawai'i Revised Statutes (HRS) Environmental Assessment (EA) in compliance with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58.** . |

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The above project will be reviewed at the January 6, 2015 Kauai Historic Preservation Review Commission meeting, a copy of the agenda is attached for your use and information. Please contact me at (808)241-4050 to confirm your attendance at the meeting.

Mahalo.

MEETING OF THE
KAUA'I COUNTY HISTORIC PRESERVATION REVIEW COMMISSION
**TUESDAY, JANUARY 6, 2015**
**3:00 p.m.**
Līhu'e Civic Center, Moikeha Building
Meeting Room 2A/2B
4444 Rice Street, Līhu'e, Kaua'i

AGENDA

CALL TO ORDER

APPROVAL OF THE AGENDA

APPROVAL OF THE OCTOBER 2, 2014 MEETING MINUTES

A. ANNOUNCEMENTS AND GENERAL BUSINESS MATTERS

B. COMMUNICATIONS

1. Letter (12/3/14) from Max Solmssen, Project Manager, Community Planning and Engineering, Inc. requesting input to identify potential environmental and/or social and economic impacts associated with the Lima Ola Workforce Housing Development Project, TMK: 2-1-001:054, Eleele, Kauai, Hawai'i for the purpose of preparing a Chapter 343 Hawai'i Revised Statutes (HRS) Environmental Assessment (EA) in compliance with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58.

C. UNFINISHED BUSINESS

1. Letter (9/16/14) from Michael Hunnemann, KAI Hawai'i, Inc. request to present an update of design of Kapahi, Puuopae, and Opaekaa Bridges; request design variation to Opaekaa Bridge (steel girders in lieu of concrete); and an update on site visit to Opaekaa Bridge by consulting engineer, historic architect, and SHPD representative.

2. CLG Status

D. NEW BUSINESS

1. Class IV Zoning Permit Z-IV-2015-8, Project Development Use Permit PDU-2015-7, Variance Permit V-2015-1 and Special Management Area Use Permit SMA(U)-2015-6 to permit repair and reconstruction of the former Coco Palms Resort including but not limited to: 350 hotel units, Lotus Restaurant and Flame Room Bar, the Lobby Building, the Commercial Building, three swimming pools, Queen's Audience Hall, the Palms Lanai, the Utility and Maintenance Building, Sea Shell Restaurant, Chapel in the Palms, 2 of 4 Bridge Crossings, and the construction of a new Queen Lagoon Building into a spa and gym facility on the site of the previously demolished structure. The project is situated in Wailua and located at 04-241 Kūhi'ō Highway, further identified as Tax Map Keys 4-1-003: 004 (por.), 005, 007, 011, and 017 and 4-1-005: 014 and 017.

   a. Memorandum (10/15/14) to Michael Dahilig, Director of Planning regarding Section 6E-10 Historic Preservation Review, Bridge Removal – Coco Palms Lagoon.

2. Class IV Zoning Permit Z-IV-2015-12 and Use Permit U-2015-11 to operate a self-storage facility and resource recovery facility for construction materials within the Nāwiliwili Bulk Sugar Building in Nāwiliwili, Tax Map Key: (4)3-2-005:009.

E. COMMISSION EDUCATION (None)

F. SELECTION OF NEXT MEETING DATE AND AGENDA TOPICS (2/5/2015)

G. ADJOURNMENT

**EXECUTIVE SESSION: The Commission may go into an executive session on an agenda item for one of the permitted purposes listed in Section 92-5(a) Hawaii Revised Statutes ("H.R.S."), without noticing the executive session on the agenda where the executive session was not anticipated in advance. HRS Section 92-7(a). The executive session may only be held, however, upon an affirmative vote of two-thirds of the members present, which must also be the majority of the members to which the board is entitled. HRS Section 92-4. The reason for holding the executive session shall be publicly announced.**

**Note: Special accommodations and sign language interpreters are available upon request five (5) days prior to the meeting date, to the County Planning Department, 4444 Rice Street, Suite 473, Lihue, Hawaii 96766. Telephone: 241-4050.**

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Sarah Peters
State of Hawai‘i Association of Hawaiian Civic Clubs
P.O. Box 1135
Honolulu, Hawai‘i 96807

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Peters:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Hui Mālama I Nā Kupuna ‘O Hawai‘i Nei
P.O. Box 190
Hale‘iwa, Hawai‘i 96711

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

To Whom It May Concern:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Hui Kakoʻo ʻĀina Hoʻopulapula
P.O. Box 37958
Honolulu, Hawaiʻi 96837

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
ʻEleʻele, Kauaʻi, Hawaiʻi

To Whom It May Concern:

Community Planning and Engineering, Inc. on behalf of the County of Kauaʻi, is in the process of preparing a Chapter 343 Hawaiʻi Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ʻEleʻele on the Island of Kauaʻi (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. James Sone
Lead Network Engineer
Hawaiian Telcom
4040 Halau Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Sone:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

United States Environmental Protection Agency
Region 9, Hawai‘i Office
P.O. Box 50003
Honolulu, Hawai‘i 96850

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Kaua‘i Postmaster
‘Ele‘ele Post Office
4485 Waialo Road
‘Ele‘ele, Hawai‘i 96705

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Laura MacIntyre
Manager
State of Hawai‘i Department of Health Environmental Planning Office
919 Ala Moana Boulevard
Honolulu, Hawai‘i 96814

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. MacIntyre:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Gerald Takamura, Chief
District Environmental Health Program - Kaua‘i
State of Hawai‘i Department of Health
3040 Umi Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Takamura:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Chairperson
State of Hawai‘i Department of Agriculture
1428 South King Street
Honolulu, Hawai‘i 96814

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Leo R. Asuncion, Jr.
Acting Director
State of Hawai‘i DBET – Office of Planning
P. O. Box 2359
Honolulu, Hawai‘i 96804

Subject: Lima Ola Workforce Housing
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Asuncion:

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

# OFFICE OF PLANNING
# STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

DAVID Y. IGE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/


Ref. No. P-14620

January 2, 2015


RECEIVED
JAN - 5 2015
COMMUNITY PLANNING AND ENGINEERING INC.


Mr. Max Solmssen, Project Manager
Community Planning and Engineering, Inc.
1286 Queen Emma Street
Honolulu, Hawaii 96813

Dear Mr. Solmssen:

Subject: Lima Ola Workforce Housing
TMK: 2-1-001: 054
Eleele, Kauai, Hawaii

Thank you for the opportunity to review and comment on the preparation of a Chapter 343, Hawaii Revised Statutes, Environmental Assessment (EA) and compliance with the National Environmental Protection Act (NEPA). The County of Kauai is proposing to construct affordable housing to its elderly residents and workforce housing for families. The 75-acre site will contain about 550 housing units built in several phases. The development will include single and multi-family units, community center, park, bike and pedestrian paths and vegetation buffers.

The Office of Planning (OP) has the following comments.

1. OP provides technical assistance to State and county agencies in administering the statewide planning system in Hawaii Revised Statutes (HRS) Chapter 226, the Hawaii State Plan. The Hawaii State Plan provides goals, objectives, priorities, and priority guidelines for growth, development, and the allocation of resources throughout the State. The Hawaii State Plan includes diverse policies and objectives of state interest including but not limited to the economy, agriculture, the visitor industry, federal expenditure, the physical environment, facility systems, socio-cultural advancement, and sustainability. The three-acre lot is less than 15-acres, which would allow the County Planning Department to process and approve the proposed Special Permit.

   The Draft Environmental Assessment should include an analysis of the Hawaii State Plan, HRS Chapter 226, in a section that addresses the project's conformity or conflict with State and county plans, policies, and controls. The analysis should include a discussion on the project's ability to meet the objectives and policies listed in HRS Chapter 226.

2. OP is the lead agency for the Hawaii Coastal Zone Management Program. The coastal zone management area is defined as "all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the U.S. territorial sea" see HRS § 205A-1 (definition of "coastal zone management area").

   The Draft EA should include a statement in a section that addresses how the project conforms or is in conflict with State and county plans, policies, and controls. The statement should include a discussion of the proposed project's ability to meet all of the objectives and policies set forth in HRS § 205A-2. Where a conflict or inconsistency exists, the statement must describe the extent to which the applicant has reconciled its proposed action with this statute. These objectives and policies include: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, managing development, public participation, beach protection, and marine resources.

3. The project area's proximity to the coastal area may result in nonpoint pollution impacts on coastal waters. Based on the documents submitted to OP, this workforce housing project is approximately 1,500 feet from Hanapepe River and ¾ of a mile from the near shore waters of Hanapepe Bay. Please review the Hawaii Watershed Guidance, which provides a summary and links to management measures that may be implemented to minimize coastal nonpoint pollution impact. Specifically, please examine page 120 (management measure for new development). The Watershed Guidance can be viewed or downloaded from the Office of Planning website at http://files.hawaii.gov/dbedt/op/czm/initiative/nonpoint/HI Watershed Guidance Final.pdf.

4. The entire island of Kauai is subject to very flashy/unstable weather patterns year round. Therefore please consider utilizing OP's Stormwater Impact Assessment to identify and evaluate information on hydrology, stressors, sensitivity of aquatic and riparian resources, and management measures to control runoff occurrences. In particular, please examine Low-Impact Development Concepts. These concepts include decentralized micro-scale controls that infiltrate, filter, store, re-use, evaporate, and detain runoff close to its source.

   This guidance document will assist in integrating stormwater impact assessment within your review process. The purpose of this document is to provide guidance on assessing stormwater impacts in the planning phase of project development. The goal is to provide a suggested framework and various tools for integrating stormwater impacts assessment. Please review the Low-Impact Development Concepts listed on pages 14-16 of the Stormwater Impact Assessment guidance. This can be found at http://files.hawaii.gov/dbedt/op/czm/initiative/stomwater_imapct/final_stormwater_impact_assessments_guidance.pdf.

5. The entire site is within the State Agricultural District. The proposal will require that the Property be reclassified to the State Urban District through the Land Use Commission. OP represents the State as a mandatory party in proceedings before the Land Use Commission. In developing its position, OP evaluates whether the project meets the LUC decision-making criteria in HRS § 205-17, as well as its conformance with Coastal Zone Management objectives and policies in HRS § 205-A-2.

6. Attached for your review and consideration in your environmental assessment and Petition is a document entitled "Attachment A – Issues of Concern in District Boundary Amendment Proceedings Based on LUC Decision-Making Criteria." We encourage the Petitioner's early consultation with our office to discuss how a petition will address these issues and criteria – particularly the areas of State concern in this document and best practices that could or will be incorporated in the proposed project to address State priority guidelines for sustainability. A short list of resources related to best practices can be found at the OP website at http://hawaii.gov/dbedt/op/land_use.htm.

Thank you for the opportunity to review this project. If you have any questions please call either Josh Hekekia of our Coastal Zone Management Program at (808) 587-2845 or Lorene Maki of our Land Use Division at (808) 587-2888.

Sincerely,

for Leo R. Asuncion
Acting Director

c: Land Use Commission

LAND USE COMMISSION
STATE OF HAWAII
2015 JAN 29 P 4: 32

**Attachment A**
**Issues of Concern in District Boundary Amendment Proceedings**
**Based on LUC Decision-Making Criteria**

The following issues are commonly discussed and analyzed for project proposals in petitions and their supporting environmental assessments (EAs) or environmental impact statements (EISs) prepared pursuant to Chapter 343, Hawai'i Revised Statutes (HRS). This list reflects the range of issues the State Land Use Commission (LUC) must take into consideration in its decision-making under Chapter 205, HRS, and Chapter 15-15, Hawai'i Administrative Rules (HAR). This list is not exhaustive or complete.

1. **Water Resources.** Groundwater and surface water resource protection and water quality are critical State issues. A thorough evaluation of these resources includes identifying and discussing: (a) estimated water demand by types of land use; (b) proposed potable and non-potable water sources to be used for the project and measures to reduce water demand and promote water reuse in the project; (c) whether the proposed project is within a designated Water Management Area; (d) the impact of the project on the sustainable yield and water quality of affected aquifers and surface water sources; (e) permits or other approvals required for proposed water source use; and (f) the consistency of the project and impact of the project in terms of proposed water use and system improvements and priorities contained in the County water use and development plan, prepared pursuant to the State Water Code, Chapter 174C, HRS.

2. **Agricultural Lands.** Article XI, Section 3, of the Hawai'i State Constitution provides that "[t]he State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency, and assure the availability of agriculturally suitable lands." Protecting agriculture is a policy objective in the Hawai'i State Plan, Chapter 226, HRS, and in the State Administration's New Day Comprehensive Plan, which is available at http://hawaii.gov/gov/about/a-new-day. Agricultural activity in the vicinity of the proposed project should be identified, and the impact of urban use or conversion of project lands on existing and future agricultural use and the viability of agricultural use of adjoining agricultural lands needs to be examined. Please discuss how the proposed project meets policy objectives to promote and protect agriculture, particularly in cases where the lands have high agricultural value.

3. **Affordable Housing.** Increasing the supply of affordable housing is a critical State and County issue. Every County has an affordable housing policy and both the Hawai'i State Plan, Chapter 226, HRS, and the State Administration's New Day Comprehensive Plan identify affordable housing as a policy priority. If applicable, please discuss specifically how the proposed project will meet State and County affordable housing policy objectives, to include a discussion of how the project's proposed residential product types will be allocated among the market and various affordable housing target populations, and the expected price ranges for the different product types.

4. **Coastal Zone Management (CZM).** The Office of Planning is the lead agency for the Hawai'i CZM Program, which is a Federal-State partnership for protecting, restoring, and responsibly developing coastal communities and resources. The coastal zone is defined as all lands of the State and the area extending seaward from the shoreline to the limit of the State's police power and management authority, including the United States territorial sea (HRS § 205A-1). EA/EISs should reference this definition of the coastal zone. State agency actions must be consistent with the CZM program objectives and policies under Section 205A-2, HRS. The EA/EIS needs to discuss the project in terms of its consistency with the following CZM objective areas.

   a. **Coastal and Ocean Resources.** The State has an interest in protecting coastal and marine ecosystems and resources, as well as coastal and marine water quality. The EA/EIS should identify any coastal and marine resources and ecosystems that may be impacted by the proposed project, and the potential for nonpoint sources of pollution from the project to adversely affect coastal and marine water quality. Project impacts on existing site and offsite

hydrology and measures to manage stormwater and runoff need to be discussed. The Office of Planning recommends the use of low impact development (LID) techniques and other best management practices (BMPs) that promote onsite infiltration and minimize runoff from storm events. More information on LID and stormwater BMPs can be found at http://hawaii.gov/dbedt/czm/initiative/lid.php.

b. **Coastal and Other Hazards.** The EA/EIS should describe any hazard risks that are relevant to the site and describe the measures that are proposed to mitigate any hazard impacts, such as from tsunami, hurricane, wind, storm wave, sea level rise, flood, erosion, volcanic activity, earthquake, landslide, subsidence, and point and nonpoint source pollution. This should include a discussion of any wildfire hazard and any mitigation measures that might be required to address potential threats from wildfires.

   The EA/EIS process also provides an opportunity to address the sustainability of proposed projects in terms of natural hazards and hazard mitigation, and the potential impact of climate change on the proposed project over time. To this end, OP recommends the final EA/EIS include a discussion of the proposed project with respect to the *State Multi-Hazard Mitigation Plan, 2010 Update*, adopted in September 2010, available at http://www.scd.hawaii.gov/documents/HawaiiMultiHazardMitigationPlan2010PUBLIC.pdf, as well as the respective County Hazard Mitigation Plan.

c. **Coastal-dependent Uses and Beach Protection.** If the project is located on or near the coast, the EA/EIS should discuss why the proposed development needs to be located on the coast, the economic uses that will be of benefit to the State, as well as potential impacts on beach access. The discussion should identify measures to protect beach systems and ensure short- and long-term public access to beaches.

d. **Coastal Recreational Resources.** If the project is located on the coast, the EA/EIS should include a description of recreational uses and facilities on or near the project site, and discuss how the impact of increasing users on coastal and ocean recreational resources and competing uses will be mitigated and managed during project development and buildout.

e. **Scenic Resources.** The EA/EIS should discuss the impact of the proposed project on scenic views to and from the coast and along the coast and coastal open space, and how any impacts on these scenic and open space resources will be avoided, minimized, or mitigated.

f. **Special Management Area (SMA) Permitting.** The SMA is defined by the Counties and includes areas in the coastal zone that are particularly sensitive so that it requires special attention. Please identify whether the proposed project is within the SMA and how SMA permitting requirements pursuant to Chapter 205A, HRS, will be satisfied.

For additional resources and information, visit http://hawaii.gov/dbedt/czm.

5. **Cultural, Archaeological, and Historic Resources.** Another CZM objective is to protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone that are significant in Hawaiian and American history and culture. If archaeological or historic properties or artifacts, including native Hawaiian burials, are identified in an archaeological inventory survey on the property, the EA/EIS should discuss how the petitioner has consulted with the State Historic Preservation Division (SHPD), what plans will be prepared to monitor or protect identified resources, and how the petitioner intends to comply with Chapter 6E, HRS, related to historic preservation, and the CZM objective and policies for historic resources contained in Sections 205A-2(b) and (c). SHPD has information and guidance available at http://hawaii.gov/dlnr/hpd/hpgrtg.htm.

The EA/EIS document should identify any cultural resources and cultural practices associated with the property, including visual landmarks, if applicable, and discuss the impact of the proposed project on identified cultural resources and practices as well as proposed mitigation measures. The LUC is obligated

under Article XII, Section 7 of the Hawai'i State Constitution to protect the reasonable exercise of customarily and traditionally exercised native Hawaiian rights. Thus, the LUC requires information as to the presence of cultural resources and cultural practices associated with the project site and vicinity for decision-making on petitions. The State Office of Environmental Quality Control provides guidance for preparing a cultural assessment at http://oeqc.doh.hawaii.gov, at "Environmental_Assessment_PrepKit." (http://oeqc.doh.hawaii.gov/Shared%20Documents/Preparation_of_Hawaii_Environmental_Policy_Act_Documents/Guidance_on_Cultural_Impact/1997%20Cultural%20Impacts%20Guidance.pdf)

6. **Biota.** The EA/EIS should include an inventory and assessment of flora and fauna, including invertebrates, found on or in proximity to the project site and in any lava tubes and caves on the property that are listed on the federal or State list of endangered or threatened species. Please also discuss species of concern and candidates for listing. The petitioner should consult with the Database Manager at the Hawai'i Biodiversity and Mapping Program, Center for Conservation Research and Training, University of Hawai'i, (808) 956-8094, as to the potential for the presence of rare species in the project area. The EA/EIS should discuss measures to be taken to protect rare, threatened, or endangered species or ecosystems of concern as required by law. The design of the biological survey should consider both wet and dry season observations to capture the fullest range of flora and fauna.

7. **Wastewater Treatment and Disposal.** The EA/EIS needs to identify the anticipated volume of wastewater to be generated by type of user, as well as the proposed means of wastewater treatment and disposal. A discussion of the availability of County wastewater collection and treatment capacity and its existing service levels, design capacity, and allocated capacity is also needed. The EA/EIS should also identify whether any facility improvements would be required to accommodate additional wastewater generated within the service area, including the proposed project. If a private wastewater treatment system is identified as the preferred option, the EA/EIS should discuss the type of plant to be used, permitting requirements, plans for reuse and/or disposal of treated effluent and waste solids, and how the private system will be operated and maintained.

8. **Energy Use and Impacts.** The State Hawai'i Clean Energy Initiative has adopted a goal of using efficiency and renewable energy resources to meet 70 percent of Hawai'i's energy demand by 2030, with 30 percent from efficiency measures and 40 percent from locally-generated renewable sources. The EA/EIS should quantify the projected energy requirements of the project and discuss measures to be taken to reduce energy demand, promote energy efficiency, and to promote use of alternative, renewable energy sources. Please discuss how energy efficiency and energy demand reduction, including reduced transportation energy use will be incorporated in the design of the project and identify the kinds of green building and sustainable design practices that could be used to promote energy and resource conservation in the proposed project. Please also identify any generating or transmission capacity constraints that may arise as a result of the proposed project and other projects planned for the region.

9. **Impact on State Facilities and Resources.** The EA/EIS should quantify the impacts of the proposed project on State-funded facilities, including schools, highways, harbors, and airports, and discuss these impacts in terms of existing and planned capacity of the impacted facilities. The EA/EIS should cite the mitigation measures proposed to be used in the development of the project and describe efforts to address identified State agency concerns. Regarding transportation impacts, consider project design options that limit the need to drive, including mixed land uses, compact site design, walkable neighborhoods, and providing a variety of transportation choices (e.g., biking, public transit, etc.).

10. **Conservation District.** If the proposed project is within the State Conservation District, the EA/EIS should provide an inventory of conservation resources, and discuss how the loss of these resources (habitat, watershed area, etc.) will impact the public.

11. **Conformance with County Plan Designations and Urban Growth or Rural Community Boundaries.** Act 26, Session Laws of Hawai'i 2008, reaffirmed the Land Use Commission's duty to consider any proposed reclassification with respect to the Counties' adopted general, community, or development plans. If the proposed project is not consistent with the County plans or lies outside a County urban growth or rural community boundary, the EA/EIS should provide an analysis and discussion of the following:

    a. **Alternative Sites Considered.** Describe and discuss alternative sites that were considered for the project, and discuss why the project could not be accommodated on lands within the urban growth or rural community boundary, if the county plan delineates such boundaries, or on land already designated by the county for similar uses.

    b. **Impact on Surrounding Lands.** Discuss what the impacts of changing the county plan designation or extending the urban growth or rural community boundary would have on the surrounding lands.

    c. **Significant Public Benefit.** Discuss what, if any, public benefits are provided by the proposed project above that already required under existing approval and permitting requirements.

    d. **Plan Amendment.** Provide a timeframe for application for and approval of any required plan amendment.

12. **Environmental Health Hazards.** The EA/EIS should discuss the potential for the project or project users to generate hazardous materials or release possible contaminants to the air, soil, or water, as well as measures to be taken to ensure that environmental and public health and safety will be protected during construction and after buildout. The EA/EIS should also identify and discuss any potential health and environmental threats that may be present due to site-specific contamination from past or current use. If contaminants of concern are identified for the project site, OP recommends that the petitioner consult with the State Department of Health's Hazard Evaluation and Emergency Response Office as to measures to be taken to address possible or actual contamination at the site.

13. **Solid Waste Management.** The EA/EIS should quantify the volume of solid waste likely to be generated by the project by types of users, and describe the impact the project will have on the County's existing and planned capacity for managing solid waste as represented in the County's solid waste management plan. The EA/EIS should discuss specific mitigation measures to be taken to reduce solid waste generation and ensure that recycling and reuse are incorporated within the project area by residential, commercial, and institutional users.

14. **Sustainability Analysis.** OP is implementing the sustainability elements of the State Administration's New Day Comprehensive Plan and Act 181, Session Laws of Hawai'i (SLH) 2011 (the new sustainability priority guideline of the Hawai'i State Planning Act) by asking petitioners to prepare sustainability plans for their projects in anticipation of district boundary amendment proceedings before the LUC. LUC Dockets A06-771, DR Horton-Schuler Homes (Ho'opili) and A11-793, Castle & Cooke Homes (Koa Ridge Makai/Castle & Cooke Waiawa) provide a good point of reference for sustainability plans. The Koa Ridge Sustainability Plan and Ho'opili Sustainability Plan can be found on the LUC's web site under each respective docket's exhibits. Links to additional helpful resources can be found at the OP website at http://hawaii.gov/dbedt/op/land_use.htm.

    OP evaluates sustainability plans based on the *Healthy Community Design Smart Growth Checklist* prepared by the Hawai'i State Department of Health, Built Environment Working Group, which recommends that State and county planning departments, developers, engineers, and other professionals apply healthy built environment principles when they plan or review new

developments or redevelopments. *See* http://hawaii.gov/health/environmental/env-planning/landuse/hcdchecklist.pdf.

The *Checklist* is adapted from the *Smart Scorecard for Development Projects* (Congress for New Urbanism and the U.S/ Environmental Protection Agency, 2002) and *East Garrison Smart Growth Checklist* (Monterey, CA). The checklist applies Smart Growth principles to accomplish the following:

- Promote fitness through safe walking, biking, and other active transportation through connectivity of planned bikeways and paths with existing and adjacent networks, designing travelways that connect multiple destinations and encourage non-vehicular travel.
- Promote clean air by making transit convenient and comfortable, minimizing petroleum-fueled car and truck use, and minimizing fossil energy use.
- Promote a healthy environment by buying green products, reducing, reusing, and recycling, and minimizing waste in construction, operations, and demolition.
- Promote fitness and health by encouraging home and community gardens.

Factors to consider include Close Proximity to Existing/Future Development and Infrastructure; Site Optimization and Compactness; Mix and Balance of Uses; and Accessibility and Mobility Choices. The *Checklist* is flexible so that developers can implement what works for their particular development. It is also consistent with the objectives of Act 181, SLH 2011, and can help petitioners address reasonably foreseeable impacts caused by a proposed project on areas of State concern listed under Section 205-17, HRS.

15. **Development Timetable.** The LUC requires that projects seeking reclassification be substantially completed within ten years or seek incremental approvals, pursuant to Section 15-15-50, HAR. The EA/EIS and/or petitioner should provide a schedule of development for each phase of the total project and a map showing the location and timing of each phase or increment of development. Regarding infrastructure (e.g., highway improvements), the petitioner should discuss how improvements will be completed to ensure that mitigation coincides with the impact created by the proposed project.

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Celia Mahikoa
Executive on Transportation, County of Kaua‘i Transportation Agency
3220 Ho‘olako Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Mahikoa:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

**Bernard P. Carvalho, Jr.**
Mayor

**Nadine K. Nakamura**
Managing Director

**Celia M. Mahikoa**
Executive on Transportation

**TRANSPORTATION AGENCY**
**County of Kaua'i, State of Hawai'i**
3220 Ho'olako Street, Līhu'e, Hawai'i 96766
TEL (808) 246-8110 FAX (808) 241-6417

January 2, 2015

Mr. Max Solmssen, Project Manager
Community Planning & Engineering, Inc.
1286 Queen Emma Street
Honolulu, Hawai'i 96813

Dear Mr. Solmssen,

The County of Kaua'i, Transportation Agency appreciates the opportunity to comment on the Lima Ola project in respect to our area of concern. We are in full support of the project and look forward to participating in the review of the development plans as they progress along. At this early stage, we have a few general comments in relation to the operation of the public transit system and the Lima Ola Development that have been bullet pointed below:

- The proposed bus stop near the corner of Kaumuali'i Highway and Mahea Road should be in the NE bound lane. Please reference our bus stop design guidelines.
- Consideration for an additional two (2) bus stops at the corner of Kamualii Highway and the northern entrance of Laulea Street, one on each side of the street.
- Space considerations for para-transit services in and around the elderly housing areas of the development. (Safe routing in and out of the area, lift deployment and access to the facilities).
- Consideration to connect the northern road in the Habitat for Humanity project with the Lima Ola Project.

If you have any questions or comments, please feel free to contact us immediately. Mahalo for the ongoing support of The Kaua'i Bus.

Sincerely,

Celia Mahikoa
Executive on Transportation

RECEIVED
JAN - 7 2015
COMMUNITY PLANNING AND ENGINEERING INC.

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Darryl D. Perry
Chief of Police, Kaua‘i Police Department
3990 Ka‘ana Street, Suite 200
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Perry:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Michael Dahilig
County of Kaua‘i Planning Department
4444 Rice Street, Suite A473
Līhu‘e, Hawai‘i 96766

Subject: Compliance with the Farmland Protection Policy Act and Special Management Area (SMA) Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Dahilig:

Community Planning and Engineering, Inc., on behalf of the Kaua‘i County Housing Agency is in the process of preparing an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343 and HRS 201H. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 - *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*, for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. Funding may be sought from the United States Department of Housing and Urban Development (HUD). Therefore, a finding of compliance with the requirements of the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) must be made for HUD-assisted new construction activities. The County of Kaua‘i is required to provide HUD with a finding from the local planning agency if the proposed site includes prime or unique farmland, or other farmland of statewide or local importance, as identified by the Department of Agriculture, Natural Resources Conservation Service (NRCS). According to the County of Kaua‘i, the subject parcel is zoned Agricultural. The State of Hawai‘i Land Use Commission zoning for the subject parcel is Agricultural. The Site is not included in the inventory of Important Agricultural Lands (IALs) as defined by the State of Hawai‘i Land Evaluation and Site Assessment Commission.

While the subject parcel is zoned Agricultural under both State and County zoning, it has been identified as an ideal location to construct affordable housing near the town center of ‘Ele‘ele, Hanapēpē and Port Allen. Therefore, an exemption from County zoning and a State Land Use District Boundary Amendment from Agricultural to Urban will be processed though the HRS 201H exemption process for the proposed affordable housing project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

HUD also requires that HUD funded projects undergo a Coastal Zone Management (CZM) consistency review as authorized by the Coastal Zone Management Act of 1972. In Hawai‘i the Special Management Area (SMA) permitting system is part of the CZM Program approved by Federal and State agencies. Therefore, concurrence from your office that the proposed project is not located within the SMA is requested.

To assist with the review, enclosed is a project location map and proposed site plan associated with TMK No. (4) 2-1-001:054. Please send your written comments to:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, Hawai‘i 96813

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012.

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Lenny Rapozo
Director, City of Kaua‘i Department of Parks and Recreation
4444 Rice Street, Suite 105
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Rapozo:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

**Bernard P. Carvalho, Jr.**
Mayor

**Nadine K. Nakamura**
Managing Director

**Leonard A. Rapozo, Jr.**
Director

**Ian K. Costa**
Deputy Director

**DEPARTMENT OF PARKS & RECREATION**
**County of Kaua'i, State of Hawai'i**
4444 Rice Street, Suite 105, Līhu'e, Hawai'i 96766
TEL (808) 241-4460 FAX (808) 241-5126

January 5, 2015

Max Solmssen
CP&E
1286 Queen Emma Street
Honolulu, Hawaii 96813

SUBJECT: Lima Ola Workforce Housing Development

Dear Mr. Solmssen,

Thank you for the opportunity to participate in the Environmental Assessment Process for the 75 acre housing project located in Eleele. The County of Kauai, Department of Parks and Recreation (DOPR) has reviewed the proposed housing plan and supports its construction. The proposed 2.8 acres park is minimal in size and the maintenance of this park should be able to be performed by DOPR. However, with the proposed 550 units, this park may not be sufficient to serve the housing community with their recreational needs. There is a proposed park across this development but the time table for this development has not be finalized.

Should there are any other questions please contact this writer at (808) 241-4455.

Sincerely,

Leonard A. Rapozo, Director
County of Kauai
Department of Parks and Recreation

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COMMUNITY PLANNING AND ENGINEERING INC

*An Equal Opportunity Employer*

Community Planning and Engineering, Inc.

December 3, 2014

Mr. George K. Costa
Director, County of Kaua‘i Office of Economic Development
4444 Rice Street, Suite 200
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Costa:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project. The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Ms. Caroline Larson
Chief Librarian
Līhu‘e Public Library
4344 Hardy Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Larson:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Clyde Vito
Center Manager
Hanapēpē Neighborhood Center
4451 Puolo Road
Hanapēpē, Hawai‘i 96716

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Vito:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Robert Westerman
Fire Chief, County of Kaua‘i Fire Department
4444 Rice Street, Suite 315
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Westerman:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Larry Dill
County Engineer, County of Kaua‘i Public Works Department
4444 Rice Street, Suite 275
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Dill:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Kirk Saiki
Manager and Chief Engineer
County of Kaua‘i Department of Water
4398 Pua Loke Street
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Saiki:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

The purpose of the proposed project is to help the County of Kaua‘i and the State of Hawai‘i meet its goal to provide much needed affordable housing to its elderly residents and workforce housing for families. The proposed project site comprises approximately 75 acres and would include approximately 550 housing units that would be built in phases over several decades. Planned housing types include single family detached units, as well as multi-family attached units and elderly housing. A community center/park, bike and pedestrian paths and vegetation buffers are also included in the plan for the proposed project (See attached Project Location Map and Site Plan). The County of Kaua‘i purchased the Site in order for the County to develop much needed workforce housing for Kaua‘i residents. We are seeking your input to identify potential environmental and/or social and economic impacts associated with the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

In conjunction with this work, we are requesting any written comments and/or information with respect to your area(s) of concern. Please send your written comments to the following address by January 2, 2015:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

Community Planning and Engineering, Inc.

December 3, 2014

Kaua‘i County Council, Council Chair
4396 Rice Street, Suite 209
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

**COUNTY COUNCIL**
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**Council Services Division**
4396 Rice Street, Suite 209
Līhu'e, Kaua'i, Hawai'i 96766

December 30, 2014

Max Solmssen, Project Manager
Community Planning and Engineering, Inc.
1286 Queen Emma Street
Honolulu, Hawai'i 96813

Dear Mr. Solmssen:

**RE: LIMA OLA WORKFORCE HOUSING DEVELOPMENT ENVIRONMENTAL ASSESSMENT (EA)**
**TAX MAP KEY NO. (4) 2-1-001:054**
**'ELE'ELE, KAUA'I HAWAI'I**

Thank you for this opportunity to provide comments as Community Planning and Engineering, Inc. puts together an Environmental Assessment (EA) for Lima Ola, a workforce housing development proposed for lands located on the south-east side of Kaumuali'i Highway as it enters 'Ele'ele (Tax Map Key No. (4) 2-1-001:054) (the Lima Ola Site).

As Chair of the Kaua'i County Council's Committee on Housing & Transportation, I wholeheartedly support the development of affordable housing on Kaua'i. However, the proposed Lima Ola Workforce Housing project will have far-reaching negative environmental consequences that deserve careful analysis and disclosure, especially in the context of other possible alternatives.

Lima Ola deviates from established environmental planning policies by not being located in proximity to service and job centers, by its use of good agricultural lands for housing, and by a lack of mixed uses and mixed incomes within the development itself. The consequences will be increased reliance on the automobile, increased traffic, increased use of fossil fuels, increased greenhouse gases leading to greater impacts on climate change, and loss of good agricultural lands. The impacts from a 550-unit development in 'Ele'ele, especially when most of the jobs and job growth are, or are projected to be, on the south, east, and north shores of Kaua'i will have significant environmental impacts, and there should be a careful accounting of those long-term impacts in a full-blown Environmental Impact Statement (EIS).

## I. Lima Ola's Non-Alignment With Planning Principles Will Have Significant Environmental Impacts

Lima Ola does not follow the principles of the Hanapēpē-'Ele'ele Development Plan, the Kaua'i General Plan (GP), or the Kaua'i Multimodal Land Transportation Plan (MLTP), all of which are premised on goals of environmental protection and wise use of resources. While both the Hanapēpē-'Ele'ele Plan and the Kaua'i General Plan need to be updated, the County is obligated to follow the general principles of these plans until and unless they are changed through the proper process.

While "smart growth" principles are not yet officially incorporated in the County's GP or an updated Hanapēpē-'Ele'ele Development Plan, it is clear from recently adopted policy documents that the County of Kaua'i is embracing "smart growth" principles. The Kaua'i County Council's recent adoption of "Complete Streets" and "Safe Routes to School" resolutions were both strongly supported by Mayor Carvalho and his department heads. However, transportation policies alone cannot achieve "smart growth." The most recent plan accepted by the Administration and the County Council, the Kaua'i Multimodal Land Transportation Plan (January, 2013), points out:

> *Land use and transportation are inextricably linked. The land use program (of the MLTP) recognizes this by addressing critically important design criteria and development guidelines,* ***without which, much of the transportation components of this plan would be difficult to implement.*** *The land use program is guided by the three principle requirements for sustainable development: compactness, completeness, and connectedness. By following these principles the County will set forth a path to 'keeping Kaua'i rural,' a core vision of the County General Plan.* (Emphasis added)

Lima Ola is not compact. Unlike the two other County Housing Agency projects under construction, Kolopua and Rice Camp, which are at R-15 to R-20 densities, Lima Ola is suburban at R-7 density. Suburban development requires a car to get around and does not support the mode shift strategy in the MLTP from Single Occupancy Vehicle (SOV) to the multiple modes of walking, bicycling, and public transit. This mode shift would lessen the community's impact on the environment while protecting the rural character of Kaua'i. The MLTP quantifies the savings in fossil fuel use and greenhouse gas generation if the MLTP is followed. The reverse can be assumed if the plan is not followed.

Lima Ola is not complete. It is not mixed use. Therefore, it is not within safe walking and biking distances of services, businesses, jobs, schools, and other needs.

Lima is not connected. To make it safe to walk or bicycle to services, businesses, or school will require enormous costs that will negatively affect the feasibility of the project. Even then, the distances will encourage car use. If these costs are avoided as prohibitive, the costs will become externalities in the form of injuries or death occurring as people try to cross a major highway, or in the household costs incurred by driving kids to school or by health opportunities foregone due to lack of active transportation options.

## II. Projected Traffic Impacts From Not Adhering To MLTP Land Use Policies

The projected traffic impacts of a 550-unit development in 'Ele'ele confirm the value of the MLTP's land use policies. With the majority of jobs located in Līhu'e, Kapa'a, and Po'ipū-Kōloa, those likely to live in Lima Ola will be commuting to work by car. They are also likely to be driving to the grocery store, to drop off kids at school, to go to the post office, or to do most anything else. This will cause both local, regional (Kōloa-Po'ipū-Kalāheo), and inter-regional (Westside to Līhu'e) congestion and will require costly improvements at those three levels that an affordable housing project cannot absorb. On the other hand if the improvements are not made, the public and the environment will suffer from traffic congestion, delayed commutes, and additional costs.

The Traffic Impact Analysis Report (TIAR) conducted by Hatch Mott MacDonald dated March 24, 2014, recommends traffic improvements, including modification of the existing traffic signals and likely relocation of the existing Port Allen welcome sign; a southbound left turn lane to be added along Kaumuali'i Highway at its intersection with Halewili Road in order to prevent the formation of a southbound Kaumuali'i Highway vehicle queue waiting traffic attempting to turn left onto Halewili Road; signalization of the Kaumuali'i Highway/Laulea Street (South) – Mahea Road intersection, including lengthening of the existing southbound Kaumuali'i Highway left-turn lane to provide a minimum of 100 feet of vehicle storage; and signalization of the Kaumuali'i Highway/Laulea Street (North) intersection, including converting the existing northbound median acceleration lane into a southbound left-turn lane.

Also mentioned in the TIAR is the lack of a bus stop(s) within a five-minute walk of the 'Ele'ele Shopping Center.

The TIAR also recognizes "the fact that some of the project traffic would need to travel through the 'Ele'ele Iluna and existing Mahea Road neighborhoods and

could lead to future quality-of-life concerns from current and future residents along Mahea Road and with the 'Ele'ele Iluna site. It recommends that the County of Kaua'i consider monitoring the concerns of residents in this area to determine if any further improvements are necessary to address these concerns. Potential improvements could include various traffic calming measures.

The most difficult local mobility issue will be the lack of a safe and convenient route to school. Children crossing Kaumuali'i Highway at grade to get to 'Ele'ele Elementary School is not in most people's mind a safe solution. A below grade underground crossing would seem to be the safest and most accessible, but it is not clear how an affordable housing project with no market housing or mixed use could feasibly handle such a cost.

The most egregious and apparently unresolvable inter-regional traffic problem comes from a recent analysis done for the Kōloa-Po'ipū-Kalāheo Community Plan. Work on the Kōloa-Po'ipū-Kalāheo Plan has identified the intersection of Papalina Road and Kaumuali'i Highway as a bottleneck with no realistic conventional solutions. The idea of a *makai* bypass around Kalāheo has been abandoned. The land uses around the intersection make widening Kaumuali'i Highway to 4-lanes very difficult and expensive, if it is even possible. A four-lane widening at the intersection presumes a four-lane highway. In many communities, such as Honolulu, highway widening has failed as a long-range solution. Furthermore, the financial feasibility of a four-lane highway is in question. Both the MLTP and the State Long Range Land Transportation Plan have documented that the federal monies needed to support that extent of highway widening on Kaua'i will not be available in the future. This dilemma undergirds the MLTP strategy to increase the capacity of existing roads with rapid expansion of public transit, bikeways and pedestrian options and **land use decisions that locate affordable housing near jobs and services.**

## III. Lima Ola Will Cause Permanent Loss of Important Agricultural Lands (IAL)

Given the prior and existing use of the Lima Ola site for growing cane and coffee respectively, the site arguably qualifies as Important Agricultural Land based on the following eight (8) criteria found in state law. On its face, seven (bold and underlined) out of the eight criteria apply to the Lima Ola site:

1. **Land currently used for agricultural production**;
2. **Land with soil qualities and growing conditions that support agricultural production of food, fiber, or fuel and energy-producing crops**;

3. Land identified under agricultural productivity rating systems, such as the agricultural lands of importance to the State of Hawai'i (ALISH) system adopted by the Board of Agriculture on January 28, 1977;
4. **Land types associated** with traditional native Hawaiian agricultural uses, such as taro cultivation, or **unique agricultural crops and uses, such as coffee,** vineyards, aquaculture, and energy production;
5. **Land with sufficient quantities of water to support viable agricultural production**;
6. **Land whose designation as important agricultural lands is consistent with general, development, and community plans of the county**;
7. **Land that contributes to maintaining a critical land mass important to agricultural operating activity**; and
8. **Land with or near support infrastructure conducive to agricultural productivity, such as transportation to markets, water, or power.**

This constitutes a significant environmental impact when one considers the competition for agricultural lands in the future for food, biotech, energy, and fiber.

## IV. Lack of Water Supply and Capacity

The existing County water system currently lacks sufficient capacity to service Lima Ola's need for an estimated 0.265 million gallons per day (mgd). As such, off-site improvements are needed to connect Lima Ola to an existing 12-inch water main on Kaumuali'i Highway, along with future improvements at the Hanapēpē/'Ele'ele water system to increase source availability.

Lima Ola is described as a 4-Phase project with a total affordable housing unit count of 550, along with upgraded pumps in the valley and construction of an intermediate water tank on their site. The Lima Ola proposal is deficient in addressing source improvements needed to accommodate full build-out of the project. Thirty-eight (38) single-family or duplex units plus 138 multi-family units are planned for construction in Phase 1 of the project. The Department of Water (DOW) has determined that although Lima Ola is located outside of their planned service area (Water Plan 2020) and would result in a deviation from DOW's plan, there is adequate water to service the first development phase of the Lima Ola Affordable Housing Project Water Master Plan. All subsequent development phases will require further evaluation by DOW, due to the need for additional source and transmission lines which would be developed during Phase Two of the development. However, if any infrastructure such as the intermediate water tank or increased line capacity needs to be built for the first phase, proceeding on the first phase would be at considerable risk of taxpayer monies. Assuming source and line

capacity could be made available for subsequent phases of the project, the cost of drilling a well or increasing line capacity could be unduly burdensome for an all-affordable housing development.

## V. Social Impacts of an All-Affordable Housing Project

Of important note is that A&B Properties, Inc. has proposed a 28-acre urban residential development in 'Ele'ele, that will be 60% affordable. Lima Ola's affordable housing development, coupled with A&B's proposed 21-acre affordable housing project, would create adjoining communities of similar demographics. It has been shown that projects with mixed incomes and demographics create much better neighborhoods with better sociological results. It has been the policy of the County in its efforts to create affordable housing, to be deliberate in its efforts to create great neighborhoods as well. The County should not forget this here.

## VI. Alternatives

The environmental assessment process includes looking at alternatives. There are many affordable housing alternatives located in the heart of Po'ipū, Kapa'a, and Līhu'e. Like Lima Ola, all of them have problems and obstacles to be overcome. But unlike Lima Ola, they would have the advantage of being located where the jobs and services are, and if designed and planned well, would not generate the traffic that Lima Ola will. They will also likely provide housing where there is the largest demand. Among those alternatives is a 5-acre site in the heart of Po'ipū upon which could be built 60 multi-family units within walking or biking distance of the hotels. The old base yard in the heart of Kapa'a Town would need to be built to overcome flood issues, but the challenges are no more than the challenges facing Lima Ola. Or, the purchase of Courtyard at Waipouli could provide 60 turn-key units, presently affordable but not after another 3-4 years when affordability requirements expire.

Another alternative would be to down-size Lima Ola to 50-60 units in an R-10 density affordable housing project, built in well-designed cottage courtyard style. Perhaps the County Housing Agency could make an agreement to partner with Gay & Robinson to give their tenants at Kaumakani and Pākalā the first chance to rent or purchase some of the units as farm worker housing. Or perhaps other sites on the Westside could be explored, and the Lima Ola site could be sold back to A&B or Kaua'i Coffee for agricultural use and the money could be used for affordable housing.

## VII. Conclusion

I support applying the land use policies in the MLTP of combined design criteria and development guidelines of compactness, completeness, and

connectedness that will lead to more livable places on Kaua'i and reduce daily driving and road congestion without reducing access and mobility. Failure to apply these policies, as with the Lima Ola affordable housing development proposal, will create significant environmental impacts that need to be analyzed, documented and disclosed.

Thank you again for this opportunity to provide comments on the EA for the Lima Ola Workforce Housing development. Should you have any questions or would like to discuss this information further, please do not hesitate to contact me at (808) 241-4188 or via E-mail at jyukimura@kauai.gov.

Sincerely,

JOANN A. YUKIMURA
Housing & Transportation Committee Chair
Kaua'i County Council

JY:ss

Community Planning and Engineering, Inc.

December 3, 2014

Glenda Nagami-Streufert
Emergency Management Officer
Kaua‘i Civil Defense Agency
3990 Ka‘ana Street, Suite 100
Līhu‘e, Hawai‘i 96766

Subject: Lima Ola Workforce Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Nagami-Streufert:

Community Planning and Engineering, Inc. on behalf of the County of Kaua‘i, is in the process of preparing a Chapter 343 Hawai‘i Revised Statutes (HRS) Environmental Assessment (EA) for the proposed workforce housing development located at Tax Map Key (TMK) parcel (4) 2-1-1:54 (the Site). The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58. The proposed project site is located in the town of ‘Ele‘ele on the Island of Kaua‘i (please see the enclosed Location Map and Site Plan). The EA is being prepared in order to evaluate the potential environmental, social and economic consequences associated with the proposed project.

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CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

# APPENDIX C: BIOLOGICAL SURVEY

# BIOLOGICAL RESOURCE ASSESSMENT FOR LIMA OLA WORKFORCE HOUSING

Prepared for

**Community Planning and Engineering, Inc.**

Prepared by

**SWCA Environmental Consultants**

**October 2013**

# BIOLOGICAL RESOURCE ASSESSMENT FOR LIMA OLA WORKFORCE HOUSING

Prepared for

**Community Planning and Engineering, Inc.**
1286 Queen Emma Street
Honolulu, Hawai‘i 96813
(808) 531-4252

Prepared by

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SWCA Project No. 25727.00

October 2013

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# 1. INTRODUCTION

The County of Kaua‘i has tasked Community Planning and Engineering, Inc. to prepare and process a Hawai‘i Revised Statutes (HRS) Chapter 343 environmental impact statement (EIS) for the proposed Lima Ola Workforce Housing Development Project. The proposed project site comprises approximately 75 acres (30 hectares) at Tax Map Key (TMK) 4-2-1-001:027 in ‘Ele‘ele, on the Island of Kaua‘i. The proposed project includes multiphase housing development, including roughly 350–400 housing units and associated facilities and infrastructure (e.g., roads, reservoir, parks, and green spaces). SWCA Environmental Consultants (SWCA) was tasked by Community Planning and Engineering, Inc. to conduct a biological resource assessment at the project site.

This report summarizes the findings of the assessment conducted by SWCA Biologists Tiffany Thair (botanist), Ling Ong (zoologist), and Bryson Luke (field technician) on September 25–26, 2013. The objectives of the natural resource assessment are as follows:

1. Identify and document the presence and relative abundance of plant species and vegetation communities at the project site.

2. Identify and document the presence and relative abundance of bird, mammal, amphibian, reptile, and invertebrate macrofauna that occur at the project site.

3. Identify any state or federally listed candidate, threatened, or endangered species; species of concern; and/or rare (either locally or statewide) species found or known to occur at the project site.

4. Provide information on the absence/presence of Hawaiian hoary bats (*Lasiurus cinereus semotus*) and relative bat activity at the project site.

5. Analyze the temporary, permanent, and indirect impacts of the project on flora and fauna at the project site.

6. Provide recommendations to prevent take of any state or federally listed candidate, threatened, or endangered species; species of concern; and/or rare (either locally or statewide) species if found or potentially could be found at the project site.

# 2. DESCRIPTION OF THE PROJECT SITE

## 2.1. Location and Vicinity

The proposed project site comprises approximately 75 acres (30 hectares) within a portion of TMK 4-2-1-001:027 in ‘Ele‘ele on the southwest side of the Island of Kaua‘i (Figure 1). Elevation at the site ranges from 175 feet (53 meters [m]) on the makai (seaward) side to 275 feet (84 m) on the mauka (landward) side. The terrain slopes gently toward the south with an average 4% slope (Kimura International, Inc. 2012).

Currently, the project site is being leased to Kaua‘i Coffee for coffee farming. Sugarcane was also formerly grown in the area. The project site is bounded by Halewili Road and undeveloped land owned by A&B Properties, Inc. on the south; undeveloped land owned by Habitat for Humanity on the west; Kaumuali‘i Highway and agricultural land on the north; and undeveloped land owned by A&B Properties, Inc. to the east (Kimura International, Inc. 2012).

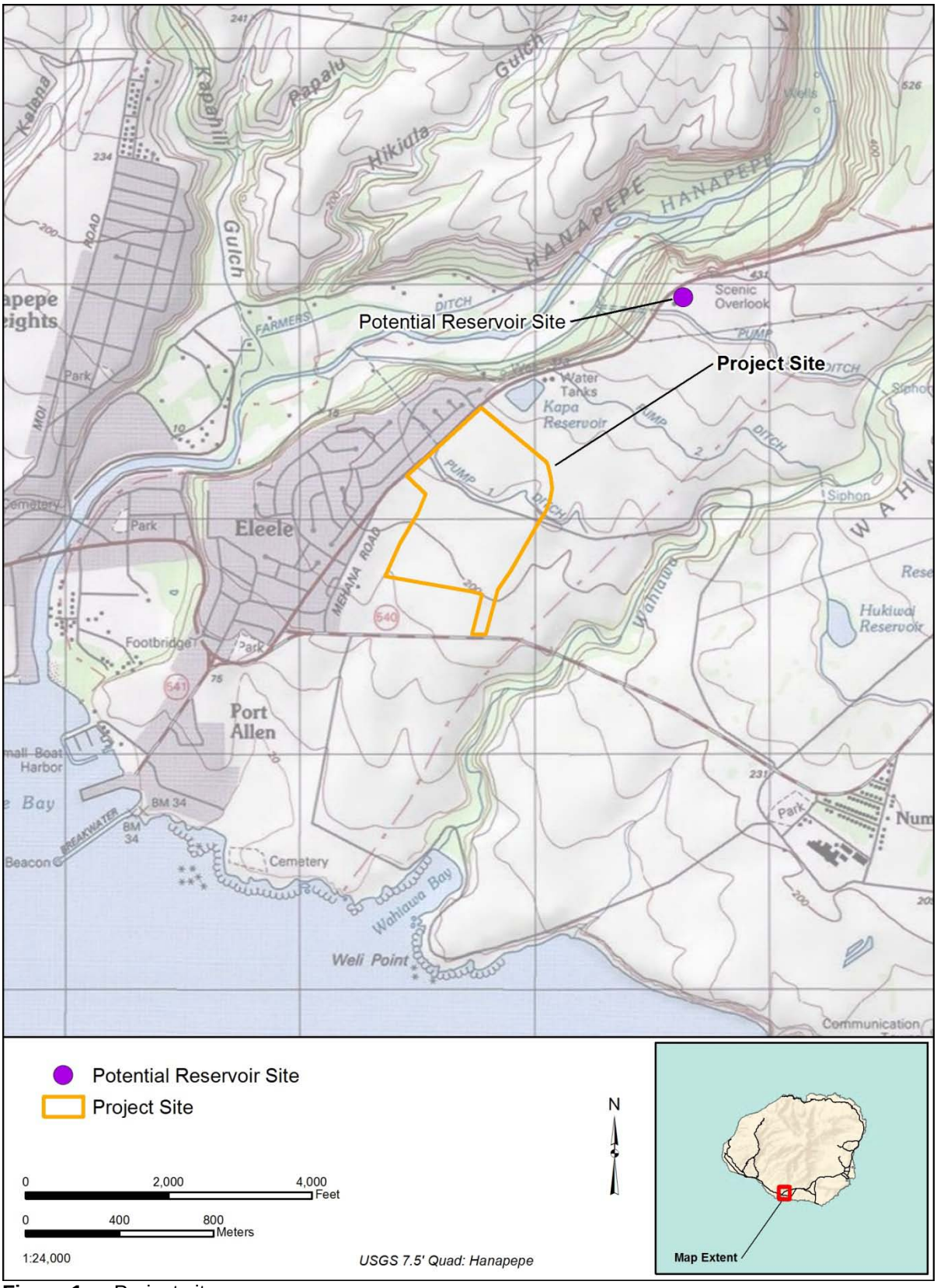


**Figure 1**. Project site.

The potential reservoir site associated with the project is less than 1 mile (1.6 kilometers) north of the project site along Kaumualiʻi Highway (R.M. Towell 2013). Elevation at the reservoir site is approximately 375 feet (114 m). The reservoir site is approximately 7,540 square feet (700 $m^2$) and is adjacent to an existing reservoir.

Mean annual rainfall for the area is approximately 30.74 inches (780.8 millimeters). Rainfall is typically highest in December–January and lowest in June–August (Giambelluca et al. 2013). The Hanapepe rainfall gage near the site has recorded nearly average rainfall for September 2013 (National Oceanic and Atmospheric Administration/National Weather Service, Weather Forecast Office Honolulu 2013). The geology at the site consists of Koloa Volcanics, between 0.15 and 3.85 megannum (i.e., one million years) (Sherrod et al. 2007). The Natural Resources Conservation Service (NRCS) identifies the soil at the site as Makaweli Silty Clay Loam, 0%–6% slopes (MgB) and Makaweli Silty Clay Loam, 6%–12% slopes (MgC) (Foote et al. 1972).

# 3. METHODS

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

A field reconnaissance of the site was conducted by three SWCA biologists on September 25–26, 2013.

## 3.1. Flora

SWCA conducted a systematic pedestrian botanical survey of the project site. The rows of coffee plants served as linear transects to guide the survey effort; SWCA walked every 5–7 rows within these areas. All vascular plant species observed at the project site were documented, and notes were made on relative abundances (e.g., abundant, common, uncommon, and rare), communities, and disturbances. Areas more likely to support native plants were more intensively examined.

Plants recorded during the survey are indicative of the season (“rainy” vs. “dry”) and the environmental conditions at the time of the survey. It is likely that additional surveys conducted at a different time of the year would result in minor variations in the species and abundances of plants observed.

## 3.2. Fauna

Prior to the survey, ten bird point-count stations were identified throughout the project site in representative habitats (Figure 2). Surveys on-site were conducted using 8-minute standard point counts with a 330-foot (100-m) radius. All birds seen or heard during point counts were recorded. Other species seen or heard between point-count stations were also recorded. Point-count surveys were conducted during daylight hours between 8:15 and 9:30 a.m. and 3:50 and 6:30 p.m.; no nocturnal surveys were conducted for seabirds.

Mammals, reptiles, amphibians, and invertebrates seen or heard during the point-count surveys or between count stations were documented. Presence or sign (e.g., scat) of invasive mammals were also recorded. All incidental sightings of native fauna between point counts were recorded.

**Figure 2**. Bird point-count stations and bat detectors at the project site.

The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) has recently been found to be more widely distributed than previously thought, and bats have been documented foraging and roosting in native and disturbed habitats. Six bat detectors (Wildlife Acoustics Songmeter SM2BAT and SM2BAT+) were deployed to record from 6:15 p.m.to 07:15 a.m. for one night (September 25 through the morning of September 26, 2013; see Figure 2).

# 4. RESULTS

The project site is disturbed from agricultural activities that have occurred in the area over several decades. No state or federally listed threatened, endangered, or candidate species were observed at the project site during the survey. No listed plant species have been found for projects in the vicinity (County of Kaua‘i 2000; Fukunaga & Associates, Inc. 1993, 2008); however, the endangered Hawaiian hoary bat and several listed waterbirds have been noted in the vicinity. The project site does not contain critical habitat for threatened or endangered plants as designated by the U.S. Fish and Wildlife Service (USFWS).

## 4.1. Flora

No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species, were observed at the project site. Sixty-six (66) plant species were recorded at the site during the survey. Of these, only two species—‘uhaloa (*Waltheria indica*) and moa (*Psilotum nudum*)—are native to the Hawaiian Islands. A single moa individual was seen, whereas ‘uhaloa is scattered sparsely throughout the project site. These two indigenous species are common throughout the Hawaiian Islands (Wagner et al. 1999; Palmer 2003). Appendix A provides a list of all plant species observed by SWCA biologists at the project site during the survey.

The vegetation at the project site is primarily dominated by rows of planted coffee trees (*Coffea arabica*), between 6 and 8 feet (1.8 and 2.5 m) tall. The coffee plants are overgrown in some areas, resulting in a closed canopy that shades out understory species. Many areas are devoid of understory vegetation and are covered with a layer of leaf litter. The most abundant understory plant is little bell (*Ipomoea triloba*), which forms thick mats under the coffee plants in portions of the project site (Figure 3). Maunaloa (*Canavalia cathartica*) is also relatively common and is found climbing up coffee plants.

Along the dirt roads, koa haole (*Leucaena leucocephala*), castor bean (*Ricinus communis*), lion’s ear (*Leonotis nepetifolia*), and Guinea grass (*Urochloa maxima*) are locally abundant (Figure 4). Other plants found scattered sparsely throughout the site or occurring in a few small patches include coffee senna (*Senna occidentalis*), fuzzy rattlepod (*Crotalaria incana*), kaliko (*Euphorbia heterophylla*), golden crown-beard (*Verbesina encelioides*), balsam pear (*Momordica charantia*), radiate fingergrass (*Chloris radiata*), and buffelgrass (*Cenchrus ciliaris*).

There is a small garden in the northwest portion of the project site along Kaumuali‘i Highway. Planted species observed in this area include banana (*Musa* sp.), eggplant (*Solanum melongena*), chili peppers (*Capsicum* sp.), and butternut squash (*Cucurbita moschata*).

The vegetation at the potential reservoir site is similar to the project site. It is dominated by rows of planted coffee trees. Understory vegetation is mostly lacking; however, little bell, Guinea grass, hairy horseweed (*Conyza bonariensis*), and other weedy grasses and herbaceous species are scattered throughout the area. No native plants were found at the potential reservoir site during the survey.

**Figure 3.** Row of coffee plants showing little bell covering the understory.

**Figure 4.** Koa haole trees and Guinea grass along dirt road.

## 4.2. Fauna

### *4.2.1. Avifauna*

Bird species observed at the project site are species typically found in agricultural areas. Thirteen species were documented during this survey (Table 1). One species was a migratory bird, the Pacific golden plover (*Pluvialis fulva*). The remaining species are introduced to the Hawaiian Islands. The most common species heard or seen during the point counts were the Japanese white-eye (*Zosterops japonicas*), followed by chickens (*Gallus gallus*) and the zebra dove (*Geopelia striata*). The Pacific golden plover,

which is considered a migratory bird species, was observed mainly on roads. No other native birds were seen or heard at the project site. Although no owls were seen or heard during the survey, the native Hawaiian short-eared owl or pueo (*Asio flammeus sandwichensis*) and the introduced barn owl (*Tyto alba*) could use the project site for hunting and roosting.

Seabirds, particularly the endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*), may fly over the project site at night while travelling to and from their upland nesting sites to the ocean. Both species nest inland in the mountainous interior of Kaua'i (Ainley et al. 1997; Mitchell et al. 2005). Although no suitable nesting sites are present at the project site, the manager of the project site, Mr. Greg Williams, stated that on occasion, Newell's shearwaters have been heard calling at night while flying over the project site.

**Table 1.** Bird Species Seen or Heard During Point Counts

| Common Name | Scientific Name | Status* | Abundance (no. per point count) | Abundance Rank |
|---|---|---|---|---|
| Common myna | *Acridotheres tristis* | NN | 0.18 | 8 |
| Cattle egret | *Bubulcus ibis* | NN | 0.18 | 8 |
| Northern cardinal | *Cardinalis cardinalis* | NN | 0.45 | 5 |
| Japanese bush warbler | *Cettia diphone* | NN | 0.18 | 8 |
| Rock pigeon | *Columba livia* | NN | 0.09 | 11 |
| House finch | *Haemorhous mexicanus* | NN | 0.09 | 11 |
| Chicken | *Gallus gallus* | NN | 1.64 | 2 |
| Hwamei | *Garrulax canorus* | NN | 1.00 | 4 |
| Zebra dove | *Geopelia striata* | NN | 1.64 | 2 |
| Red-crested cardinal | *Paroaria coronata* | NN | 0.27 | 6 |
| Pacific golden plover | *Pluvialis fulva* | M | 0.09 | 11 |
| Spotted dove | *Streptopelia chinensis* | NN | 0.27 | 6 |
| Japanese white-eye | *Zosterops japonicus* | NN | 5.36 | 1 |
| | **Total** | | **13** | |

* NN = non-native; M = migratory

### *4.2.2. Hawaiian Hoary Bat*

Four of the six detectors detected bat calls on the night of September 25 through the morning of September 26, 2013. Bat passes (two bat calls or more) were detected at detector locations B, C, D and E (Table 2). Bats were detected along all habitat types that were sampled: along the roads lining the coffee rows (detector B and E), along the large irrigation ditch in the middle of the property (detector D), and along the edge of the property that borders a fallow field (detector C) that is overgrown with weedy species. The highest number of bat passes was detected at detector D, where overlapping calls indicated the presence of at least two bats. Bat calls were detected between 7:16 p.m. and 3:06 a.m.

**Table 2.** Bat Activity at the Bat Detectors

| Detector | No. of Passes Detected |
|---|---|
| A | 0 |
| B | 3 |
| C | 1 |
| D | 5 |
| E | 1 |
| F | 0 |

### 4.2.3. Other Mammals

No other mammals were observed at the project site. Feral dogs (*Canis familiaris*) were heard outside the project site, and animal sign (scat) was found in multiple coffee rows on-site, likely belonging to feral pigs (*Sus scrofa*). Dogs and cats (*Felis catus*) are ubiquitous and are likely to enter the project site, as are mice (*Mus musculus*) and rats (*Rattus* spp.).

### 4.2.4. Reptiles and Amphibians

One gecko (Family: Gekkonidae) was heard during the point count survey. No amphibians were observed or heard during the survey. None of the terrestrial reptiles or amphibians in Hawai‘i are native to the islands, so these are not species of interest.

### 4.2.5. Invertebrates

Two common native dragonfly species, the native green darner (*Anax junius*) and the native globe skimmer (*Pantala flavescens*) were seen at the project site during the survey. Introduced pollinators observed during the survey include the large orange sulphur butterfly (*Phoebis agarithe*), the Sonoran carpenter bee (*Xylocopa sonorina*), and the honey bee (*Apis mellifera*). Other introduced insects noted during the survey include the cane spider (*Heteropoda venatoria*), the black stink bug (*Coptosoma xanthogramma*), the black and yellow mud dauber (*Sceliphron caementarium*) and crab spiders (*Gasteracantha* spp.).

Shells of non-native mollusks belonging to the giant African snail (*Achatina fulica*), the predatory rosy wolf snail (*Euglandina rosea*), and the invasive Asiatic clam (*Corbicula fluminea*) were found at the project site. The Asiatic clam shells were found along the irrigation ditch that runs through the middle of the project site.

# 5. DISCUSSION AND RECOMMENDATIONS

## 5.1. Flora

The vegetation at the project site is disturbed from previously land-use activities. The vegetation types and species identified are not considered unique. Almost 97% of the plant species seen are not native, and the only two native species found are common throughout the Hawaiian Islands. No threatened or endangered plants were found during the reconnaissance, and no designated plant critical habitat is found nearby. No listed plant species have been found for projects in the vicinity (County of Kaua‘i 2000; Fukunaga & Associates, Inc. 1993, 2008). Therefore, the proposed project is not expected to have a significant, adverse impact on botanical resources.

SWCA recommends that native Hawaiian plants be used for landscaping around the project to the maximum extent possible. Potential native species that may be appropriate for landscaping at the proposed project site include kou (*Cordia subcordata*), lonomea (*Sapindus oahuensis*), alahe‘e (Psydrax odorata), ‘uki‘uki (*Dianella sandwicensis*) and ‘ilie‘e (*Plumbago zeylanica*). Additional information on selecting appropriate plants for landscaping can be obtained from the following websites:

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

## 5.2. Fauna

The state and federally endangered Hawaiian hoary bat was detected at the project site. No other state or federally listed species, or candidates for listing, were observed at the project site during the survey. Other listed species that could occasionally fly over the site include the endangered Hawaiian petrel and threatened Newell’s shearwater.

The endangered Hawaiian hoary bat was detected at the project site in four locations. Bats may roost or forage at the project site because suitable roost trees and suitable foraging grounds appear to be present. Hawaiian hoary bat roosts are typically in trees with dense canopy foliage, or in the subcanopy when the canopy is sparse, with open access for launching into flight (U.S. Department of Agriculture 2009). Based on these criteria, bats could use the old coffee trees as roost trees on occasion. However, to date, Hawaiian hoary bats have not yet been documented roosting in coffee trees. Hawaiian hoary bats are known to forage along corridors such as along tree-lined roads, and thus may forage along the roads of the project site.

To prevent direct impacts the Hawaiian hoary bat, the following are recommended:

- No trees taller than 15 feet (4.6 m) within the proposed project site should be trimmed or removed between June 1 and September 15 when non-volant juvenile bats (bats that cannot fly) may be roosting in the trees.

- Any fences that are erected as part of the project should have a barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. For existing fences at the project site, the top strand of barbed wire should be removed or replaced with barbless wire.

SWCA expects that the implementation of these guidelines, which have been promulgated by the USFWS, will avoid all direct impacts to Hawaiian hoary bats.

Major threats to the endangered Hawaiian petrel and threatened Newell's shearwater include the attraction of adults and newly fledged juveniles to bright lights while transiting between their nest sites and the ocean. Juvenile birds are particularly vulnerable to light attraction and are sometimes grounded when they become disoriented by lights (Mitchell et al. 2005). Many of these grounded birds are vulnerable to mammalian predators or to being struck by vehicles. The following recommendations are provided to avoid and minimize light attraction of the endangered Hawaiian petrel and threatened Newell's shearwater to the project site:

- Construction activity should be restricted to daylight hours as much as practicable during the seabird breeding season (April through November) to avoid the use of nighttime lighting that could be an attraction to seabirds.
- All outdoor lights should be shielded to prevent upward radiation at the housing development. This has been shown to reduce the potential for seabird attraction (Reed et al. 1985; Telfer et al. 1987). A selection of acceptable seabird friendly lights can be found at http://www.kauai-seabirdhcp.info/minimization/lights/.
- Outside lights that are not needed for security and safety should be turned off from dusk through dawn during the fledgling fallout period (September 15–December 15).

The Pacific golden plover is one of the most common wintering migrants throughout the Pacific Basin (Pyle and Pyle 2009). These birds may be displaced by the proposed project, but are expected to find suitable foraging habitat at nearby agricultural or grassy areas. The proposed residential project may also provide habitat for the Pacific golden plover if lawns and gardens are present (Pyle and Pyle 2009). The Pacific golden plover has increased in number in the main Hawaiian Islands in recent years (Pyle and Pyle 2009), and the temporary or permanent displacement of these individuals at the project site is not expected to affect the overall population of either species.

The two native dragonfly species, the globe skimmer and green darner, are common on all Hawaiian Islands and are not expected to be negatively impacted by the project. No non-native birds, mammals, insects, mollusks, reptiles or amphibians are expected to be impacted by the project.

# 6. **LITERATURE CITED**


Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997. Townsend's and Newell's Shearwater (*Puffinus auricularis*). In *The Birds of North America*, No. 297, edited by A. Poole and F. Gill. Philadelphia, Pennsylvania: The Birds of North America, Inc.

County of Kaua'i. 2000. Final Environmental Assessment for Wind-Resistant Single Family Dwellins, Eleele Nani II Subdivision.

Evenhuis, N.L. and L.G. Eldredge. 2011. Taxonomic changes in Hawaiian ferns and lycophytes. Records of the Hawaii Biological Survey for 2009–2010. *Bishop Museum Occasional Papers* 110:11–16.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. 1972. *Soil Survey of the Islands of Kaua'i, O'ahu, Maui, Moloka'i, and Lana'i, State of Hawai'i.* U.S. Department of Agriculture, Soil Conservation Service.

Fukunaga & Associates, Inc. 1993. Final Environmental Assessment for Eleele Wastewater Treatment Plant Expansion – Phase 1. Prepared for County of Kaua'i.

Fukunaga & Associates, Inc. 2008. Final Environmental Assessment Eleele Facility Plan. Prepared for County of Kaua'i.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte. 2013. Rainfall Atlas of Hawai'i. Bull. Amer. Meteor. Soc. 94, 313-316, doi: 10.1175/BAMS-D-11-00228.1. Available at: http://rainfall.geography.hawaii.edu. Accessed on October 18, 2013.

Kimura International, Inc. 2012. Lima Ola Workforce Housing Development Master Plan. Prepared for County of Kaua'i.

Mitchell, C., C. Ogura, D.W. Meadows, A. Kane, L. Strommer, S. Fretz, D. Leonard, and A. McClung. 2005. Hawaii's comprehensive wildlife conservation strategy. Department of Land and Natural Resources, Honolulu, Hawai'i. Available from http://www.state.hi.us/dlnr/dofaw/cwcs/. Accessed on August 21, 2008.

National Oceanic and Atmospheric Administration/National Weather Service, Weather Forecast Office Honolulu. 2013. Hydrology in Hawai'i. Available at: http://www.prh.noaa.gov/hnl/hydro/pages/sep13sum.php. Accessed on October 8, 2013.

Palmer, D.D. 2003. *Hawaii's Ferns and Fern Allies*. Honolulu: University of Hawai'i Press.

Pyle, R.L., and P. Pyle. 2009. *The Birds of the Hawaiian Islands: Occurrence, History, Distribution, and Status.* Honolulu, Hawai'i: B.P. Bishop Museum. Version 1 (31 December 2009). Available at: http://hbs.bishopmuseum.org/birds/rlp-monograph/. Accessed on October 30, 2013.

Reed, J.R., J.L. Sincock, and J.P. Hailman. 1985. Light attraction in endangered procelliariiform birds: Reduction by shielding upward radiation. *Auk* 102:377–383.

R.M. Towell. 2013. Final Lima Ola Feasibility Study, Workforce Housing Development, ‘Ele‘ele, Kaua‘i. Prepared for County of Kaua‘i.

Sherrod, D.R., J.M. Sinton, S.E. Watkins, and K.M. Brunt. 2007. *Geologic Map of the State of Hawai‘i.* U.S. Geological Survey Open-File Report 2007-1089, 83 p., 8 plates, scales 1:100,000 and 1:250,000, with GIS database.

Staples, G.W. and D.R. Herbst. 2005. Garden Flora. Plants cultivated in the Hawaiian Islands and other tropical places. Honolulu, Hawai‘i: Bishop Museum Press.

Telfer, T.C., J.L. Sincock, and G.V. Byrd. 1987. Attraction of Hawaiian seabirds to lights: Conservation efforts and effects of moon phase. *Wildlife Society Bulletin* 15:406–413.

U.S. Department of Agriculture. 2009. Bats of the U.S. Pacific Islands. Biology Technical Note No. 20. Natural Resources Conservation Service, Pacific Islands Area.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer. 1999. *Manual of the flowering plants of Hawai‘i, Volumes I & II. Revised edition*. Honolulu, Hawai‘i: University of Hawai‘i Press.

Wagner, W.L. and D.R. Herbst. 2003. *Supplement to the Manual of the Flowering Plants of Hawai‘i.* Version 3.1.

Wagner, W.L., D.R. Herbst, N. Khan, and T. Flynn. 2012. *Hawaiian Vascular Plant Updates: A Supplement to the Manual of the Flowering Plants of Hawai‘i and Hawai‘i’s Ferns and Fern Allies.* Version 1.3. Collaborated between Smithsonian Institution and the National Tropical Botanical Garden.

# Appendix A

## CHECKLIST OF PLANTS OBSERVED AT LIMA OLA WORKFORCE HOUSING PROJECT SITE ON SEPTEMBER 25–26, 2013

The following checklist is an inventory of plant species observed by SWCA biologists on September 25–26, 2013, during the survey of the Lima Ola project site. The plant names are arranged alphabetically by family and then by species into three groups: Ferns and Lycophytes, Monocots, and Dicots. The taxonomy and nomenclature of the ferns and lycophytes is in accordance with Palmer (2003) and Evenhuis and Eldredge (2011). The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999), Wagner and Herbst (2003), and Staples and Herbst (2005). Recent name changes are those recorded in Wagner et al. (2012).

**Status:**

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

**Relative Site Abundance:**

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

| Scientific Name | Common and Hawaiian Name(s) | Status | Abundance |
|---|---|---|---|
| **FERNS & LYCOPHYTES** | | | |
| | | | |
| PSILOTACEAE | | | |
| *Psilotum nudum* (L.) P.Beauv. | moa, upright whiskfern | I | R |
| | | | |
| **MONOCOTS** | | | |
| | | | |
| COMMELINACEAE | | | |
| *Commelina diffusa* Burm.f. | honohono | X | R |

| | | | |
|---|---|---|---|
| CYPERACEAE | | | |
| *Cyperus rotundus* L. | nut sedge | X | U |
| | | | |
| DIOSCOREACEAE | | | |
| *Dioscorea* sp. | yam | X | R |
| | | | |
| MUSACEAE | | | |
| *Musa* sp. | banana | X | R |
| | | | |
| POACEAE | | | |
| *Cenchrus ciliaris* L. | buffelgrass | X | C |
| *Chloris barbata* Sw. | swollen fingergrass | X | U |
| *Chloris radiata* (L.) Sw. | radiate fingergrass, plushgrass | X | C |
| *Cynodon dactylon* (L.) Pers. | Bermuda grass | X | R |
| *Digitaria insularis* (L.) Mez ex Ekman | sourgrass | X | R |
| *Eleusine indica* (L.) Gaertn. | wiregrass | X | U |
| *Eragrostis amabilis* (L.) Wight & Arn. | lovegrass | X | R |
| *Melinis repens* (Willd.) Zizka | Natal redtop, Natal grass | X | R |
| *Setaria verticillata* (L.) P.Beauv. | bristly foxtail, mau‘u pilipili | X | U |
| *Sorghum halepense* (L.) Pers. | Johnson grass | X | U |
| *Urochloa maxima* (Jacq.) R. D. Webster | Guinea grass | X | C |
| | | | |
| **DICOTS** | | | |
| | | | |
| ACANTHACEAE | | | |
| *Thunbergia fragrans* Roxb. | white thunbergia, sweet clock-vine | X | R |
| | | | |
| AMARANTHACEAE | | | |
| *Amaranthus spinosus* L. | spiny amaranth | X | U |
| *Amaranthus viridis* L. | slender amaranth, pakai | X | U |

| | | | |
|---|---|---|---|
| ASTERACEAE | | | |
| *Acanthospermum australe* (Loefl.) Kuntze | spiny-bur, Paraguay bur | X | U |
| *Bidens pilosa* L. | Spanish needle, beggartick | X | U |
| *Conyza bonariensis* (L.) Cronq. | hairy horseweed | X | U |
| *Crassocephalum crepidioides* (Benth.) S.Moore | ---- | X | R |
| *Emilia fosbergii* Nicolson | pualele | X | R |
| *Emilia sonchifolia* (L.) DC. | Flora's paintbrush | X | R |
| *Parthenium hysterophorus* L. | false ragweed, Santa Maria | X | U |
| *Verbesina encelioides* (Cav.) Benth. & Hook. | golden crown-beard | X | C |
| | | | |
| AIZOACEAE | | | |
| *Trianthema portulacastrum* L. | ---- | X | R |
| | | | |
| BRASSICACEAE | | | |
| *Lepidium virginicum* L. | ---- | X | R |
| | | | |
| CONVOLVULACEAE | | | |
| *Ipomoea obscura* (L.) Ker Gawl. | morning glory | X | U |
| *Ipomoea triloba* L. | little bell | X | A |
| | | | |
| CUCURBITACEAE | | | |
| *Cucurbita moschata* (Lamarck) Poiret | butternut squash | X | R |
| *Lagenaria siceraria* (Molina) Standl. | bottle gourd, long squash | P | U |
| *Momordica charantia* L. | balsam pear, bitter melon | X | U |
| | | | |
| EUPHORBIACEAE | | | |
| *Euphorbia heterophylla* L. | kaliko | X | C |
| *Euphorbia hirta* L. | hairy spurge, garden spurge | X | U |
| *Euphorbia hypericifolia* L. | graceful spurge | X | U |
| *Euphorbia hyssopifolia* L. | ---- | X | U |

| | | | |
|---|---|---|---|
| *Euphorbia prostrata* Aiton | prostrate spurge | X | U |
| *Phyllanthus debilis* Klein ex Willd. | niruri | X | R |
| *Ricinus communis* L. | castor bean | X | A |
| | | | |
| FABACEAE | | | |
| *Canavalia cathartica* Thouars | maunaloa | X | C |
| *Chamaecrista nictitans* (L.) Moench | partridge pea | X | R |
| *Crotalaria incana* L. | fuzzy rattlepod | X | C |
| *Indigofera spicata* Forssk. | creeping indigo | X | U |
| *Leucaena leucocephala* (Lam.) de Wit | koa haole | X | C |
| *Macroptilium atropurpureum* (DC) Urb. | ---- | X | R |
| *Macroptilium lathyroides* (L.) Urb. | wild bean, cow pea | X | R |
| *Mimosa pudica* L. | sensitive plant | X | R |
| *Pithecellobium dulce* (Roxb.) Benth. | Manila tamarind, ‘opiuma | X | R |
| *Pueraria montana* (Lour.) Merr. | kudzu | X | U |
| *Senna occidentalis* (L.) Link | coffee senna, ‘auko‘i | X | C |
| *Vigna speciosa* (Kunth) Verdc. | snail maunaloa | X | U |
| | | | |
| LAMIACEAE | | | |
| *Leonotis nepetifolia* (L.) R. Br. | lion’s ear | X | C |
| | | | |
| MALVACEAE | | | |
| *Abelmoschus esculentus* (L.) Moench | okra | X | R |
| *Abutilon grandifolium* (Willd.) Sweet | hairy abutilon | X | R |
| *Sida acuta* Burm.f. ssp. *carpinifolia* (L.f.) Borss.Waalk. | --- | X | U |
| *Sida ciliaris* L. | --- | X | R |
| | | | |
| MYRTACEAE | | | |
| *Syzygium cumini* (L.) Skeels | Java plum | X | R |
| | | | |

| | | | |
|---|---|---|---|
| NYCTAGINACEAE | | | |
| *Boerhavia coccinea* Mill. | --- | X | R |
| | | | |
| ONAGRACEAE | | | |
| *Ludwigia octovalvis* (Jacq.) P.H.Raven | primrose willow, kāmole | P? | R |
| | | | |
| RUBIACEAE | | | |
| *Coffea arabica* L. | coffee, Arabian coffee | X | A |
| | | | |
| SOLANACEAE | | | |
| *Capsicum* sp. | chili pepper | X | R |
| *Solanum lycopersicum* L. | tomato | X | R |
| *Solanum melongena* L. | eggplant | X | R |
| | | | |
| STERCULIACEAE | | | |
| *Waltheria indica* L. | ‘uhaloa | I | U |

# APPENDIX D: AIR QUALITY STUDY

# AIR QUALITY STUDY

# FOR THE PROPOSED

# LIMA OLA WORKFORCE HOUSING PROJECT

**ELEELE, KAUAI, HAWAII**

**Prepared for:**

**Community Planning and Engineering**

**April 25, 2014**


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7 Estimated Indirect Air Pollution Emissions from Lima Ola Workforce Housing Project Electrical Demand

## 1.0 SUMMARY

The County of Kauai is proposing the Lima Ola Workforce Housing Project at Eleele, Kauai. The proposed project will include 150 single-family homes, 365 multi-family residential units and 35 elderly housing units. This study examines the potential short- and long-term air quality impacts that could occur as a result of construction and use of the proposed facilities and suggests mitigative measures to reduce any potential air quality impacts where possible and appropriate.

Both federal and state standards have been established to maintain ambient air quality. At the present time, seven parameters are regulated including: particulate matter, sulfur dioxide, hydrogen sulfide, nitrogen dioxide, carbon monoxide, ozone and lead. Hawaii air quality standards are generally comparable to the national standards although the state standards for carbon monoxide are more stringent than the national standards.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected by its elevation near sea level and by its location along the southern coast of Kauai. Good ventilation is received much of the time by the prevailing trade winds. Temperatures in the project area are generally very consistent and moderate with average daily temperatures ranging from about 68°F to 81°F. Rainfall in the project area is moderate with an average of about 43 inches per year.

Except for occasional impacts from volcanic emissions (vog) and possibly occasional localized impacts from traffic congestion and local agricultural sources, the present air quality of the project area is believed to be relatively good. There is very little air

quality monitoring data from the Department of Health for the project area, but the limited data that are available suggest that air pollution concentrations are generally well within state and national air quality standards.

If the proposed project is given the necessary approvals to proceed, it may be inevitable that some short- and/or long-term impacts on air quality will occur either directly or indirectly as a consequence of project construction and use. Short-term impacts from fugitive dust will likely occur during the project construction phases. To a lesser extent, exhaust emissions from stationary and mobile construction equipment, from the disruption of traffic, and from workers' vehicles may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the property line. Hence, an effective dust control plan must be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind screens, keeping adjacent paved roads clean, and by covering of open-bodied trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of project areas early in the construction schedule will also reduce dust emissions. Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program. Exhaust emissions can be mitigated by moving construction equipment and workers to and from the project site during off-peak traffic hours.

After construction, motor vehicles coming to and from the proposed development will result in a long-term increase in air pollution emissions in the project area. To assess the impact of emissions from these vehicles, a computer modeling study was

undertaken to estimate current ambient concentrations of carbon monoxide at intersections in the project vicinity and to predict future levels both with and without the proposed project. During worst-case conditions, model results indicated that present 1-hour and 8-hour carbon monoxide concentrations are well within both the state and the national ambient air quality standards. In the year 2040 without the project, carbon monoxide concentrations were predicted to remain nearly unchanged or decrease (improve) slightly in the project area despite an increase in traffic volumes, and worst-case concentrations should remain well within air quality standards. This is primarily due to the assumed retirement of older motor vehicles with less efficient emission control equipment with the passage of time. With the project in the year 2040 after full build-out, carbon monoxide concentrations compared to the without-project case were projected to remain unchanged or increase only slightly, and worst-case concentrations should remain well within air quality standards. Implementing mitigation measures for traffic-related air quality impacts is probably unnecessary and unwarranted.

Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with a development's electrical power requirements. Quantitative estimates of these potential impacts were not made, but based on the relatively small estimated demand level and assuming that power on Kauai continues to be derived mostly from fuel oil, air pollution emissions from project electrical demand would increase island-wide emissions by 4 percent or less. Renewable energy sources, if developed, could reduce these emissions substantially. Incorporating energy conservation design features and promoting energy conservation programs within the proposed development could also serve to reduce any associated emissions.

## 2.0 INTRODUCTION

The County of Kauai is proposing to develop the Lima Ola Workforce Housing Project at Eleele on the island of Kauai. The proposed development will be located on 75 acres of land to the east of Kaumualii Highway (see Figure 1). The project site, which is currently in agricultural production, is bordered by Kaumualii Highway to the northwest, an approved residential housing development to the southwest, and existing agricultural fields to the north, south and west.

The Lima Ola Workforce Housing Project is proposed to include 150 single-family homes, 365 multi-family units and 35 “elderly” multi-family units (which would be reserved for senior citizens only), plus a community center and park. This would provide a total of 550 affordable residential units for the workers and their families living on Kauai. It is projected that full build-out of the project could take 30 years.

The purpose of this study is to describe existing air quality in the project area and to assess the potential short- and long-term direct and indirect air quality impacts that could result from construction and use of the proposed facilities as planned. Measures to mitigate potential project impacts are suggested where possible and appropriate.

## 3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are speci-

fied in the cited documents. As indicated in the table, national and state AAQS have been established for particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of both primary and secondary standards for most of the regulated air pollutants. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow a specified number of exceedances each year.

The Hawaii AAQS are in some cases considerably more stringent than the comparable national AAQS. In particular, the Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit.

The national AAQS are reviewed periodically, and multiple revisions have occurred over the past 30 years. In general, the national AAQS have become more stringent with the passage of time and as more information and evidence become available concerning the detrimental effects of air pollution. Changes to the Hawaii AAQS over the past several years have tended to follow revisions to the national AAQS, making several of the Hawaii AAQS the same as the national AAQS.

## 4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affects the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in regional and local climates within the state are caused by the mountainous topography.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east of the islands. These trade winds are one of the outstanding features of Kauai's climate along with equable temperatures from day to day and season to season and the marked variation in rainfall from the wet to the dry season and from place to place.

The nearest long-term wind data available for the project area are collected at the Lihue Airport located about 15 miles to the east of Eleele. These data are probably at least semi-representative

of the project area. As indicated in Table 2, they indicate a mean annual wind speed of 12.8 mph and a northeast annual prevailing wind direction for this area of Kauai [1]. Monthly wind speeds and directions are similar to the annual averages. Winds from the south are infrequent occurring only a few days during the year and mostly in winter in association with kona storms.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from stack sources. In Hawaii, the annual and daily variations of temperature depend to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. At Lihue Airport, average annual daily minimum and maximum temperatures are 68°F and 81°F, respectively. The extreme minimum temperature on record is 50°F, and the extreme maximum is 90°F [1]. Temperatures at the project site are very similar.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is often measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the project area, stability classes 5 or 6 can be expected to occasionally occur, developing during clear, calm nighttime or

early morning hours when temperature inversions form due to radiational cooling or to drainage flow from the mountainous interior of the island. Stability classes 1 through 4 occur during the daytime, depending mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights in Hawaii typically are above 3000 feet (1000 meters).

Rainfall can have a beneficial effect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. Normal annual rainfall for Lihue Airport is about 43 inches. Three-fourths of this total, on the average, falls during the wet season of October through April. Widespread rainstorms, which account for much of the precipitation, occur most frequently during this period. January is the wettest month, averaging over six inches [1]. Rainfall in the Eleele area is similar.

## 5.0 PRESENT AIR QUALITY

Present air quality in the project area is mostly affected by air pollutants from motor vehicles, industrial sources, agricultural operations and to a lesser extent by natural sources. Table 3 presents an air pollutant emission summary for the island of Kauai for calendar year 1993. These are the most recent data available. The emission rates shown in the table pertain to manmade emissions only, i.e., emissions from natural sources are not included. As suggested in the table, much of the particulate emissions on Kauai originate from area sources, such as the mineral/aggregate products industry and agriculture. Sulfur oxides are emitted almost exclusively by point sources, such as power plants and industrial boilers. Nitrogen oxides emissions emanate predominantly from area sources (mostly motor vehicle traffic), although industrial point sources also contribute a significant share. The majority of carbon monoxide emissions occur from area sources (motor vehicle traffic), while hydrocarbons are emitted mainly from point sources. Based on previous emission inventories that have been reported for Kauai, emissions of particulate and nitrogen oxides may have increased during the last several years, while emissions of sulfur oxides, carbon monoxide and hydrocarbons probably have declined.

Arterial roadways in the project area, such as Kaumualii Highway, presently carry moderate levels of vehicle traffic during peak traffic hours. Emissions from motor vehicles using this roadway, primarily nitrogen oxides and carbon monoxide, will tend to be carried away from the project site by the prevailing winds.

Sources of industrial air pollution are located at Port Allen, which is located about 1 mile to the southwest. These industrial sources emit sulfur dioxide, nitrogen oxides, particulate matter, carbon monoxide and other air pollutants. Prevailing winds from

the east or northeast will carry these emissions away from the project area most of the time.

Until recently, air pollution in the project area originating from agricultural sources could mainly be attributed to sugar cane operations. Emissions from the mills and much of the canefield operations in the area have now been eliminated with the termination of sugarcane cultivation. Minor emissions of dust may occur from coffee growing, farming and ranching activities.

Natural sources of air pollution emissions that also could affect the project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and perhaps distant volcanoes on the island of Hawaii.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state, but very little data is available for the island of Kauai. Table 4 shows annual summaries of air quality measurements that were made at Niumalu for the period 2011 through 2012. These are the only published and most recent air quality monitoring data that are currently available for the project area. This is a special purpose monitoring station located near Nawiliwili Harbor that is intended to monitor emissions from ships visiting the harbor.

During the 2011-2012 period, sulfur dioxide concentrations measured at the Niumalu monitoring station were mostly low compared to the standards. The highest annual 1-hour concentrations reported for 2011 and 2012 were 0.078 and 0.090 parts per million (ppm), respectively. Annual second-highest 3-hour concentrations (which are most relevant to the air quality standards) ranged from 0.051 to 0.055 ppm, while the annual

second-highest 24-hour concentrations were 0.055 ppm for each of the two years. Annual average concentrations were only about 0.002 to 0.003 ppm. For each of the two years reported, one 1-hour concentration exceeded the national standard. There were no exceedances of the state 3-hour or 24-hour AAQS for sulfur dioxide during the 2-year period.

Particulate matter less than 2.5 microns in diameter (PM-2.5) is also measured at the Niumalu monitoring station. For this parameter, the annual 24-hour $98^{th}$-percentile concentration is the most relevant to the national standard. Annual $98^{th}$-percentile 24-hour PM-2.5 concentrations ranged from 12.7 to 13.5 micrograms per cubic meter ($\mu g/m^3$) between 2011 and 2012. Average annual concentrations ranged from 4.9 to 6.8 $\mu g/m^3$. All values reported were within the national AAQS.

Carbon monoxide measurements were also obtained at the Niumalu monitoring station. The annual second-highest 1-hour concentrations for the two years reported ranged from 0.7 to 1.2 ppm. The annual second-highest 8-hour concentrations ranged from 0.7 to 0.9 ppm. No exceedances of the state or national 1-hour or 8-hour AAQS were reported.

The highest annual 1-hour concentrations of nitrogen dioxide reported at the Niumalu monitoring station ranged from 0.025 to 0.042 ppm. Annual average concentrations of this pollutant were 0.003 ppm. These values were safely inside the state and national AAQS.

Although very little ambient air quality data is available to characterize existing conditions, due to the relatively small number of emission sources in the project area, it is likely that

all ambient air quality standards are currently being met except perhaps for small areas near traffic congested locations. Present worst-case concentrations of carbon monoxide due to traffic-related emissions occurring in the project area are estimated later in this study using computerized emissions and atmospheric dispersion models.

## 6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur due to project construction. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during project construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts from slow-moving construction equipment traveling to and from the project site, from a temporary increase in local traffic caused by commuting construction workers, and from the disruption of normal traffic flow caused by lane closures of adjacent roadways.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with site clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately. This is because of its elusive nature of emission and because the potential for its generation varies greatly depending upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA [2] has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled

fugitive dust emissions at the project site would likely be somewhere near that level, depending on the amount of rainfall that occurs. In any case, State of Hawaii Air Pollution Control Regulations [3] prohibit visible emissions of fugitive dust from construction activities at the property line. Thus, an effective dust control plan for the project construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is often a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or truck tire washing, may be appropriate. Paving of parking areas and/or establishment of landscaping as early in the construction schedule as possible can also lower the potential for fugitive dust emissions. Monitoring dust at the project property line could be considered to quantify and document the effectiveness of dust control measures.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the annual standard for nitrogen dioxide is not likely to be violated by short-term construction equipment emissions. Also, the new short-term (1-hour) standard for nitrogen dioxide is based on a three-year average; thus it is unlikely that relatively short-term construction emissions would

exceed the standard. Carbon monoxide emissions from diesel engines are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Project construction activities may also obstruct the normal flow of traffic at times to such an extent that overall vehicular emissions in the project area will temporarily increase. The only means to alleviate this problem will be to attempt to keep roadways open during peak traffic hours and to move heavy construction equipment and workers to and from construction areas during periods of low traffic volume. Thus, most potential short-term air quality impacts from project construction can be mitigated.

## 7.0 LONG-TERM IMPACTS OF PROJECT

### 7.1 Roadway Traffic

After construction is completed, use of the proposed facilities will result in increased motor vehicle traffic in the project area, potentially causing long-term impacts on ambient air quality. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide. They also emit nitrogen oxides and other contaminates.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the President signed into law the Clean Air Act Amendments. This legislation required further emission reductions, which have been phased in since 1994. More recently, additional restrictions were signed into law during the Clinton administration, and these began to take effect during the past decade. The added restrictions on emissions from new motor vehicles will lower average emissions

each year as more and more older vehicles are retired and leave the state's roadways. It is estimated that carbon monoxide emissions, for example, will go down by an average of about 20 percent per vehicle during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term indirect ambient air quality impact of increased roadway traffic associated with a project such as this, computerized emission and atmospheric dispersion models can be used to estimate ambient carbon monoxide concentrations along roadways leading to and from the project. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single new development.

For this project, three scenarios were selected for the carbon monoxide modeling study: (1) year 2014 with present conditions, (2) year 2040 without the project, and (3) year 2040 with the project. To begin the modeling study of the three scenarios, critical receptor areas in the vicinity of the project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. For this study, the same key intersections identified in the traffic study were also selected for air quality analysis. These included the following four intersections:

- Kaumualii Highway at Waialo Road/Eleele Road
- Kaumualii Highway at Halewili Road

- Kaumualii Highway at Laulea Street/Mahea Road
- Kaumualii Highway at Laulea Street North

The traffic impact report for the project [4] describes the existing and projected future traffic conditions and laneage configurations of these intersections in detail. In performing the air quality impact analysis, it was assumed that all recommended traffic mitigation measures would be implemented.

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the three scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to the national and state AAQS was also used to provide another measure of significance.

Maximum carbon monoxide concentrations typically coincide with peak traffic periods. The traffic impact assessment report evaluated morning and afternoon peak traffic periods. These same periods were evaluated in the air quality impact assessment.

Vehicular carbon monoxide emissions for each year studied were calculated using EPA’s Motor Vehicle Emission Simulator (MOVES) computer model [5]. MOVES was configured for a project-level analysis specifically for Hawaii. Assumptions included an urban, unrestricted road type, default fuel supply and fuel formulation, default vehicle age distribution and ambient temperature of 68 F. MOVES emission factors were generated both for idling and for moving traffic.

After computing vehicular carbon monoxide emissions through the use of MOVES, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [6] currently recommend that the computer model CAL3QHC [7] be used to assess carbon monoxide concentrations at roadway intersections, or in areas where its use has previously been established, CALINE4 [8] may be used. Until a few years ago, CALINE4 was used extensively in Hawaii to assess air quality impacts at roadway intersections. In December 1997, the California Department of Transportation recommended that the intersection mode of CALINE4 no longer be used because it was thought the model has become outdated. Studies have shown that CALINE4 may tend to over-predict maximum concentrations in some situations. Therefore, CAL3QHC was used for the subject analysis.

CAL3QHC was developed for the U.S. EPA to simulate vehicular movement, vehicle queuing and atmospheric dispersion of vehicular emissions near roadway intersections. It is designed to predict 1-hour average pollutant concentrations near roadway intersections based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Although CAL3QHC is intended primarily for use in assessing atmospheric dispersion near signalized roadway intersections, it can also be used to evaluate unsignalized intersections. This is accomplished by manually estimating queue lengths and then applying the same techniques used by the model for signalized intersections. Currently, only one of the four study intersections is signalized: Kaumualii Highway at Waialo Road/Eleele Road. For the future scenario without the project, in accordance with the traffic report, this was assumed to remain the case. For the future with-project case, in accordance with the traffic report, it was assumed that the intersections of

Kaumualii Highway at Laulea Street/Mahea Road and Kaumualii Highway at Laulea Street North would become signalized.

Input peak-hour traffic data were obtained from the traffic study cited previously. This included vehicle approach volumes, saturation capacity estimates, intersection laneage and signal timings (where applicable). All emission factors that were input to CAL3QHC for free-flow traffic on roadways were obtained from MOVES based on assumed free-flow vehicle speeds corresponding to the posted speed limits.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway-mixing zone. The roadway-mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. Model receptor sites were thus located at the edges of the mixing zones near all intersections that were studied for all three scenarios. This implies that pedestrian sidewalks either already exist or are assumed to exist in the future. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 6 was assumed for the morning cases, while atmospheric stability category 4 was assumed for the afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion within rural or suburban areas for these periods. A surface roughness length of 100 cm and a mixing height of 1000 meters were used in all cases. Worst-case wind

conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration. Concentration estimates were calculated at wind directions of every 5 degrees.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at low levels. Thus, background contributions of carbon monoxide from sources or roadways not directly considered in the analysis were accounted for by adding a background concentration of 0.5 ppm to all predicted concentrations for 2014. Although increased traffic is expected to occur within the project area during the next several years with or without the project, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease with time. Hence, a background value of 0.5 ppm was assumed to persist for the future scenarios studied.

Predicted Worst-Case 1-Hour Concentrations

Table 5 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations for the existing case (2014) and for each of the two future (2040) alternatives that were studied. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated worst-case 1-hour concentration for the present (2014) scenario was 1.4 parts per million (ppm), and this occurred during the morning at the intersection of Kaumualii Highway and Waialo Road/Eleele Road. Worst-case values for other locations and times ranged from 0.8 to

1.2 ppm. These concentrations are well within both the national AAQS of 35 ppm and the state standard of 9 ppm.

In the year 2040 without the proposed project, the predicted highest worst-case 1-hour concentration occurred again at the intersection of Kaumualii Highway and Waialo Road/Eleele Road with a value of 1.2 ppm occurring during the morning. Peak-hour worst-case values at the other locations and times studied for the 2040 without project scenario ranged between 0.8 and 1.1 ppm. Compared to the existing case, predicted concentrations for the year 2040 without the project remained mostly unchanged or decreased (improved) slightly, and worst-case concentrations remained well within the state and national standards.

As indicated in Table 5, predicted worst-case concentrations with the project in the year 2040 were not significantly different than those without the project. Thus, the predicted worst-case 1-hour concentrations for the 2040 with-project alternative at all locations studied continued to remain well within both the national and state standards.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [9] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from about 0.4 to 0.5. EPA

guidelines [10] recommend using a value of 0.6 to 0.7 unless a locally derived persistence factor is available. Recent monitoring data for Honolulu reported by the Department of Health [11] suggest that this factor may range between about 0.35 and 0.55 depending on location and traffic variability. Considering the location of the project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-case 8-hour concentrations. However, it should be noted that the 8-hour concentration estimates are generally less reliable than the 1-hour values due to the prediction methodology involved.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 6. For the 2014 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the study locations ranged from 0.6 to 0.7 ppm, with the highest concentration occurring at the intersection of Kaumualii Highway and Waialo Road/Eleele Road. The estimated worst-case concentrations for the existing case were well within both the national limit of 9 ppm and the state standard of 4.4 ppm.

For the 2040 without project scenario in comparison to the existing case, worst-case concentrations decreased slightly or remained unchanged. Concentrations ranged from 0.5 ppm to 0.6 ppm with the highest concentration occurring at the intersections of Kaumualii Highway at Waialo Road/Eleele Road and Kaumualii Highway at Halewili Road. All predicted 8-hour concentrations for this scenario were well within both the national and the state AAQS.

For the 2040 with-project scenario, the estimated worst-case concentrations were unchanged or increased slightly compared to the without-project case, and all predicted 8-hour concentrations for the with-project scenario remained well within both the national and the state AAQS.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

## 7.2 Electrical Demand

The proposed project also will cause indirect air pollution emissions from power generating facilities as a consequence of electrical power usage. The annual electrical demand of the project will reach approximately 10 million kilowatt-hours [12]. Electrical power for the project will most probably be provided mainly by oil-fired generating facilities, but some of the project power may also be derived from photovoltaic systems, wind power or other alternative energy sources, especially if the state’s initiative for renewable energy is realized. In order to meet the electrical power needs of the proposed project, power generating facilities will likely be required to burn more fuel and hence more air pollution will be emitted at these facilities. Given in Table 7 are estimates of the indirect air pollution emissions that would result from the project electrical demand assuming all power is provided by burning more fuel oil at local power plants. These values can be compared to the island-wide emission estimates for 1993 given in Table 3. The estimated

indirect emissions from project electrical demand amount to about 4 percent or less of the present air pollution emissions occurring on Kauai Island if all power is assumed to be derived from oil.

## 8.0 CONCLUSIONS AND RECOMMENDATIONS

### Existing Conditions

Although very little ambient air quality data are available to characterize existing conditions, it is likely that state and federal ambient air quality standards are currently being met in the project area, except perhaps for occasional exceedances of the stringent state carbon monoxide standards within small areas near traffic-congested locations.

### Short-Term Impacts and Mitigation

The major potential short-term air quality impact of the project will occur from the emission of fugitive dust during construction phases. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Use of wind screens and/or limiting the area that is disturbed at any given time will also help to contain fugitive dust emissions. Wind erosion of inactive areas of the site that have been disturbed could be controlled by mulching or by the use of chemical soil stabilizers. Dirt-hauling trucks should be covered when traveling on roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the project area. Paving of parking areas and establishment of landscaping early in the construction schedule will also help to control dust.

Monitoring dust at the project boundary during the period of construction could be considered as a means to evaluate the effectiveness of the project dust control program and to adjust the program if necessary.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides) will also occur both from on-site construction equipment and from vehicles used by construction workers and from trucks traveling to and from the project. Increased vehicular emissions due to disruption of traffic by construction equipment and/or commuting construction workers can be alleviated by moving equipment and personnel to the site during off-peak traffic hours.

**Long-Term Impacts and Mitigation**

After construction of the proposed project is completed and it is fully occupied, carbon monoxide concentrations in the project area should remain nearly unchanged with or without the project compared to the existing case, and worst-case concentrations should remain well within both the state and the national ambient air quality standards. Implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

Supplying the project with electric power will result in indirect (off site) emissions of air pollution at electric utility facilities, but the increased emissions will be minimal. Nevertheless, indirect emissions from project electrical demand could likely be reduced somewhat by incorporating energy-saving features into project design requirements. This might include the use of solar water heaters; using energy-efficient lighting systems; designing building space so that window positions maximize indoor light without unduly increasing indoor heat;

using landscaping where feasible to provide afternoon shade to cut down on the use of air conditioning; installation of insulation and double-glazed doors to reduce the effects of the sun and heat; providing movable, controlled openings for ventilation at opportune times; and possibly installing automated room occupancy sensors.

## REFERENCES


1. "Local Climatological Data, Annual Summary With Comparative Data, Lihue, Hawaii, 1992", U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, National Climatic Center, Asheville, NC.

2. Compilation of Air Pollutant Emission Factors, Volume I: Stationary Point and Area Sources, Fifth Edition, AP-42, U.S. Environmental Protection Agency, Research Triangle Park, NC, January 1995.

3. State of Hawaii. Hawaii Administrative Rules, Chapter 11-60, Air Pollution Control.

4. Hatch Mott MacDonald, Lima Ola Workforce Housing Project Traffic Impact Analysis, Final Report, March 24, 2014.

5. User Guide for Motor Vehicle Emission Simulator, MOVES2010b, U.S. Environmental Protection Agency, Office of Transportation and Air Quality, Assessment and Standards Division, Ann Arbor, Michigan, June 2012, EPA-420-B-12-001b.

6. Guideline on Air Quality Models (Revised), Including Supplements A and B, EPA-450/2-78-027R, U.S. Environmental Protection Agency, Research Triangle Park, NC, July 1986.

7. User's Guide to CAL3QHC Version 2.0: A Modeling Methodology for Predicting Pollutant Concentrations Near Roadway Intersections, U.S. Environmental Protection Agency, November 1992.

8. CALINE4 - A Dispersion Model for Predicting Air Pollutant Concentrations Near Roadways, FHWA/CA/TL-84/15, California State Department of Transportation, November 1984 with June 1989 Revisions.

9. "Persistence Factors for Mobile Source (Roadway) Carbon Monoxide Modeling", C. David Cooper, Journal of the Air & Waste Management Association, Volume 39, Number 5, May 1989.

10. Guideline for Modeling Carbon Monoxide from Roadway Intersections, U.S. Environmental Protection Agency, EPA-454/R-92-005, November 1992.

11. Annual Summaries, Hawaii Air Quality Data, 2008-2012, State of Hawaii Department of Health.

12. Personal communication via email, Max R. Solmssen, Environet, Inc., to Barry D. Neal, B.D. Neal & Associates, March 26, 2014, Electrical Estimates for Lima Ola Workforce Housing Project.

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# Figure 1 - Project Location Map

## Island of Kauai

Scale 1:375,000

0 2 4 6 8 10 12 mi

1" = 5.92 mi Data Zoom 9-1

MN (9.6° E)

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**Table 1**

**SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS**

| Pollutant | Units | Averaging Time | Maximum Allowable Concentration | | |
|---|---|---|---|---|---|
| | | | National Primary | National Secondary | State of Hawaii |
| Particulate Matter (<10 microns) | $\mu g/m^3$ | Annual | - | - | 50 |
| | | 24 Hours | 150[a] | 150[a] | 150[b] |
| Particulate Matter (<2.5 microns) | $\mu g/m^3$ | Annual | 15[c] | 15[c] | - |
| | | 24 Hours | 35[d] | 35[d] | - |
| Sulfur Dioxide | ppm | Annual | - | - | 0.03 |
| | | 24 Hours | - | - | 0.14[b] |
| | | 3 Hours | - | 0.5[b] | 0.5[b] |
| | | 1 Hour | 0.075[e] | - | - |
| Nitrogen Dioxide | ppm | Annual | 0.053 | 0.053 | 0.04 |
| | | 1 Hour | 0.100[f] | - | - |
| Carbon Monoxide | ppm | 8 Hours | 9[b] | - | 4.4[b] |
| | | 1 Hour | 35[b] | - | 9[b] |
| Ozone | ppm | 8 Hours | 0.075[g] | 0.075[g] | 0.08[g] |
| Lead | $\mu g/m^3$ | 3 Months | 0.15[h] | 0.15[h] | - |
| | | Quarter | 1.5[i] | 1.5[i] | 1.5[i] |
| Hydrogen Sulfide | ppm | 1 Hour | - | - | 0.025[b] |

[a] Not to be exceeded more than once per year on average over three years.
[b] Not to be exceeded more than once per year.
[c] Three-year average of the weighted annual arithmetic mean.
[d] 98th percentile value of the 24-hour concentrations averaged over three years.
[e] Three-year average of annual fourth-highest daily 1-hour maximum.
[f] 98th percentile value of the daily 1-hour maximum averaged over three years.
[g] Three-year average of annual fourth-highest daily 8-hour maximum.
[h] Rolling 3-month average.
[i] Quarterly average.

**Table 2**

**MEAN WIND SPEED AND PREVAILING DIRECTION FOR LIHUE AIRPORT, KAUAI**

| | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Speed (mph) | 11.3 | 12.0 | 12.8 | 13.7 | 13.4 | 13.6 | 14.1 | 13.4 | 12.1 | 11.9 | 12.7 | 12.2 | 12.8 |
| Direction | NE | ENE | NE | NE | NE | NE | NE | NE | NE | NE | NE | NE | NE |

Notes: Mean wind speeds are based on 32 years of data. Mean wind direction based on 20 years of data.

Source: "Local Climatological Data, Annual Summary With Comparative Data, Lihue, Hawaii, 1999", U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Environmental Data Service, National Climatic Center, Asheville, NC.

**Table 3**

**AIR POLLUTION EMISSIONS INVENTORY FOR ISLAND OF KAUAI, 1993**

| Air Pollutant | Point Sources (tons/year) | Area Sources (tons/year) | Total (tons/year) |
|---|---|---|---|
| Particulate | 614 | 4,817 | 5,431 |
| Sulfur Oxides | 703 | nil | 703 |
| Nitrogen Oxides | 4,072 | 7,054 | 11,126 |
| Carbon Monoxide | 2,315 | 11,974 | 14,289 |
| Hydrocarbons | 859 | 224 | 1,083 |

Source: Final Report, "Review, Revise and Update of the Hawaii Emissions Inventory Systems for the State of Hawaii", prepared for Hawaii Department of Health by J.L. Shoemaker & Associates, Inc., 1996

**Table 4**

**ANNUAL SUMMARIES OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST LIMA OLA WORKFORCE HOUSING PROJECT**

| Parameter / Location | 2011 | 2012 |
|---|---|---|
| **Sulfur Dioxide / Niumalu** | | |
| 1-Hour Averaging Period: | | |
| No. of Samples | 6358 | 7825 |
| Highest Concentration (ppm) | 0.078 | 0.090 |
| 2nd Highest Concentration (ppm) | 0.063 | 0.075 |
| No. of 1-Hr Averages Greater than 0.075 ppm | 1 | 1 |
| 3-Hour Averaging Period: | | |
| No. of Samples | 2079 | 2541 |
| Highest Concentration (ppm) | 0.055 | 0.057 |
| 2nd Highest Concentration (ppm) | 0.055 | 0.051 |
| No. of 1-Hr Averages Greater than 0.500 ppm | 0 | 0 |
| 24-Hour Averaging Period: | | |
| No. of Samples | 269 | 269 |
| Highest Concentration (ppm) | 0.055 | 0.055 |
| 2nd Highest Concentration (ppm) | 0.055 | 0.055 |
| No. of 1-Hr Averages Greater than 0.140 ppm | 0 | 0 |
| Annual Average Concentration (ppm) | 0.003 | 0.002 |
| **Particulate (PM-2.5) / Niumalu** | | |
| 24-Hour Averaging Period: | | |
| No. of Samples | 248 | 346 |
| Highest Concentration ($\mu g/m^3$) | 15.9 | 16.2 |
| 98th Percentile Concentration ($\mu g/m^3$) | 12.7 | 13.5 |
| No. of 24-Hr Averages Greater than 35 $\mu g/m^3$ | 0 | 0 |
| Annual Average Concentration ($\mu g/m^3$) | 4.9 | 6.8 |
| **Carbon Monoxide / Niumalu** | | |
| 1-Hour Averaging Period: | | |
| No. of Samples | 1036 | 7570 |
| Highest Concentration (ppm) | 0.7 | 1.2 |
| 2nd Highest Concentration (ppm) | 0.7 | 1.2 |
| No. of 1-Hr Averages Greater than 35 ppm | 0 | 0 |
| 8-Hour Averaging Period: | | |
| No. of Samples | 1043 | 7545 |
| Highest Concentration (ppm) | 0.7 | 1.0 |
| 2nd Highest Concentration (ppm) | 0.7 | 0.9 |
| No. of 8-Hr Averages Greater than 9 ppm | 0 | 0 |

**(Continued)**

**Table 4 (Continued)**

**ANNUAL SUMMARIES OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST LIMA OLA WORKFORCE HOUSING PROJECT**

| Parameter / Location | 2011 | 2012 |
|---|---|---|
| **Nitrogen Dioxide / Niumalu** | | |
| 1-Hour Averaging Period: | | |
| No. of Samples | 5982 | 7430 |
| Highest Concentration (ppm) | 0.025 | 0.042 |
| 2nd Highest Concentration (ppm) | 0.025 | 0.039 |
| No. of 1-Hr Averages Greater than 0.100 ppm | 0 | 0 |
| Annual Average Concentration (ppm) | 0.003 | 0.003 |

Source: State of Hawaii Department of Health, "Annual Summaries, Hawaii Air Quality Data, 2011 - 2012"

**Table 5**

**ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR LIMA OLA WORKFORCE HOUSING PROJECT (parts per million)**

| Roadway Intersection | Year/Scenario | | | | | |
|---|---|---|---|---|---|---|
| | 2014/Present | | 2040/Without Project | | 2040/With Project | |
| | AM | PM | AM | PM | AM | PM |
| Kaumualii Highway at Waialo Road/Eleele Road | 1.4 | 1.1 | 1.2 | 0.9 | 1.1 | 0.9 |
| Kaumualii Highway at Halewili Road | 1.2 | 0.9 | 1.1 | 0.8 | 1.1 | 0.9 |
| Kaumualii Highway at Laulea St/Mahea Rd | 1.2 | 0.8 | 1.0 | 0.8 | 1.1 | 0.8 |
| Kaumualii Highway at Laulea Street North | 1.2 | 0.8 | 1.0 | 0.8 | 1.1 | 0.8 |

Hawaii State AAQS: 9
National AAQS: 35

**Table 6**

**ESTIMATED WORST-CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS ALONG ROADWAYS NEAR LIMA OLA WORKFORCE HOUSING PROJECT (parts per million)**

| Roadway Intersection | Year/Scenario | | |
|---|---|---|---|
| | 2014/Present | 2040/Without Project | 2040/With Project |
| Kaumualii Highway at Waialo Road/Eleele Road | 0.7 | 0.6 | 0.6 |
| Kaumualii Highway at Halewili Road | 0.6 | 0.6 | 0.6 |
| Kaumualii Highway at Laulea St/Mahea Rd | 0.6 | 0.5 | 0.6 |
| Kaumualii Highway at Laulea Street North | 0.6 | 0.5 | 0.6 |

Hawaii State AAQS: 4.4
National AAQS: 9

**Table 7**

**ESTIMATED INDIRECT AIR POLLUTION EMISSIONS FROM LIMA OLA WORKFORCE HOUSING PROJECT ELECTRICAL DEMAND[a]**

| Air Pollutant | Emission Rate (tons/year) |
|---|---|
| Particulate | 1 |
| Sulfur Dioxide | 25 |
| Carbon Monoxide | 1 |
| Nitrogen Oxides | 10 |

[a]Based on U.S. EPA emission factors for utility boilers [2]. Assumes demand of 10 million kw-hrs per year of electrical power use, 33% energy conversion efficiency and low-sulfur distillate oil used to generate power.

# APPENDIX E: TRAFFIC IMPACT ANALYSIS

# LIMA OLA WORKFORCE HOUSING PROJECT

## ELEELE, HAWAII

TRAFFIC IMPACT ANALYSIS

*Final Report*

Prepared For

Community Planning and Engineering, Inc.
Honolulu, Hawaii

March 24, 2014
Revised October 28, 2014

334377 Report4.doc

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I *Traffic/Pedestrian Signalization Options for Lima Ola Workforce Housing Development*, Community Planning and Engineering, October 2014.

# EXECUTIVE SUMMARY

The proposed Lima Ola Workforce Housing project would be located to the east of Kaumualii Highway (Route 50) in Eleele, Hawaii, a community on the island of Kauai, Hawaii. The project site is currently in agricultural production. The proposed project would construct approximately 550 affordable residential units of various densities.

***Scope of Work:***

In total, this traffic study includes a traffic impact analysis of operations at four intersections during typical weekday AM and PM peak hours. The following intersections were analyzed in this study:

1. Waialo Road (Route 541)-Eleele Road / Kaumualii Highway (Route 50);
2. Kaumualii Highway (Route 50) / Halewili Road (Route 540);
3. Kaumualii Highway (Route 50) / Laulea Street (South) / Mahea Road; and
4. Kaumualii Highway (Route 50) / Laulea Street (North).

The specific traffic scenarios evaluated as part of this traffic study are:

- Existing Traffic Conditions;
- Future without Project Conditions (Year 2040);
- Future with Project Conditions (Year 2040); and

In addition, a shorter-term analysis scenario – Future with Project Phases 1 and 2 Conditions – was also evaluated at the sole project access to Kaumualii Highway (Route 50) that would be open under the first two phases of the project.

An evaluation of potentially significant project impacts has also been performed for all modes of travel (vehicle, pedestrian, bicycle and transit).

***Analysis Assumptions:***

The traffic analysis is based upon the methodologies within the 2010 *Highway Capacity Manual*. The software package Synchro (version 8) was used to perform the intersection analysis within this report.

For the purposes of this report and analysis, Kaumualii Highway (Route 50) near the study project site (i.e. Study Intersections 1 through 3) will be referred to as in a north-south alignment, with all of its cross streets being referred to as in east-west alignments at their respective intersections, and Waialo Road (Route 541) and Eleele Road will be referred to as in a north-south alignment at their mutual intersection (Study Intersection 1) with east-west Kaumualii Highway (Route 50). These conventions will be used throughout this report and analysis.

***Existing Conditions:***

Existing conditions utilize existing traffic volumes at the study intersections. Existing traffic volume data was collected in January 2014.

Traffic Operations:

Under Existing conditions, two of the stop-controlled intersections – Kaumualii / Halewili and Kaumualii / Laulea (South) - Mahea – currently operate at an overall LOS A with side-street operations of LOS C (AM) and LOS E (PM). The other stop-controlled intersection – Kaumualii / Laulea (North) – currently operates at an overall LOS A with side-street operations of LOS C.

The signalized intersection under Existing conditions – Waialo – Eleele / Kaumualii – currently operates at LOS C (AM) and LOS E (PM).

***Future without Project Conditions:***

Future Growth Forecasts:

A growth rate above existing volumes of 1% per year over twenty-six years (i.e. 1% per year for the twenty-six years between 2014 and 2040), or 26% total, was applied to the through volumes along the two regional highways within the study area – Kaumualii Highway (Route 50) and Halewili Road (Route 540) – and to the turning movements at their mutual intersection, as approved by Hawaii Department of Transportation staff. A growth rate of 0.25% per year for twenty-six years, or 6.5% total, was applied to the remaining turning movements at the other study intersections.

Anticipated vehicle traffic from the approved housing subdivision, Eleele Iluna, was also incorporated into this analysis, as taken from the report *Traffic Impact Assessment Report for Eleele I Luna*, prepared by Pacific Planning and Engineering in November 1997.

Traffic Operations:

Under Future without Project conditions, the Kaumualii / Halewili intersection would operate at an overall LOS A with side-street operations of LOS E (AM) and LOS F (PM). The Kaumualii / Laulea (South) - Mahea intersection would also operate at an overall LOS A with side-street operations of LOS D (AM) and LOS F (PM). The other stop-controlled intersection – Kaumualii / Laulea (North) – would operate at an overall LOS A with side-street operations of LOS D (AM) and LOS C (PM).

The signalized study intersection – Waialo – Eleele / Kaumualii – would operate at LOS D (AM) and LOS F (PM) under Future without Project conditions.

***Future with Project Conditions:***

Scenario Definition:

Future with Project Condition volumes are the sum of the Future without Project Condition volumes with the new project traffic.

Project Definition:

The proposed project includes 150 single-family homes, 365 multi-family units, and 35 "elderly" multi-family units (i.e. reserved for senior citizens only), plus a community center and park. The project would be split into four construction phases around the project site, progressing from south to north in a clockwise pattern.

The project also includes a new east-west pedestrian pathway that would connect the community park to Kaumualii Highway (Route 50) in the vicinity of a proposed new bus stop for Route 100.

Vehicular project access would be via two access points:

- Southerly access via an easterly extension of Mahea Road (further extension beyond the Eleele Iluna subdivision);
- Northerly access via an easterly extension of Laulea Street (North) along the northerly border of the project site.

The southerly access point (i.e. Mahea Road extension) would be built as part of Phase 1 of the project, while the other access point would not be built until Phase 3 of the project.

Project Trip Generation:

The trip generation estimate uses trip rates published in 2012 by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition. See **Appendix D** for excerpts of this publication that were used in this analysis.

The project is estimated to generate 3,577 daily vehicle trips, with 276 trips (61 in, 215 out) during the AM peak hour and 347 trips (222 in, 125 out) during the PM peak hour. This total is after accounting for trip reductions due to the anticipated pedestrian/bicycle (5%) and transit use (5%) by project residents.

Project Trip Distribution and Assignment:

Trip distribution for the project has been derived based upon the relative level of existing traffic on the surrounding street network. The project trips were then assigned along the study street network using that distribution. See Section 4.4 for more details regarding the project trip distribution.

Traffic Operations:

Under Future with Project conditions, the Kaumualii / Halewili intersection would continue to operate at an overall LOS A with side-street operations of LOS E (AM) and LOS F (PM). The Kaumualii / Laulea (South) - Mahea intersection would operate at an overall LOS E with side-street operations of LOS F. The other stop-controlled intersection – Kaumualii / Laulea (North) – would operate at an overall LOS E (AM) and LOS B (PM) with side-street operations of LOS F.

The signalized study intersection – Waialo – Eleele / Kaumualii – would continue to operate at LOS D (AM) and LOS F (PM) under Future with Project conditions.

***Future with Project Phases 1 and 2 Conditions:***

Scenario Definition and Derivation:

Traffic projections for the Future with Project Phases 1 and 2 Condition were developed in a similar manner to the Future with Project Condition traffic projections, except that the growth has been scaled back to the Year 2030. More specifically, the differences include the following:

1) The same growth rates of 1% per year and 0.25% per year were again applied to the Existing volumes, but now only for a sixteen-year span (versus twenty-six years as under Future without Project and Future With Project conditions).

2) Only Project Phases 1 and 2 are open and occupied, with all project traffic using the Mahea Road extension to access the project site.

3) Traffic forecasts were only derived for one study intersection – Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road

Note: It is assumed that the approved Eleele Iluna subdivision would be fully built and occupied by the Year 2030; thus all of its potential traffic was again incorporated into this traffic forecast.

Definition – Phases 1 and 2:

Phases 1 and 2 of the project comprise approximately 113 single-family homes, 182 multi-family units, and 35 “elderly” multi-family units (i.e. reserved for senior citizens only), plus a community center and park. Project access would only be via an easterly extension of Mahea Road. The proposed east-west pedestrian pathway would be connected to Kaumualii Highway (Route 50) under this scenario.

Trip Generation – Phases 1 and 2:

Project Phases 1 and 2 are estimated to generate 2,166 daily vehicle trips, with 167 trips (38 in, 129 out) during the AM peak hour and 211 trips (134 in, 77 out) during the PM peak hour.

Trip Distribution and Assignment – Current Zoning:

Trip distribution for project Phases 1 and 2 would be identical to the distribution for the full project. See Section 5.4 for more details regarding the project trip distribution.

Traffic Operations:

Under Future with Project Phases 1 and 2 Conditions, the Kaumualii (Route 50) / Laulea (South) – Mahea intersection would operate at an overall LOS D with side-street operations of LOS F.

***Project Impacts and Recommended Improvements:***

Note: See **Exhibit ES-1** for a summary of the recommended improvements described below.

Traffic Operations:

Improvements are recommended all four of the study intersections:

Waialo Road (Route 541) – Eleele Road / Kaumualii Highway (Route 50)

- Add a second westbound Kaumualii Highway (Route 50) left turn lane;
- Add a second southbound through lane on Waialo Road (Route 541) leaving the intersection (i.e. between Kaumualii Highway (Route 50) and the Eleele Shopping Center driveway).

This improvement would require modification of the existing traffic signal and likely the relocation of the existing Port Allen welcome sign.

Kaua'i County would be responsible for implementation of this improvementImplementation of this improvement is not recommended until the westbound left turn lane on Kaumualii Highway (Route 50) exceeds 300 vehicles during the AM or PM peak hour traffic periods (7:00 – 8:00 AM and 4:00 – 5:00 PM, respectively) for two consecutive years. Verification of this situation should begin after Phase 1 of the project is built and occupied.

Kaumualii Highway (Route 50) / Halewili Road (Route 540)

- Add a southbound median acceleration lane along Kaumualii Highway.
- Add a southbound left turn lane along Kaumualii Highway (Route 50) at this intersection.

Kaua'i County would be responsible for implementation of this improvement. Implementation of this improvement is not recommended until delays on the Halewili Road (Route 540) approach at Kaumualii Highway (Route 50) exceed 200 seconds during the PM peak hour (4:00 – 5:00 PM). Verification of this situation should begin after Phases 1 and 2 of the project are built and occupied.

Note: The recommended median acceleration lane could be channelized to lead directly into one of the two westbound Kaumualii Highway (Route 50) left turn lanes at Waialo Road (Route 541). If implemented, channelizers should be added along at least part of the acceleration lane stripe separating it from the mainline southbound through lane, in order to prevent traffic from merging into the acceleration lane too early.

Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road

- Signalize intersection; and
- Lengthen the existing southbound Kaumualii Highway (Route 50) left turn lane to provide a minimum of 100 feet of vehicle storage.

Kaua'i County would be responsible for implementation of this improvement. Implementation of the improvements at this intersection are not recommended until traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants. Verification of this situation should begin after Phase 1 of the project is built and occupied.

Kaumualii Highway (Route 50) / Laulea Street (North)

- Signalize intersection; and
- Convert the existing northbound median acceleration lane on Kaumualii Highway (Route 50) into a southbound left turn lane.

Kaua'i County would be responsible for implementation of this improvement. Implementation of the median acceleration lane into a left turn lane should be implemented with the fourth intersection approach under Phase 3. Implementation of the traffic signal is not recommended until traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants. Verification of this situation should begin after Phase 3 of the project is built and occupied.

Pedestrian Circulation:

All of the access roadways leading to and internal roadways within the project site will have either sidewalks or joint pedestrian/bicycle paths. These features, along with the proposed pedestrian pathway connection to Kaumualii Highway (Route 50) will provide a complete pedestrian circulation network within the project site.

Existing gaps in the pedestrian infrastructure external to the project site will affect the ability of pedestrians to access the project site. A sidewalk or pedestrian/bicycle pathway should be constructed along the northern frontage of Mahea Road between the project site and Kaumualii Highway (including through the Eleele Iluna project). This improvement will require coordination with the Eleele Iluna project to ensure that this improvement is constructed within that project. Kaua'i County would be responsible for implementation of this improvement, along with the cooperation of the project applicant for the Eleeele Iluna project. Implementation is recommended before Phase 1 of the project is built and occupied.

Consideration should also be made to address the gaps in the pedestrian network at the northern primary access and the secondary access. This would include a westerly extension of the existing sidewalk along Laulea Street (North) to Kaumualii Highway (Route 50) – an extension of one block – and the addition of either a sidewalk or pedestrian/bicycle pathway along the internal north-south roadway within the Eleele Iluna project (specifically between Mahea Road and the secondary access into the study project site).
The following pedestrian-related improvements should be incorporated into the signal improvements at the Kaumualii Highway (Route 50) intersections with Laulea Street (South) – Mahea Road and Laulea Street (North).

- Add pedestrian crossing phases and countdown pedestrian signal heads;
- Add pedestrian crosswalks across specific approaches to the interesections:
    - Kaumualii (Route 50) / Laulea (South) – Mahea: north and east approaches of the intersection;
    - Kaumualii (Route 50) / Laulea (North): south and west approaches of the intersection

Kaua'i County would be responsible for implementation of this improvement. These improvements would be incorporated into the traffic signal designs at each intersection.

There may be a period of time when portions of the proposed project are built and occupied but the recommended traffic signals are not yet implemented. The Hawaii Department of Transportation (HDOT) has expressed a desire that the Kawa'i County Housing Authority (KCHA) integrate safety measures at these two intersections when the situation arises prior to traffic signal warrants being met at either intersection.

There are a number of potential interim improvements that can be implemented prior to a traffic signal. Community Planning and Engineering (CPE) prepared a report summarizing the potential improvement options at both intersections, including the benefits and drawbacks of each; it is included within **Appendix I**. Other improvements are also being considered by KCHA.

It is recommended that the County of Kaua'i evaluate these options and implement at least one of them prior to construction and occupation of Phase 1 of the project.

<u>Bicycle Circulation:</u>

The proposed pedestrian pathways within the project site, in concert with the internal project roadway system, would provide sufficient bicycle circulation throughout the project site and into/out of the project site. The level of bicycle activity generated by the project would not require any additional bicycle lanes or paths in the project vicinity.

Transit Usage:

The new bus stop along northbound Kaumualii Highway (Route 50) proposed by the project would fill an major gap in transit service to the community, as currently there is no eastbound bus stop in western Eleele. The new bus stop would also better facilitate access to transit for residents within the project site, especially in combination with the proposed pedestrian pathway. The level of transit demand added by project residents and visitors would not rise to the level that would require any increase in transit service to the project area.

The County of Kaua'i should consider adding new bus stops for Routes 100 and 200 along Waialo Road (Route 541) in the vicinity of the Eleele Shopping Center.

Project Access:

The recommended improvements at the Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road intersection under Future with Project Phases 1 and 2 (Year 2030) conditions would be the same as under both Future with Project (Year 2040) conditions. The aforementioned pedestrian crosswalk, signal timing and signal infrastructure improvements at this intersection are also recommended under both scenarios.
The County of Kaua'i should consider monitoring the quality-of-life concerns of residents along Mahea Road and the future internal north-south roadway through the Eleele Iluna site due to project traffic, in order to determine if any further improvements are necessary to address these concerns. Potential improvements could include, for example, various traffic calming improvements. Monitoring is recommended after Phase 1 of the project is built and occupied.

| Category | Potential Impact | Recommendation | Responsibility | Implementation Trigger |
|---|---|---|---|---|
| Traffic Operations | Waialo (Route 541) - Eleele/ Kaumualii (Route 50) | 1) Add second westbound Kaumualii left turn lane;<br>2) Add second southbound through lane on Waialo south of intersection. | Kaua'i County | Westbound Kaumualii Highway (Route 50) left turn lane exceeds 300 vehicles during the AM or PM peak hour traffic periods (7:00 – 8:00 AM and 4:00 – 5:00 PM, respectively) for two consecutive years.<br>Verify after Phase 1 of the project is built and occupied. |
| | Kaumualii (Route 50)/ Halewili (Route 540) | 1) Add southbound Kaumualii median acceleration lane;<br>2) Add southbound Kaumualii left turn lane;<br>3) Consider extending median acceleration lane to meet westbound Kaumualii left turn lane (including use of channelizers) | Kaua'i County | Delays on Halewili Road (Route 540) approach to Kaumualii Highway (Route 50) exceed 200 seconds during the PM peak hour (4:00 – 5:00 PM).<br>Verify after Phases 1 and 2 of the project are built and occupied |
| | Kaumualii (Route 50)/ Laulea (South) - Mahea | 1) Signalize intersection;<br>2) Lengthen southbound Kaumualii left turn lane to 100 feet of vehicle storage. | Kaua'i County | Traffic volumes meet a minimum of two of the three MUTCD volume-based signal warrants.<br>Verify after Phase 1 of the project is built and occupied. |
| | Kaumualii (Route 50)/ Laulea (North) | 1) Signalize intersection;<br>2) Convert existing northbound Kaumualii median acceleration lane into a southbound left turn lane. | Kaua'i County | Traffic Signal: Traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants.<br>Left turn lane: Implement with the fourth intersection approach under Phase 3.<br>Verify both after Phase 3 of the project is built and occupied. |
| Pedestrian Circulation | Discontinuous sidewalks between project site and remainder of Eleele community | 1) Construct a sidewalk or pedestrian/bicycle pathway along the northern frontage of Mahea Road between the project site and Kaumualii Highway (including through the Eleele Iluna project);<br>2) Consider extending the existing sidewalk along Laulea Street (North) one block east to Kaumualii;<br>3) Consider constructing a sidewalk or pedestrian pathway along the north-south internal roadway within the Eleele Iluna project (between project scecondary access and Mahea Road). | Kaua'i County, in coordination with project applicant for Eleele Iluna project | Before Phase 1 of the project is built and occupied |
| | Increased pedestrian crossing demand across Kaumualii (Route 50) | 1) Add pedestrian signal phases and countdown signals (north and east approaches) and missing crosswalk (east approach) at Kaumualii (Route 50)/Laulea (South) - Mahea.<br>2) Add pedestrian signal phases and countdown signals (south and west approaches) and missing crosswalks (north and west approaches) at Kumualii (Route 50)/Laulea (North).<br>3) Before implementation of traffic signals, implement pedestrian crossing improvement(s). | Kaua'i County | Signals: Incorporate into signal design.<br>Pedestrian Improvements: Before Phase 1 of the project is built and occupied. |
| Bicycle Circulation | None | None | None | None |
| Transit Usage | Lack of transit access to Eleele Shopping Center | Consider adding new Route 100 and 200 bus stops on Waialo Road (Route 541) near Eleele Shopping Center. | Kaua'i County | None |
| Project Access | Shorter-Term operations of project access | Implement above recommended improvements at Kaumualii (Route 50)/ Laulea (South) - Mahea. | Kaua'i County | See Above |
| | Potential quality-of-life concerns of existing Mahea Road and residents and future Eleele Iluna residents due to project traffic | Monitor resident concerns within existing neighborhoods and Eleele Iluna project with regards to project traffic | Kaua'i County | After Phase 1 of the project is built and occupied |

**EXHIBIT ES-1**
**Summary of Recommended Improvements**

# 1 INTRODUCTION

The proposed Lima Ola Workforce Housing project would be located to the east of Kaumualii Highway (Route 50) in Eleele, Hawaii, a community on the island of Kauai, Hawaii. The project site is currently in agricultural production. The proposed project would construct approximately 550 affordable residential units of various densities. **Exhibit 1** shows the location of the study project, while **Exhibit 2A** shows the proposed project site plan.

The purpose of this Traffic Impact Analysis (TIA) is to evaluate the potential traffic impacts that may result from the study project; this includes potential impacts to multiple modes of transportation – vehicular travel, pedestrian, bicycle, and transit. The TIA presents the results from a series of analyses performed to determine the existing traffic conditions and how traffic conditions would change with the implementation the study project and future traffic growth.

## *1.1 Project Description*

The project would include 150 single-family homes, 365 multi-family units, and 35 "elderly" multi-family units (i.e. reserved for senior citizens only), plus a community center and park. The project would be split into four construction phases around the project site, progressing from south to north in a clockwise pattern. **Exhibit 2B** shows the proposed project phasing plan.

Project access to the project site would be through the easterly extensions of two existing streets adjacent to the project site – Mahea Road and Laulea Street. These access points would open with different phases of the project; see Section 4.2 for more information regarding the project phasing.

## *1.2 Project Area*

The project site is bordered by Kaumualii Highway (Route 50) to the northwest, a approved residential development to the southwest ("Habitat for Humanity" project – see Section 3.1 for more information), and existing agricultural fields to the north, south and west. Refer to **Exhibit 1** for details of the local access road network serving the study project site.

## *1.3 Scope of Work*

The scope of work for this traffic study was developed in conjunction with staff at the State of Hawaii Department of Transportation to identify the potential traffic impacts that may be associated with the development of the study project. Intersections were selected for analysis based on the potential for the project to impact the facility. The purpose of this analysis is therefore to verify if the project would represent a significant impact upon any of the study intersections, and if so, what level of improvement would be required to mitigate that impact.

The intersections comprising the analyzed study area were identified in conjunction with staff at the State of Hawaii Department of Transportation. Beyond the limits of the study area, the project trips disperse onto multiple local streets. As the distance from the project increases the number of trips considered reduces and the distribution assumptions are less reliable.

In total, this traffic study includes a traffic impact analysis of operations at four intersections during typical weekday AM and PM peak hours. Recommendations for improvements have been made where warranted by identified potential transportation-related impacts.

The following intersections were analyzed in this study:

1. Waialo Road (Route 541)-Eleele Road / Kaumualii Highway (Route 50);
2. Kaumualii Highway (Route 50) / Halewili Road (Route 540);
3. Kaumualii Highway (Route 50) / Laulea Street (South) / Mahea Road; and
4. Kaumualii Highway (Route 50) / Laulea Street (North).

Note: Laulea Street intersects Kaumualii Highway (Route 50) at two consecutive intersections approximately one half-mile apart. To better differentiate the two intersections, this report uses the terms "Laulea Street (North)" to refer to the northern intersection and "Laulea Street (South)" to refer to the southern intersection.

The traffic scenarios evaluated in this traffic study were selected to test the potential traffic impacts from the project itself. These evaluations also include projected future traffic growth from local and regional sources within the Eleele region that would add traffic to the study intersections. See Chapter 3 for more information regarding the derivation of the future traffic growth within the study area.

The specific traffic scenarios evaluated as part of this traffic study are:

- Existing Traffic Conditions;
- Future without Project Conditions (Year 2040); and
- Future with Project Conditions (Year 2040).

In addition, a shorter-term analysis scenario – Future with Project Phases 1 and 2 Conditions – was also evaluated at the sole project access to Kaumualii Highway (Route 50) that would be open under the first two phases of the project.

Traffic forecasts for this study were developed based upon the study area street system, including the location of the project access points upon the street system and the prevalence of impediments to quick and efficient vehicle travel (including stop signs and other traffic controls, posted speed limits, and conflicting pedestrian and bicycle traffic). Peak hour trips generated by each of the projects are estimated using trip generation rates published by the Institute of Transportation Engineers (ITE), 9$^{th}$ Edition.

## *1.4 Traffic Operation Evaluation Methodologies*

The following paragraphs describe the methodologies utilized in this analysis to evaluate the operations of all of the study intersections and roadway segments. All of the analysis is based upon the *2010 Highway Capacity Manual* methodologies.

### *1.4.1 Intersection Operational Analysis*

Intersection traffic operations were evaluated based on the Level of Service (LOS) concept. LOS is a qualitative description of an intersection and roadway's operation, ranging from LOS A to LOS F. Level of service "A" represents free flow un-congested traffic conditions. Level of service "F" represents highly congested traffic conditions with what is commonly considered unacceptable delay to vehicles on the road segments and at intersections. The intermediate levels of service represent incremental levels of congestion and delay between these two extremes.

Intersection operations were evaluated using technical procedures documented in the *2010 Highway Capacity Manual (HCM*). These procedures vary, depending upon the type of intersection control (traffic signal, all-way stop, one- and two-way stop, etc.) For signalized intersections, average control delay per vehicle is utilized to define intersection level of service. Delay is dependent on a number of factors including the signal cycle length, the roadway capacity (number of travel lanes) provided on each intersection approach and the traffic demand. **Appendix A1** shows the relationship between vehicle delay and the signalized intersection level of service categories. The Synchro software program (version 8) was utilized to model the traffic impact of the different development scenarios and to calculate signalized and un-signalized intersection levels of service.

At one-way stop controlled intersections, the operating efficiency of vehicle movements that must yield to through movements are analyzed. The level of service for vehicle movement on the controlled approaches is based on the distribution of gaps in the major street traffic stream and driver judgment in selecting gaps. The methodology assumes the frequency and size of these gaps is random; no credit is provided for gaps created by the operations of upstream traffic signals. **Appendix A2** shows the relationship between the vehicle delay and level of service for two-way stop controlled intersections. The *2010 HCM* calculates the level of service of the minor street approaches. Using this data, an overall intersection level of service was calculated. Both are reported in this study because traffic on the minor street approaches has the lowest priority of right-of-way at the intersection and are the most critical in terms of delay.

### *1.4.2 Modeling of Right Turns*

The signalized study intersection – Waialo-Eleele / Kaumualii – allows right turns on red (RTOR), and these right turns can have an effect on the intersection LOS calculations. However, the *2010 HCM* methodologies do not directly incorporate RTOR operations. Therefore, to be conservative, this analysis does not include any RTOR at any of the signalized study intersections. The results of the intersection analyses can thus be seen as reflecting a "worst case" scenario, as the effect of vehicles turning right on red on the intersection operations were not directly accounted for.

### *1.5 Assumptions regarding Cardinal Geometry in Analysis*

As can be seen from **Exhibit 1**, not all of the study street system within the Eleele area is oriented in any of the four cardinal directions. For example, Kaumualii Highway (Route 50) near the project site is oriented approximately 45 degrees clockwise from true north. In addition, streets such as Kaumualii Highway (Route 50) change direction within the study area. For the purposes of this report and analysis, Kaumualii Highway (Route 50) near the study project site (i.e. Study Intersections 1 through 3) will be referred to as in a north-south alignment, with all of its cross streets being referred to as in east-west alignments at their respective intersections, and Waialo Road (Route 541) and Eleele Road will be referred to as in a north-south alignment at their mutual intersection (Study Intersection 1) with east-west Kaumualii Highway (Route 50). These conventions will be used throughout this report and analysis.

# 2 EXISTING TRAFFIC CONDITIONS

This chapter presents a description of the existing road network, existing traffic volumes, intersection levels of service, and an overview of traffic flow conditions within the study area under existing traffic conditions.

## *2.1 Existing Traffic Network*

Regional access to the study project site is provided by Kaumualii Highway (Route 50). Other area streets include Mahea Road, Laulea Street, Halewili Road (Route 540), Waialo Road (Route 541) and Eleele Road. A brief description of each street in the study road network follows, in alphabetical order.

**Eleele Road** is a two-lane residential street within western Eleele. No bicycle lanes are provided along this street, and sidewalks are only provided along a one-block section east of Uliuli Road. Parking is allowed in both directions of the street. Eleele Road is the primary access into and out of the residential neighborhood that it serves. This includes Eleele Elementary School, which can be accessed off of roadways that intersect with Eleele Road. The posted speed limit on Eleele Road is 25 MPH.

**Halewili Road (Route 540)** is a two-lane, east-west state highway leading into and out of western Eleele. It connects to Kaumualii Highway (Route 50) at each end – the western intersection is in Eleele, and the eastern intersection is just west of Kalaheo. No bicycle lanes or sidewalks are provided along this roadway, although it does have a narrow paved shoulder. Parking is allowed in both directions of the roadway on the adjacent unpaved shoulder. The speed limit on Halewili Road (Route 540) is 50 MPH.

**Kaumualii Highway (Route 50)** is a two-lane state highway within Eleele. This roadway is the primary highway along the southern coast of the island of Kaua'i, extending between roughly Waimea to the west and Lihue to the east. There are no bicycle lanes or sidewalks along Kaumualii Highway (Route 50), although unpaved shoulders with both low-level and high foliage are present along both sides of the highway within Eleele. Parking is allowed along the highway within the unpaved shoulders. The speed limit on Kaumualii Highway (Route 50) within Eleele (including the study area) is 35 MPH.

**Laulea Street** is a two-lane residential street within northwestern Eleele. The roadway forms a loop, connecting with Kaumualii Highway (Route 50) at consecutive intersections spaced roughly a half-mile apart. Parking is permitted on both sides of the street within unpaved shoulders. No bicycle lanes are present along Laulea Road. A sidewalk is present along the outside edge of Laulea Road (i.e. along the eastbound frontage at its southern end and along the westbound frontage at its western end), with the sole exception of the first block immediately west of its northern intersection with Kaumualii Highway (Route 50). The speed limit on Laulea Street is 25 MPH.

**Mahea Road** is a two-lane, east-west residential street within western Eleele. It provides primary access to a small residential neighborhood to the east of Kaumualii Highway. No sidewalks or bicycle lanes are present along Mahea Road. On-Street parking is allowed within unpaved shoulders along both sides of the street. There is no posted speed limit on Mahea Road; the presumed speed limit is 25 MPH.

**Waialo Road (Route 541)** is a two- to four-lane, north-south state highway within southeastern Eleele. The highway provides access to a number of different land uses, including the community's only shopping center, an industrial park, a power plant, visitor-oriented commercial, residential neighborhoods, and Port Allen, a harbor for marine tours of Kaua'i. Immediately south of Kaumualii Highway (Route 50), Waialo Road (Route 541) is four lanes wide (two lanes in each direction); the roadway narrows to two lanes (one lane in each direction) approximately 1,000 feet south of Kaumualii Highway (Route 50). No sidewalks or bicycle lanes exist along Wailalo Road. Parking is not formally prohibited on Waialo Road (Route 541), but the ability to park is limited in portions of the northbound direction due to narrow shoulders. The speed limit on Waialo Road is 35 MPH.

### *2.2 Existing Transit Systems*

The County of Kaua'i Transportation Agency operates The Kaua'i Bus, the public transit system within the county. Two bus routes traverse the study area – Routes 100 and 200. Route 100 travels eastbound between Kekaha and Lihue via Eleele, while Route 200 travels the westbound along the same route. Both routes operate every half-hour between roughly 5:30 AM and 11:00 PM on weekdays, and every two hours during the same time periods on weekends and holidays.

The lone bus stop within the study area is located along Southbound Kaumualii Highway (Route 50), just south of Laulea Street (south). This stop is only serviced by Route 200; there is no bus stop for Route 100 in the vicinity of the project site.

### *2.3 Existing Traffic Data*

To establish existing traffic flow conditions, new traffic counts were conducted at the four study intersection on Tuesday, January 7 and Wednesday, January 8, 2014 during the weekday AM (i.e. 6:30 – 8:30 am – Wednesday only) and PM (i.e. 3:30 – 5:30 pm – Tuesday only) peak hours. From the peak period traffic counts, the AM and PM peak hour turning movement volumes were identified, then balanced between adjacent intersections to account for minor variations in the count volumes. The existing peak hour traffic volumes are presented on **Exhibit 3**.

### *2.4 Existing Conditions Intersection Operations*

Existing conditions AM and PM intersection levels of service are summarized on **Exhibit 4**. The LOS calculation sheets for existing traffic conditions can be found in **Appendix B**.

One of the four study intersections is currently signalized, while the other three are one- or two-way stop-controlled. All four study intersections were analyzed under Existing conditions. Please refer to **Exhibit 4** for detail of the type of traffic control at each intersection.

Under Existing conditions, two of the stop-controlled intersections – Kaumualii / Halewili and Kaumualii / Laulea (South) - Mahea – currently operate at an overall LOS A with side-street operations of LOS C (AM) and LOS E (PM). The other stop-controlled intersection – Kaumualii / Laulea (North) – currently operates at an overall LOS A with side-street operations of LOS C.

The signalized intersection under Existing conditions – Waialo – Eleele / Kaumualii – currently operates at LOS C (AM) and LOS E (PM).

# 3 FUTURE WITHOUT PROJECT CONDITIONS (YEAR 2040)

This section describes the analysis results of the study intersection operations under Future traffic conditions without the study project developed. The Future without Project traffic condition is defined as traffic conditions roughly twenty-six years beyond existing conditions, or the Year 2040.

## *3.1 Derivation of Future Traffic Volumes*

Traffic projections for the Future without Project Condition were developed using both growth rates and previously quantified trip activity for an approved project adjacent to the project site.

A growth rate above existing volumes of 1% per year over twenty-six years (i.e. 1% per year for the twenty-six years between 2014 and 2040), or 26% total, was applied to the through volumes along the two regional highways within the study area – Kaumualii Highway (Route 50) and Halewili Road (Route 540) – and to the turning movements at their mutual intersection, as directed by Hawaii Department of Transportation staff. A growth rate of 0.25% per year for twenty-six years, or 6.5% total, was applied to the remaining turning movements at the other study intersections.

The site of an approved housing subdivision, Eleele Iluna, is located adjacent to the project site, sandwiched between the project site and an existing neighborhood along Mehana Road. This development, comprising approximately 100 single-family homes on a long but narrow property, is currently scheduled to break ground in 2014. Roadway infrastructure within the Eleele Iluna subdivision includes a short easterly extension of Mahea Road and a new internal north-south road. The report *Traffic Impact Assessment Report for Eleele I Luna*, prepared by Pacific Planning and Engineering in November 1997, contains the projected trip assignment for this residential subdivision; this assignment was used to account for the increased traffic from the Eleele Iluna project, including extrapolation of these trips through all four of the study intersections.

**Exhibit 5** contains the Future without Project traffic volumes at the study intersections.

## *3.2 Future without Project Traffic Conditions*

**Exhibit 4** tabulates corresponding morning and evening peak hour levels of service, the details of which are presented in **Appendix C**.

Under Future without Project conditions, the Kaumualii / Halewili intersection would operate at an overall LOS A with side-street operations of LOS E (AM) and LOS F (PM). The Kaumualii / Laulea (South) - Mahea intersection would also operate at an overall LOS A with side-street operations of LOS D (AM) and LOS F (PM). The other stop-controlled intersection – Kaumualii / Laulea (North) – would operate at an overall LOS A with side-street operations of LOS D (AM) and LOS C (PM).

The signalized study intersection – Waialo – Eleele / Kaumualii – would operate at LOS D (AM) and LOS F (PM) under Future without Project conditions.

# 4 FUTURE WITH PROJECT CONDITIONS (YEAR 2040)

This section describes the analysis results of the study intersection operations under Future with Project traffic conditions. The Future with Project scenario is defined as traffic conditions roughly twenty-six years beyond existing conditions, or the Year 2040, and includes trips from the study project.

## *4.1 Derivation of Future with Project Traffic Volumes*

Future with Project volumes include both the future growth projected under Future without Project conditions (see Chapter 3 for more information), plus the trips generated by the study project (see below).

## *4.2 Project Definition and Access*

The proposed project includes 150 single-family homes, 365 multi-family units, and 35 "elderly" multi-family units (i.e. reserved for senior citizens only), plus a community center and park. The project would be split into four construction phases around the project site, progressing from south to north in a clockwise pattern.

The project also includes a new east-west pedestrian pathway that would connect the community park to Kaumualii Highway (Route 50) in the vicinity of a proposed new bus stop for Route 100.

Project access would be via two access points. The southerly access would be via an easterly extension of Mahea Road, further extending the roadway beyond the short extension being built by the aforementioned Eleele Iluna subdivision. The northerly access would be via an easterly extension of Laulea Street (North) along the northerly border of the project site.

**Exhibit 2B** depicts the project phasing of the access roadways. The southerly access point (i.e. Mahea Road extension) would be built as part of Phase 1 of the project, while the other two access points would not be built until Phase 3 of the project.

## *4.3 Project Trip Generation*

**Exhibit 6** summarizes the estimated project trip generation. This estimate uses trip rates published in 2012 by the Institute of Transportation Engineers (ITE) in *Trip Generation Manual*, 9th Edition. See **Appendix D** for excerpts of this publication that were used in this analysis.

The trip generation estimate for the multi-family uses was derived using trip rates for "Apartment." The multi-family elderly units were derived using trip rates for "Senior Adult Housing – Attached." In addition, the project trip generation includes trip reductions due anticipated pedestrian/bicycle (5%) and transit (5%) usage by project residents.

Note that the community center and park are not anticipated to generate any vehicular trips to/from outside of development. These uses expected to only be used by residents residing within the project site, and thus would not generate traffic outside of the project site. As such, these uses were not included within trip gen estimate.

As cited within **Exhibit 6**, the project is estimated to generate 3,577 daily vehicle trips, with 276 trips (61 in, 215 out) during the AM peak hour and 347 trips (222 in, 125 out) during the PM peak hour.

### *4.4 Project Trip Distribution and Assignment*

Trip distribution defines the origins and destinations of all trips to and from a project site. Trip distribution for the project has been derived based upon the relative level of existing traffic on the surrounding street network.

The trip distribution for the project is shown on **Exhibit 7**, alongside the project trip assignment, and is also repeated below:

The project trip distribution would be as follows:

| | |
|---|---|
| To/From North: | 0% |
| To/From South:<br>Waialo Road (Route 541) – 15% (AM), 25% (PM) | 15% (AM),<br>25% (PM) |
| To/From East:<br>Kaumualii Highway (Route 50) – 50% | 50% |
| To/From West:<br>Kaumualii Highway (Route 50) – 25%<br>Laulea Street (South) – 10% (AM), 0% (PM) | 35% (AM),<br>25% (PM) |
| TOTAL: | 100% |

Vehicular project access to the site would be via one of two roadway extensions into the project site – Mahea Road and Laulea Street (North). The project trip assignment reflects use of both access points.

Note: As previously discussed, the three project access points will be opened in phases. For example, only the Mahea Road connection would be open during Phases 1 and 2 of the project. See Chapter 5 for more information about how the phasing of the project access points may affect the short-term operations of the study street network.

### *4.5 Future with Project Traffic Conditions*

The traffic that would be generated by the study project was added to the Future without Project volumes to create Future with Project traffic conditions. Future with Project morning and evening peak hour turning volumes are illustrated on **Exhibit 8**. **Exhibit 4** tabulates corresponding morning and evening peak hour levels of service, the details of which are presented in **Appendix E**.

Under Future with Project conditions, the Kaumualii / Halewili intersection would continue to operate at an overall LOS A with side-street operations of LOS E (AM) and LOS F (PM). The Kaumualii / Laulea (South) - Mahea intersection would operate at an overall LOS E with side-street operations of LOS F. The other stop-controlled intersection – Kaumualii / Laulea (North) – would operate at an overall LOS E (AM) and LOS B (PM) with side-street operations of LOS F.

The signalized study intersection – Waialo – Eleele / Kaumualii – would continue to operate at LOS D (AM) and LOS F (PM) under Future with Project conditions.

# 5 FUTURE WITH PROJECT PHASES 1 AND 2 CONDITIONS (YEAR 2030)

This section describes the analysis results of traffic operations under Future with Project Phases 1 and 2 traffic conditions. The Future with Project Phases 1 and 2 scenario is defined as traffic conditions roughly sixteen years beyond existing conditions, or the Year 2030, and includes only Phases 1 and 2 of the project and a single project access via Mahea Road. This scenario focuses on the operations of the Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road intersection, which would connect to the sole project access under Project Phases 1 and 2.

## *5.1 Derivation of Future with Project Phases 1 and 2 Traffic Volumes*

Traffic projections for the Future with Project Phases 1 and 2 Condition were developed in a similar manner to the Future with Project Condition traffic projections, except that the growth has been scaled back to the Year 2030. More specifically, the differences include the following:

1) The same growth rates of 1% per year and 0.25% per year were again applied to the Existing volumes, but now only for a sixteen-year span (versus twenty-six years as under Future without Project and Future With Project conditions).

2) Only Project Phases 1 and 2 are open and occupied, with all project traffic using the Mahea Road extension to access the project site.

3) Traffic forecasts were only derived for one study intersection – Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road

Note: It is assumed that the approved Eleele Iluna subdivision would be fully built and occupied by the Year 2030; thus all of its potential traffic was again incorporated into this traffic forecast.

## *5.2 Project Definition and Access*

Phases 1 and 2 of the project comprise approximately 113 single-family homes, 182 multi-family units, and 35 “elderly” multi-family units (i.e. reserved for senior citizens only), plus a community center and park.

Note: The proposed east-west pedestrian pathway would be constructed along the park frontage under Project Phase 2, and thus would connect to Kaumualii Highway (Route 50) under this scenario.

Again, project access under Project Phases 1 and 2 would solely be via an easterly extension of Mahea Road, further extending the roadway beyond the short extension being built by the aforementioned Eleele Iluna subdivision.

### *5.3 Trip Generation – Project Phases 1 and 2*

**Exhibit 9** summarizes the estimated trip generation for Project Phases 1 and 2. As with the full project trip generation, this estimate uses trip rates published in 2012 by the Institute of Transportation Engineers in *Trip Generation Manual*, 9th Edition. Credit has again been taken for pedestrian/bicycle (5%) and transit (5%) trips by residents of the project site, all of which would reduce the potential overall vehicular trip generation of the project.

As cited within **Exhibit 9**, Project Phases 1 and 2 are estimated to generate 2,166 daily vehicle trips, with 167 trips (38 in, 129 out) during the AM peak hour and 211 trips (134 in, 77 out) during the PM peak hour.

### *5.4 Trip Distribution and Assignment – Project Phases 1 and 2*

The trip distribution for Project Phases 1 and 2 would be identical to that previously described for the project as a whole. However, as previously discussed, all project traffic under Project Phases 1 and 2 would utilize a single project access point – a westward extension of Mahea Road. **Exhibit 10** depicts the project trip distribution and assignment for Project Phases 1 and 2.

### *5.5 Future with Project Phases 1 and 2 Traffic Conditions*

Future with Project Phases 1 and 2 morning and evening peak hour turning volumes are illustrated on **Exhibit 10**. **Exhibit 11** tabulates corresponding morning and evening peak hour levels of service, the details of which are presented in **Appendix F**.

Note that most study intersections would experience fewer vehicle delays under Future with Project Phases 1 and 2 Conditions, compared to Future with Project Conditions, as the latter scenario contains more project trip activity. However, due to the concentration of project traffic on Mahea Road under Project Phases 1 and 2, one intersection – Kaumualii Highway (Route 50) / Laulea Street (South) - Mahea Road -- could experience additional short-term impacts that may not be as acute as under full buildout of the project or with the additional project access points open. Hence, only the Kaumualii (Route 50) / Laulea (South) - Mahea intersection was analyzed under this scenario.

Under Future with Project Phases 1 and 2 Conditions, the Kaumualii (Route 50) / Laulea (South) – Mahea intersection would operate at an overall LOS D with side-street operations of LOS F.

# 6 PROJECT IMPACTS AND RECOMMENDED IMPROVEMENTS

The following sections summarize the potential project impacts to the area circulation system and the corresponding recommended improvements. See **Exhibit 12** for a summary of the recommended improvements.

## *6.1 Potential Project Impacts and Recommended Improvements – Traffic Operations*

As summarized in the preceding sections of this report, all four study intersections would operate at LOS F (overall and/or side-street operations); hence, roadway improvements are recommended at all four study intersections. The following paragraphs of this section address the recommended improvements at each of these intersections to offset the study project's impact. The recommended improvements are also summarized within **Exhibit 12**.

<u>Waialo Road (Route 541) – Eleele Road / Kaumualii Highway (Route 50)</u>
This intersection would experience overall operations of LOS D (AM) and LOF F (PM) with implementation of the study project. It is recommended that a second westbound Kaumualii Highway (Route 50) left turn lane be added at this intersection, along with a second southbound through lane on Waialo Road (Route 541) leaving the intersection (i.e. between Kaumualii Highway (Route 50) and the Eleele Shopping Center driveway). This improvement would require modification of the existing traffic signal and likely the relocation of the existing Port Allen welcome sign. Kaua'i County would be responsible for implementation of this improvement.

Note: Implementation of this improvement is not recommended until the westbound left turn lane on Kaumualii Highway (Route 50) exceeds 300 vehicles during the AM or PM peak hour traffic periods (7:00 – 8:00 AM and 4:00 – 5:00 PM, respectively) for two consecutive years. Verification of this situation should begin after Phase 1 of the project is built and occupied.

<u>Kaumualii Highway (Route 50) / Halewili Road (Route 540)</u>
This intersection would experience overall operations of LOS A with side-street operations of LOS E (AM) and LOS F (PM) with implementation of the study project. The largest amount of delay at this intersection would be experienced by vehicles attempting to turn left from Halewili Road (Route 540) onto Kaumualii Highway (Route 50). Signalization of this intersection is not recommended because the Manual on Uniform Traffic Control Devices (MUTCD) signal warrants would not be met at this intersection. (See **Appendix G** for the signal warrant worksheets at this intersection.) It is instead recommended that a southbound median acceleration lane be added along Kaumualii Highway at this intersection, which will allow left-turning traffic from Halewili Road (Route 540) to turn onto Kaumualii Highway (Route 50) in two stages as gaps in northbound Kaumualii Highway (Route 50) traffic appear, rather than the current condition where left-turning traffic must wait for less frequent simultaneous gaps in both

directions of Kaumualii Highway (Rotue 50) traffic. Kaua'i County would be responsible for implementation of this improvement.

As part of this improvement, it is also recommended that a southbound left turn lane be added along Kaumualii Highway (Route 50) at this intersection, in order to prevent the formation of southbound Kaumuali Highway (Route 50) vehicle queues waiting behind traffic attempting to turn left onto Halewili Road (Route 540). Kaua'i County would be responsible for implementation of this improvement.

Note 1: The recommended median acceleration lane could be channelized to lead directly into one of the two westbound Kaumualii Highway (Route 50) left turn lanes at Waialo Road (Route 541). If this were to be implemented, it is also recommended that channelizers be added along at least part of the acceleration lane stripe separating it from the mainline southbound through lane, in order to prevent traffic from merging into the acceleration lane too early; otherwise, the speed differential between vehicles could create localized traffic congestion.

Note 2: Implementation of this improvement is not recommended until delays on the Halewili Road (Route 540) approach at Kaumualii Highway (Route 50) exceed 200 seconds during the PM peak hour (4:00 – 5:00 PM). Verification of this situation should begin after Phases 1 and 2 of the project are built and occupied.

<u>Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road</u>
This intersection would experience side-street operations of LOS F with implementation of the project. The MUTCD signal warrant #3 (Peak Hour) was found to be met under Future with Project conditions. (See **Appendix G** for the signal warrant worksheets at this intersection.) It is therefore recommended that the following improvements be implemented at this intersection:

- Signalize intersection; and
- Lengthen the existing southbound Kaumualii Highway (Route 50) left turn lane to provide a minimum of 100 feet of vehicle storage. (See **Appendix H** for a conceptual layout of this improvement.)

Kaua'i County would be responsible for implementation of this improvement.

Note: Implementation of the improvements at this intersection are not recommended until traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants. Verification of this situation should begin after Phase 1 of the project is built and occupied.

<u>Kaumualii Highway (Route 50) / Laulea Street (North)</u>
This intersection would experience side-street operations of LOS F with implementation of the project. The MUTCD signal warrant #3 (Peak Hour) was found to be met under Future with Project conditions. (See **Appendix G** for the signal warrant worksheets at this intersection.) It is therefore recommended that the following improvements be implemented at this intersection (see next page):

- Signalize intersection; and
- Convert the existing northbound median acceleration lane on Kaumualii Highway (Route 50) into a southbound left turn lane. (See **Appendix H** for a conceptual layout of this improvement.)

Kaua'i County would be responsible for implementation of this improvement.
Note: Implementation of the median acceleration lane into a left turn lane should be implemented with the fourth intersection approach under Phase 3. Implementation of the traffic signal is not recommended until traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants. Verification of this situation should begin after Phase 3 of the project is built and occupied.

### *6.2 Potential Project Impacts and Recommended Improvements – Pedestrian Facilities*

All of the access roadways leading to and internal roadways within the project site will have either sidewalks or joint pedestrian/bicycle paths. These features, along with the proposed pedestrian pathway connection to Kaumualii Highway (Route 50) will provide a complete pedestrian circulation network within the project site.

External to the site, there will be gaps in the pedestrian infrastructure where both project access points meet either the adjacent proposed Eleele Iluna project or the existing roadway network. For example, there is currently no sidewalk or pathway along Mahea Road between Kaumualii Highway (Route 50) and the project site, nor are any sidewalks or pathways proposed within the Eleele Iluna project. As Mahea Road would be the sole project access under Project Phases 1 and 2, and would also be the most direct path for students walking to Eleele Elementary School (in conjunction with the existing sidewalk along Laulea Street (South)), these gaps in the pedestrian infrastructure will affect the ability of pedestrians to access the project site. It is therefore recommended that either a sidewalk or pedestrian/bicycle pathway be constructed along the northern frontage of Mahea Road between the project site and Kaumualii Highway (including through the Eleele Iluna project). This improvement will require coordination with the Eleele Iluna project to ensure that this improvement is constructed within that project. Kaua'i County would be responsible for implementation of this improvement, along with the cooperation of the project applicant for the Eleele Iluna project. Implementation is recommended before Phase 1 of the project is built and occupied.

Consideration should also be made to address the gaps in the pedestrian network at the northern access, specifically a westerly extension of the existing sidewalk along Laulea Street (North) to Kaumualii Highway (Route 50) – an extension of one block.

The proposed traffic signals at the Kaumualii Highway (Route 50) intersections with Laulea Street (South) – Mahea Road and Laulea Street (North) will provide controlled pedestrian crossings across the highway. It is recommended that pedestrian crossing phases and pedestrian crosswalks be implemented as part of both signal improvements. At the Kaumualii (Route 50) / Laulea (South) – Mahea signal, crosswalks should be added across the north and east approaches of the intersection (i.e. across

southbound Kaumualii Highway (Route 50) and eastbound Laulea Street (South)), in order to connect the recommended sidewalk/pathway on Mahea Street with the existing sidewalk along Laulea Street (South). At the Kaumualii (Route 50) / Laulea (North) intersection, crosswalks are recommended across the south and west approaches (i.e. across northbound Kaumualii Highway (Route 50) and the westbound Laulea Street (North) extension). Both signals should also use countdown pedestrian signal heads. All of these components should be incorporated into the design of both traffic signals.

As implied earlier in this report, there may be a period of time when portions of the proposed project are built and occupied but the recommended traffic signals at Kaumualii (Route 50) / Laulea (South) – Mahea and Kaumualii (Route 50) / Laulea (North) are not yet implemented. The Hawaii Department of Transportation (HDOT) has expressed a desire that the Kawa'i County Housing Authority (KCHA) integrate safety measures at these two intersections when the situation arises prior to traffic signal warrants being met at either intersection.

There are a number of potential interim improvements that can be implemented prior to a traffic signal. Community Planning and Engineering (CPE) prepared a report summarizing the potential improvement options at both intersections, including the benefits and drawbacks of each; it is included within **Appendix I**. This document includes the following potential improvement options:

- Option 1 – Installation of Traffic Signal Lights. This is the improvement that was previously recommended at both intersections for eventual implementation.

- Option 2 – Installation of Pedestrian Hybrid Beacons (PHB). This is a pedestrian-activated improvement that stops conflicting highway traffic so that pedestrians can cross.

- Option 3 – Installation of Flashing Pedestrian Crossing and Rumble Strips. This is a combination of two improvements. The first improvements implements white Bott's Dots along the pavement to slow approaching vehicles. The second improvement adds in-street flashing lights across the entire crosswalk that are pedestrian activated. They are paired with flashing crosswalk signs on both ends of the crosswalk.

An additional option currently being considered by KCHA is the addition of a flashing beacons and median pedestrian refuge island at each intersection. The flashing beacons could be installed atop each existing pedestrian crossing sign assembly (W11-2 and W16-7P) next to the crosswalks at each intersection, and the median refuge island would allow pedestrians to cross each direction of Kaumualii Highway (Route 50) separately, while waiting within the median island between crossings.

It is recommended that the County of Kaua'i evaluate these options and implement at least one of them prior to construction and occupation of Phase 1 of the project.

### *6.3 Potential Project Impacts and Recommended Improvements – Bicycle Facilities*

The proposed pedestrian pathways within the project site would also allow use by bicyclists. These pathways, in concert with the internal project roadway system, would provide sufficient bicycle circulation throughout the project site and into/out of the project site. The level of bicycle activity generated by the project would not require any additional bicycle lanes or paths in the project vicinity.

### *6.4 Potential Project Impacts and Recommended Improvements – Transit*

The two transit routes nearest the project site – Routes 100 and 200 – provide regular transit service to the area throughout most of the day on weekdays and weekends. The new bus stop along northbound Kaumualii Highway (Route 50) proposed by the project would fill a major gap in transit service to the community, as currently there is no eastbound bus stop in Eleele. The new bus stop would also better facilitate access to transit for residents within the project site, especially in combination with the proposed pedestrian pathway. The level of transit demand added by project residents and visitors would not rise to the level that would require any increase in transit service to the project area.

The County of Kaua'i should consider adding new bus stops for Routes 100 and 200 along Waialo Road (Route 541) in the vicinity of the Eleele Shopping Center. This improvement would help to reduce vehicular demand to and from the shopping center, including to and from the project site. Currently, there are no bus stops within a five-minute walk of the shopping center.

### *6.5 Potential Project Impacts and Recommended Improvements – Project Access*

The side-street operations of the Kaumualii Highway (Route 50) / Laulea Street (South) – Mahea Road intersection under both Future with Project (Year 2040) and Future with Project Phases 1 and 2 (Year 2030) conditions would be LOS F. The recommended improvements for both scenarios are also the same, namely:

- Signalize intersection; and
- Lengthen the existing southbound left turn lane to provide 100 feet of vehicle storage.

The aforementioned pedestrian crosswalk, signal timing and signal infrastructure improvements at this intersection identified under Section 6.1 are also recommended under both scenarios.

The fact that some of the project traffic would need to travel through the Eleele Iluna and existing Mahea Road neighborhoods could lead to future quality-of-life concerns from current and future residents along Mahea Road and within the Eleele Iluna site. The County of Kaua'i should consider monitoring the concerns of residents in this area in order to determine if any further improvements are necessary to address these concerns. These potential improvements could include, for example, various traffic calming improvements. Monitoring is recommended after Phase 1 of the project is built and occupied.

# 7 REFERENCES

## *7.1 List of References*

1. The Kaua'i Bus web site, http://www.kauai.gov/Transportation. Accessed January 15, 2014.
2. Pacific Planning and Engineering, *Traffic Impact Assessment Report for Eleele I Luna*, November 1997.
3. Institute of Transportation Engineers, *Trip Generation Manual*, 9th Edition, 2012.
4. United States Department of Transportation, Federal Highway Administration, *Manual on Uniform Traffic Control Devices for Streets and Highways*, 2009 Edition, December 2009.
5. *Traffic/Pedestrian Signalization Options for Lima Ola Workforce Housing Development*, Community Planning and Engineering, October 2014.

## *7.2 List of Contacts*

1. Richard Santo, PE, Community Planning and Engineering, Honolulu, Hawaii.
2. Stephen L. Spears, Kauai Habitat for Humanity, Eleele, Hawaii.
3. Fred Reyes, PE, Hawaii Department of Transportation, Kauai, Hawaii.
4. Donald Smith, PE, Hawaii Department of Transportation, Kauai, Hawaii.
5. Goro Sulijoadikusumo, Hawaii Department of Transportation, Honolulu, Hawaii.

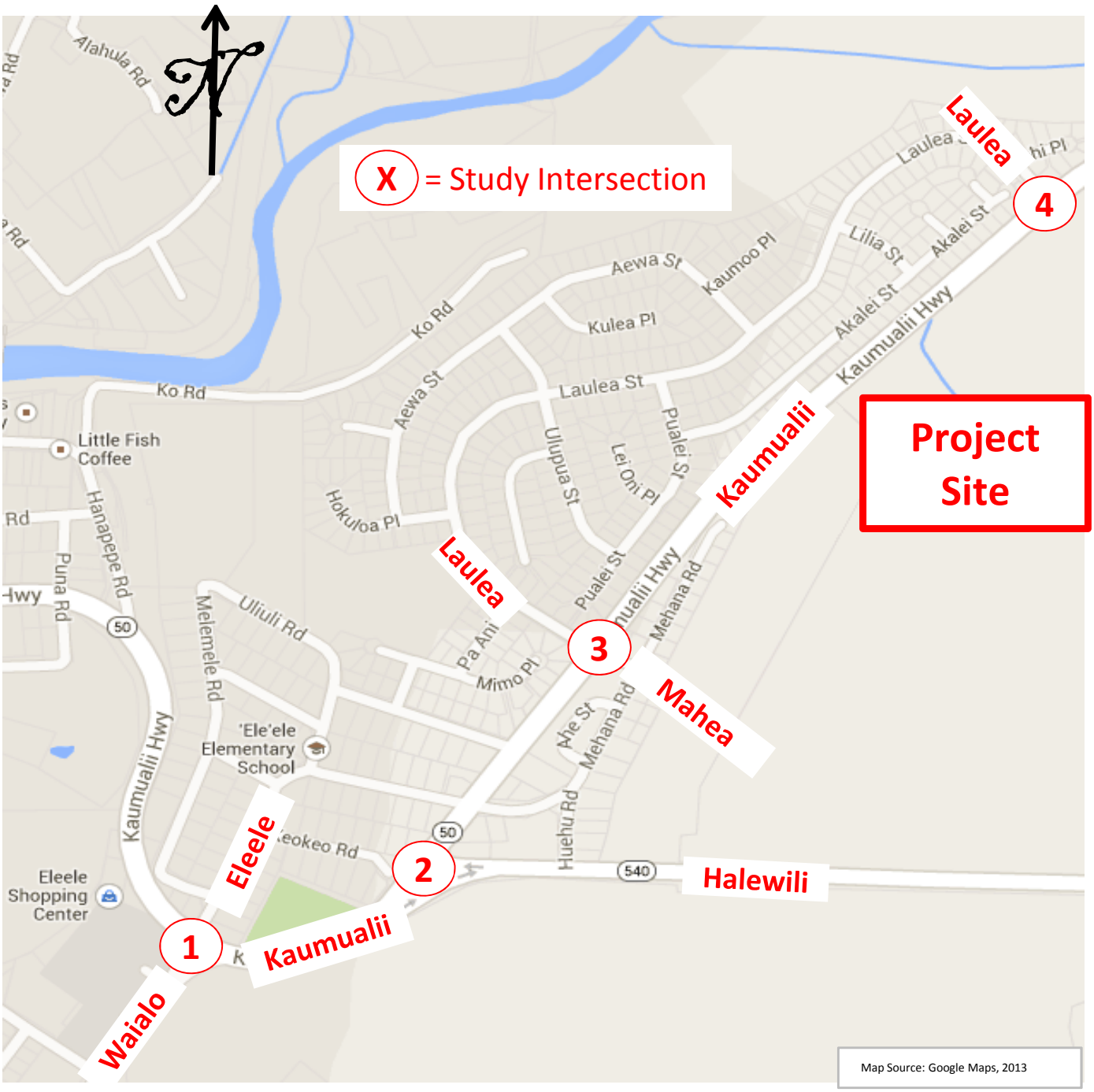


EXHIBIT 1
Project Location Map

Source: PBR Hawaii & Associates, February 2014.

EXHIBIT 2A

Project Site Plan

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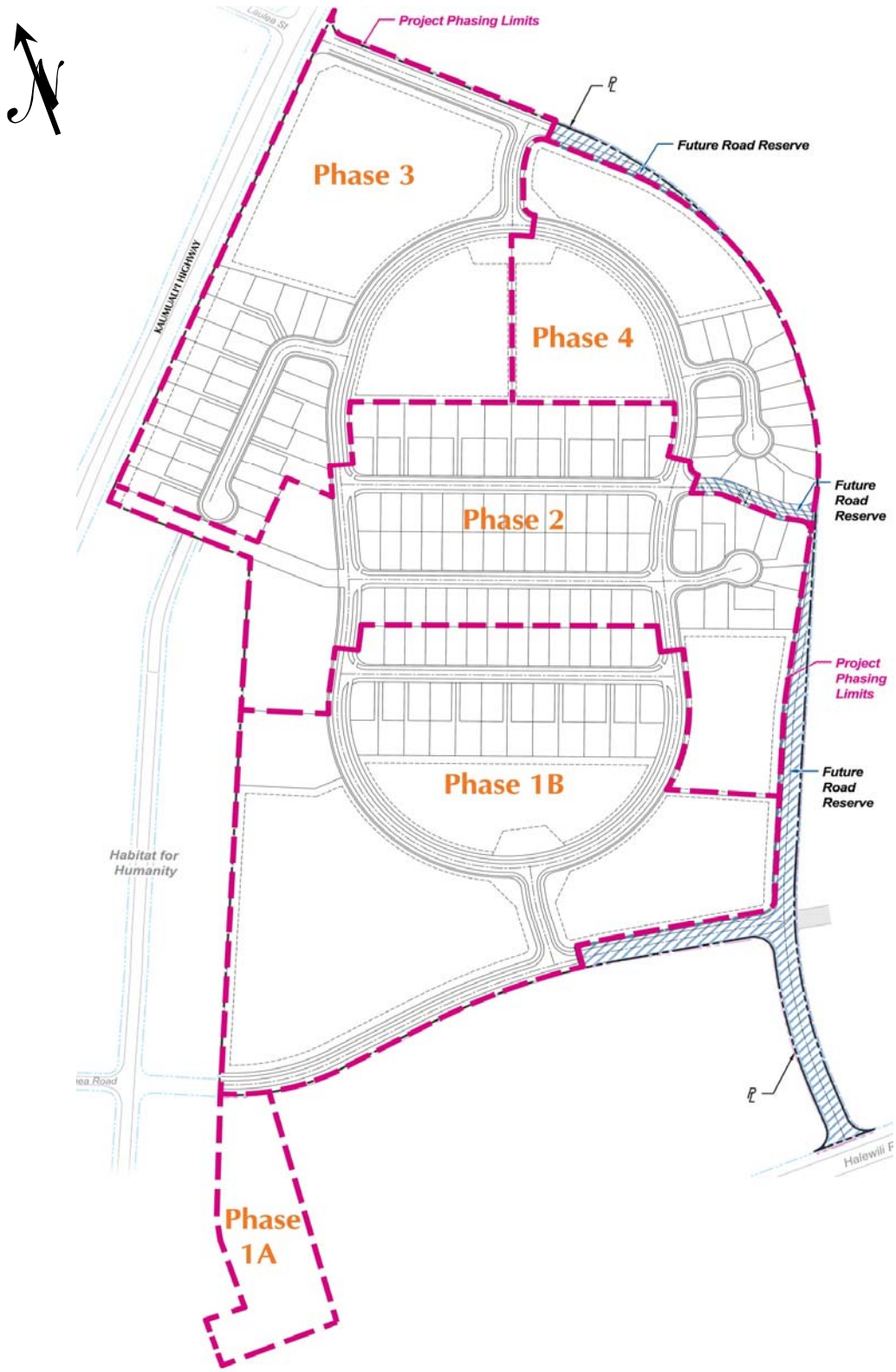


Source: PBR Hawaii & Associates, March 2014.

EXHIBIT 2B

Project

Phasing Plan

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Notes:
1. XX (YY) = AM (PM)
2. Not to Scale

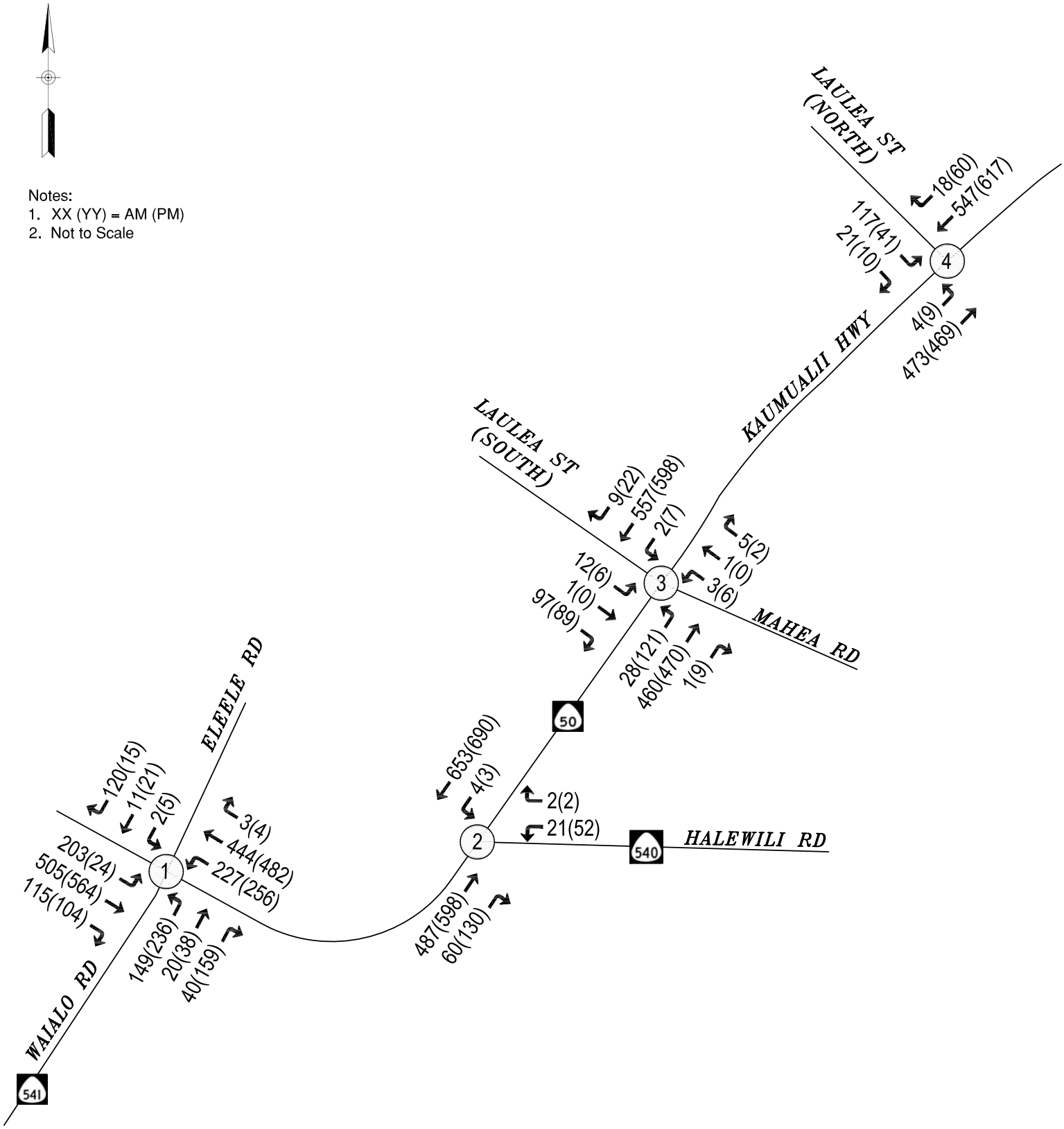


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EXHIBIT 3
Existing Conditions
AM & PM Peak Hour Volumes

| | N-S Street | E-W Street | Existing Lane Configuration | Existing Intersection Control | Existing Conditions (Year 2014) | | | | Future without Project Conditions (Year 2040) | | | | Future with Project Conditions (Year 2040) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | AM Peak Hr | | PM Peak Hr | | AM Peak Hr | | PM Peak Hr | | AM Peak Hr | | PM Peak Hr | |
| | | | | | Delay (sec) | LOS | Delay (sec) | LOS | Delay (sec) | LOS | Delay (sec) | LOS | Delay (sec) | LOS | Delay (sec) | LOS |
| 1 | Waialo Road (Route 541) - Eleele Road | Kaumualii Highway (Route 50) | NB 1-L/T, 1-R<br>SB 1-L/T/R<br>EB 1-L, 1-T, 1-R<br>WB 1-L, 1-T/R | Signal | 25.4 | C | 56.0 | E | 42.2 | D | 91.1 | F | 50.8 | D | 113.5 | F |
| | | | | *With Improvement* | | | | | | | | | *36.9* | *D* | *70.8* | *E* |
| 2 | Kaumualii Highway (Route 50) | Halewili Road (Route 540) | NB 1-T, 1-R<br>SB 1-L/T<br>WB 1-L, 1-R | One-Way Stop (Side Street) | 0.5<br>24.5 | A<br>C | 1.7<br>47.5 | A<br>E | 0.8<br>38.6 | A<br>E | 6.1<br>163.2 | A<br>F | 0.9<br>46.9 | A<br>E | 9.6<br>282.1 | A<br>F |
| | | | | *With Improvement* | | | | | | | | | *0.4*<br>*21.1* | *A*<br>*C* | *1.2*<br>*35.7* | *A*<br>*E* |
| 3 | Kaumualii Highway (Route 50) | Laulea Street (South) - Mahea Road | NB 1-L, 1-T/R<br>SB 1-L, 1-T, 1-R<br>EB 1-L/T, 1-R<br>WB 1-L/T/R | Two-Way Stop (Side Street) | 1.8<br>22.0 | A<br>C | 2.2<br>43.8 | A<br>E | 2.7<br>26.7 | A<br>D | 3.7<br>59.6 | A<br>F | 43.4<br>442.4 | E<br>F | 45.1<br>803.1 | E<br>F |
| | | | | *With Improvement* | | | | | | | | | *11.0* | *B* | *11.7* | *B* |
| 4 | Kaumualii Highway (Route 50) | Laulea Street (North) | NB 1-L, 1-T<br>SB 1-T, 1-R<br>EB 1-L, 1-R | One-Way Stop (Side Street) | 2.2<br>18.4 | A<br>C | 0.8<br>16.4 | A<br>C | 2.6<br>25.8 | A<br>D | 0.8<br>21.1 | A<br>C | 46.3<br>491.7 | E<br>F | 11.7<br>284.3 | B<br>F |
| | | | | *With Improvement* | | | | | | | | | *11.1* | *B* | *9.5* | *A* |

NOTES:
1. L, T, R = Left, Through, Right.
2. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound.
3. Analysis performed using 2010 Highway Capacity Manual methodologies.
4. "With Improvement" operations include the recommended improvement. See **Exhibit 12** for a summary of all recommended improvements.



**EXHIBIT 4**
**Intersection Levels of Service**

Notes:
1. XX (YY) = AM (PM)
2. Not to Scale

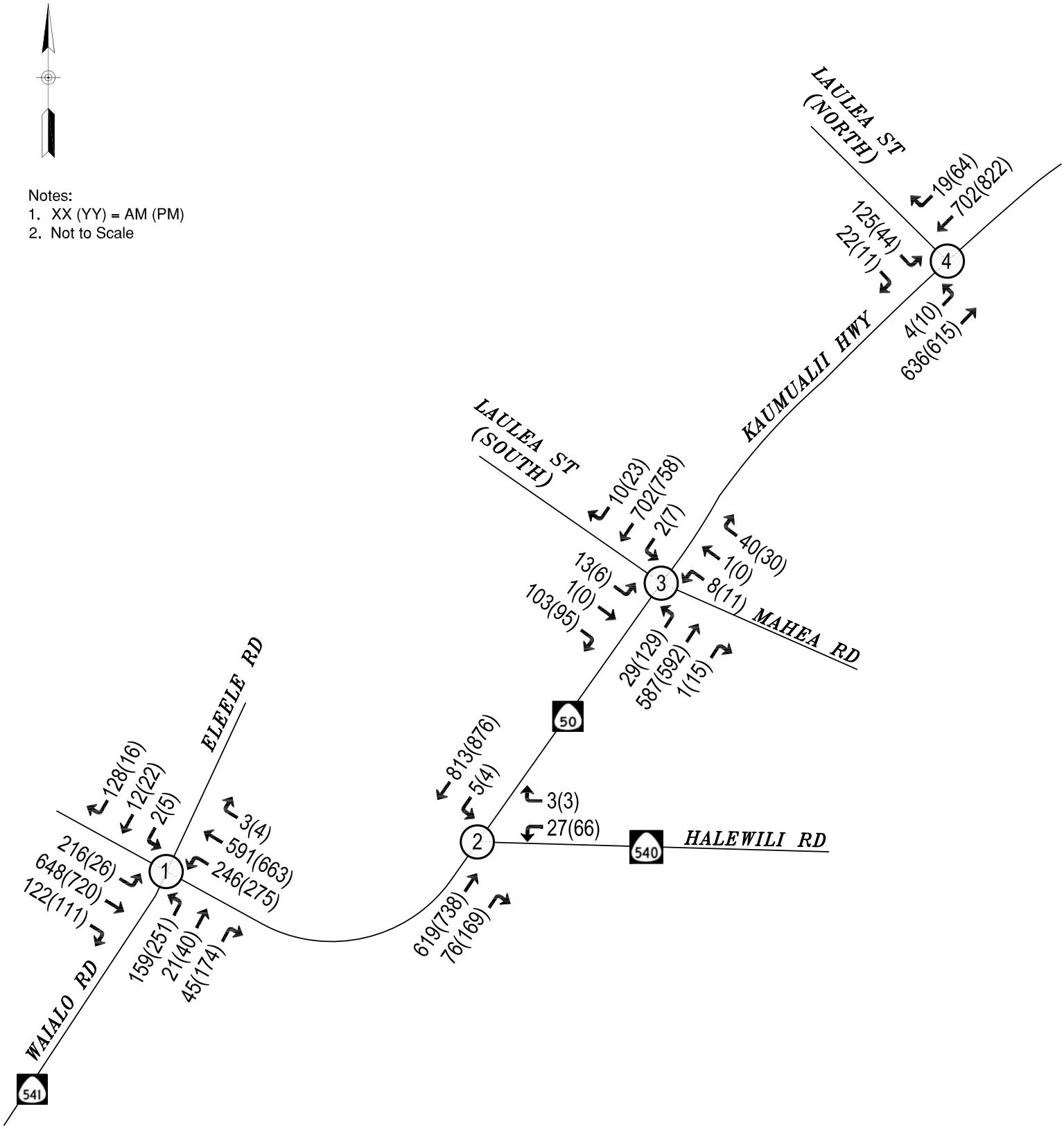


EXHIBIT 5
Future without Project Conditions
AM & PM Peak Hour Volumes

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# Project Trip Generation

| TRIP GENERATION RATES | ITE LAND USE CODE | DAILY TRIP RATE | AM PEAK HOUR PEAK HOUR RATE | AM PEAK HOUR % OF ADT | AM PEAK HOUR % IN | AM PEAK HOUR % OUT | PM PEAK HOUR PEAK HOUR RATE | PM PEAK HOUR % OF ADT | PM PEAK HOUR % IN | PM PEAK HOUR % OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| Single-Family Detatched Housing (per dwelling unit) | 210 | 9.52 | 0.75 | 8% | 25% | 75% | 1.00 | 11% | 63% | 37% |
| Apartment (per dwelling unit) | 220 | 6.65 | 0.51 | 8% | 20% | 80% | 0.62 | 9% | 65% | 35% |
| Senior Adult Housing - Attached (per dwelling unit) | 252 | 3.44 | 0.20 | 6% | 34% | 66% | 0.25 | 7% | 54% | 46% |

| GENERATED TRIPS | PROJECT SIZE | DAILY TRIPS | AM PEAK HOUR PEAK HOUR TRIPS | AM PEAK HOUR % OF ADT | AM PEAK HOUR TRIPS IN | AM PEAK HOUR TRIPS OUT | PM PEAK HOUR PEAK HOUR TRIPS | PM PEAK HOUR % OF ADT | PM PEAK HOUR TRIPS IN | PM PEAK HOUR TRIPS OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| Proposed Uses | | | | | | | | | | |
| Single-Family Housing | 150 Units | 1,428 | 113 | 8% | 28 | 85 | 150 | 11% | 95 | 55 |
| Multi-Family Housing (Apartments) | 365 Units | 2,427 | 186 | 8% | 37 | 149 | 226 | 9% | 147 | 79 |
| Multi-Family Elderly Housing (Senior Adult Housing) | 35 Units | 120 | 7 | 6% | 2 | 5 | 9 | 8% | 5 | 4 |
| **Subtotal (Proposed Uses):** | | **3,975** | **306** | | **67** | **239** | **385** | | **247** | **138** |
| Pedestrian/Bicycle Trip Reduction (5%):[2] | | -199 | -15 | | -3 | -12 | -19 | | -12 | -7 |
| Transit Trip Reduction (5%):[3] | | -199 | -15 | | -3 | -12 | -19 | | -13 | -6 |
| **Total Net Project Trip Generation:** | | **3,577** | **276** | | **61** | **215** | **347** | | **222** | **125** |

Notes:

1. Trip generation rates from Institute of Transportation Engineers, "Trip Generation Manual," 9th Edition, 2012, unless otherwise noted. See **Appendix D** for document excerpts used within this estimate.
2. Pedestrian/Bicycle Trip Reduction accounts for the estimated portion of project site traffic being made on foot or on a bicycle (5%).
3. Transit Trip Reduction accounts for the estimated portion of project site traffic being made via mass transit (5%).

EXHIBIT 6

Project

Trip Generation

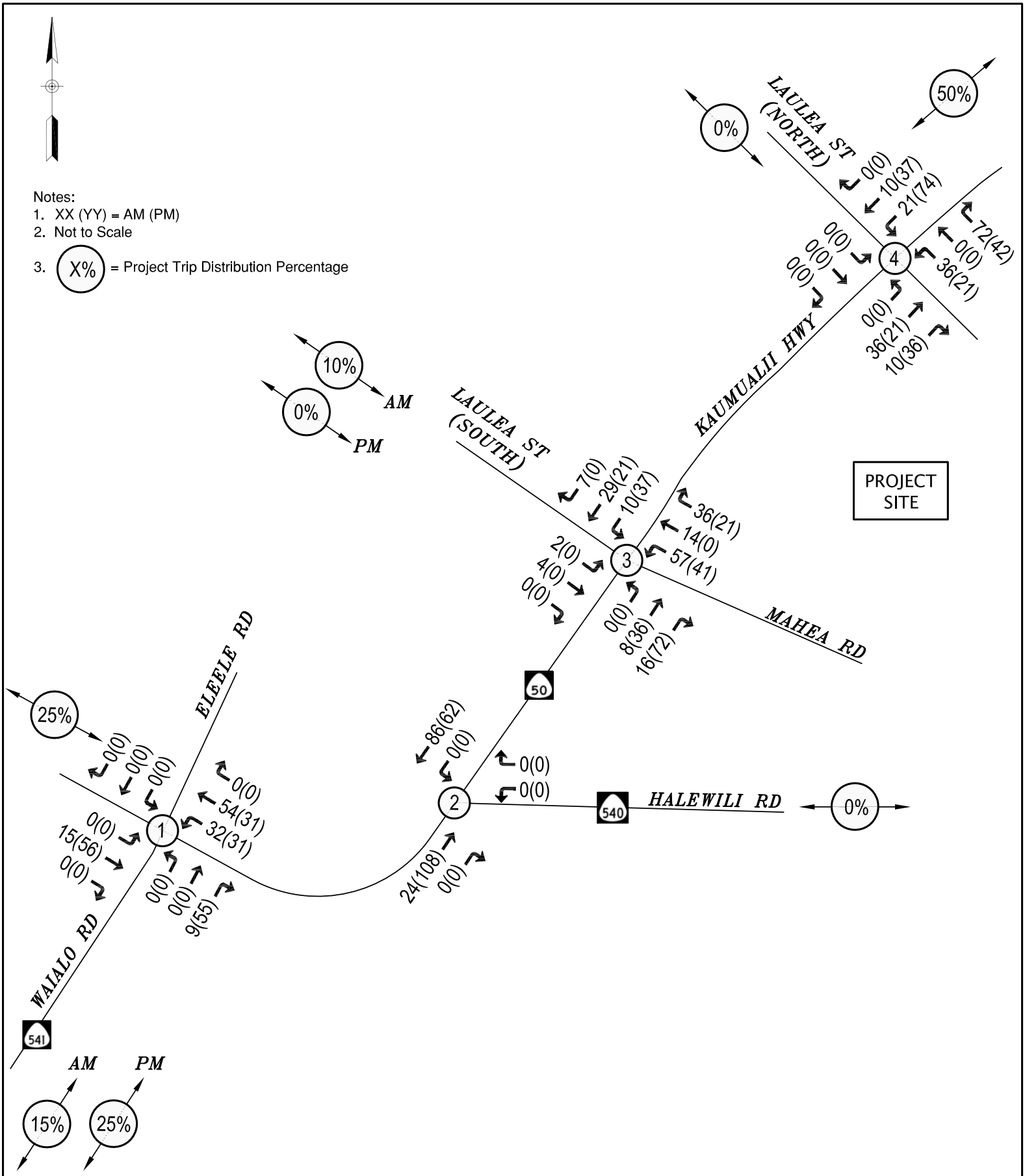


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EXHIBIT 7

Project Trip Distribution & Assignment

AM & PM Peak Hour Volumes

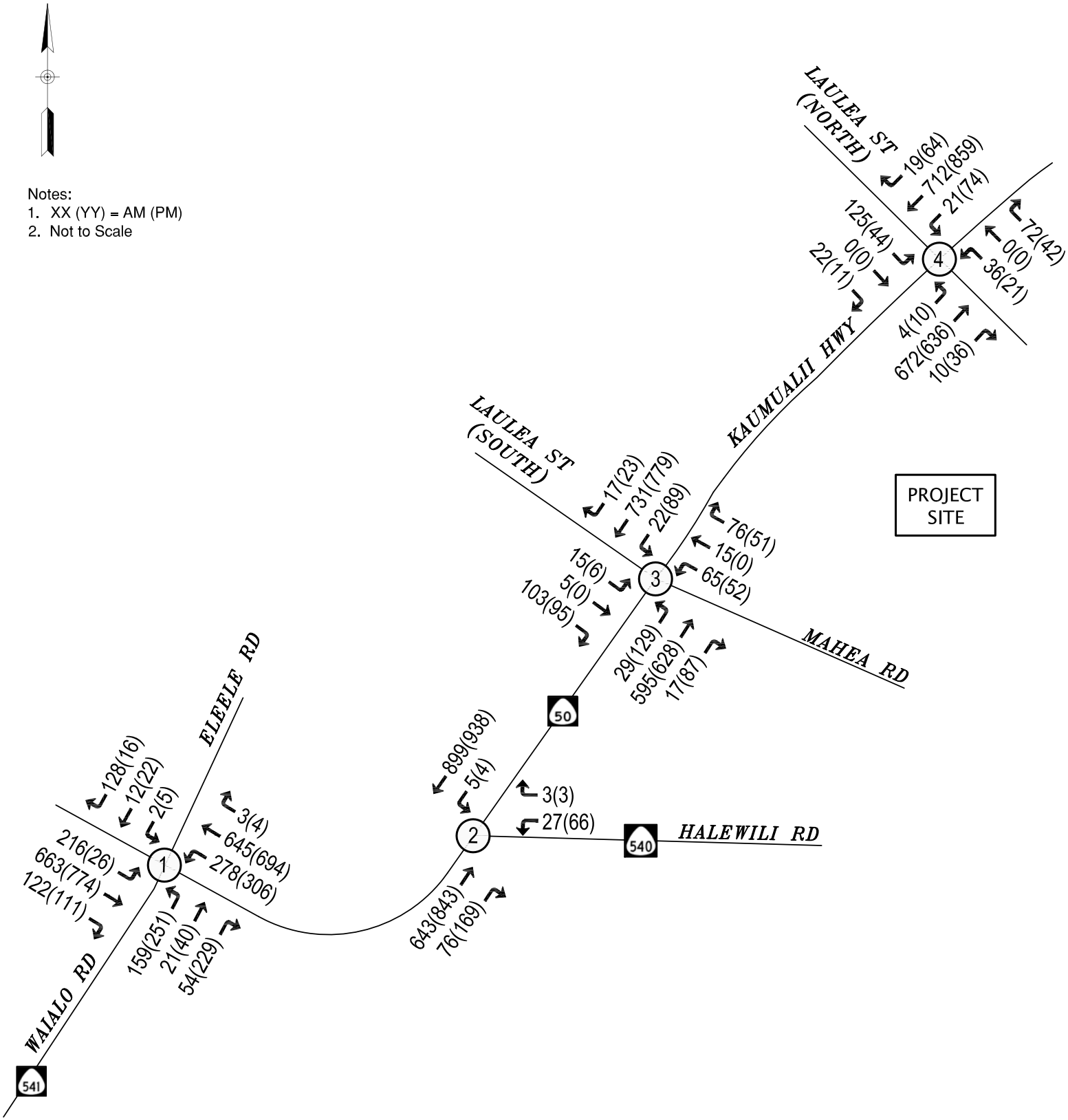


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EXHIBIT 8
Future with Project Conditions
AM & PM Peak Hour Volumes

## Project Trip Generation - Phases 1 and 2

| TRIP GENERATION RATES | ITE LAND USE CODE | DAILY TRIP RATE | AM PEAK HOUR PEAK HOUR RATE | AM PEAK HOUR % OF ADT | AM PEAK HOUR % IN | AM PEAK HOUR % OUT | PM PEAK HOUR PEAK HOUR RATE | PM PEAK HOUR % OF ADT | PM PEAK HOUR % IN | PM PEAK HOUR % OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| Single-Family Detatched Housing (per dwelling unit) | 210 | 9.52 | 0.75 | 8% | 25% | 75% | 1.00 | 11% | 63% | 37% |
| Apartment (per dwelling unit) | 220 | 6.65 | 0.51 | 8% | 20% | 80% | 0.62 | 9% | 65% | 35% |
| Senior Adult Housing - Attached (per dwelling unit) | 252 | 3.44 | 0.20 | 6% | 34% | 66% | 0.25 | 7% | 54% | 46% |

| GENERATED TRIPS | PROJECT SIZE | DAILY TRIPS | AM PEAK HOUR PEAK HOUR TRIPS | AM PEAK HOUR % OF ADT | AM PEAK HOUR TRIPS IN | AM PEAK HOUR TRIPS OUT | PM PEAK HOUR PEAK HOUR TRIPS | PM PEAK HOUR % OF ADT | PM PEAK HOUR TRIPS IN | PM PEAK HOUR TRIPS OUT |
|---|---|---|---|---|---|---|---|---|---|---|
| Proposed Uses | | | | | | | | | | |
| Single-Family Housing | 113 Units | 1,076 | 85 | 8% | 21 | 64 | 113 | 11% | 71 | 42 |
| Multi-Family Housing (Apartments) | 182 Units | 1,210 | 93 | 8% | 19 | 74 | 113 | 9% | 73 | 40 |
| Multi-Family Elderly Housing (Senior Adult Housing) | 35 Units | 120 | 7 | 6% | 2 | 5 | 9 | 8% | 5 | 4 |
| **Subtotal (Proposed Uses):** | | **2,406** | **185** | | **42** | **143** | **235** | | **149** | **86** |
| Pedestrian/Bicycle Trip Reduction (5%):[2] | | -120 | -9 | | -2 | -7 | -12 | | -7 | -5 |
| Transit Trip Reduction (5%):[3] | | -120 | -9 | | -2 | -7 | -12 | | -8 | -4 |
| **Total Net Project Trip Generation:** | | **2,166** | **167** | | **38** | **129** | **211** | | **134** | **77** |

Notes:

1. Trip generation rates from Institute of Transportation Engineers, "Trip Generation Manual," 9th Edition, 2012, unless otherwise noted. See **Appendix D** for document excerpts used within this estimate.
2. Pedestrian/Bicycle Trip Reduction accounts for the estimated portion of project site traffic being made on foot or on a bicycle (5%).
3. Transit Trip Reduction accounts for the estimated portion of project site traffic being made via mass transit (5%).

EXHIBIT 9
Project
Trip Generation -
Phases 1 and 2

Notes:
1. XX (YY) = AM (PM)
2. Not to Scale

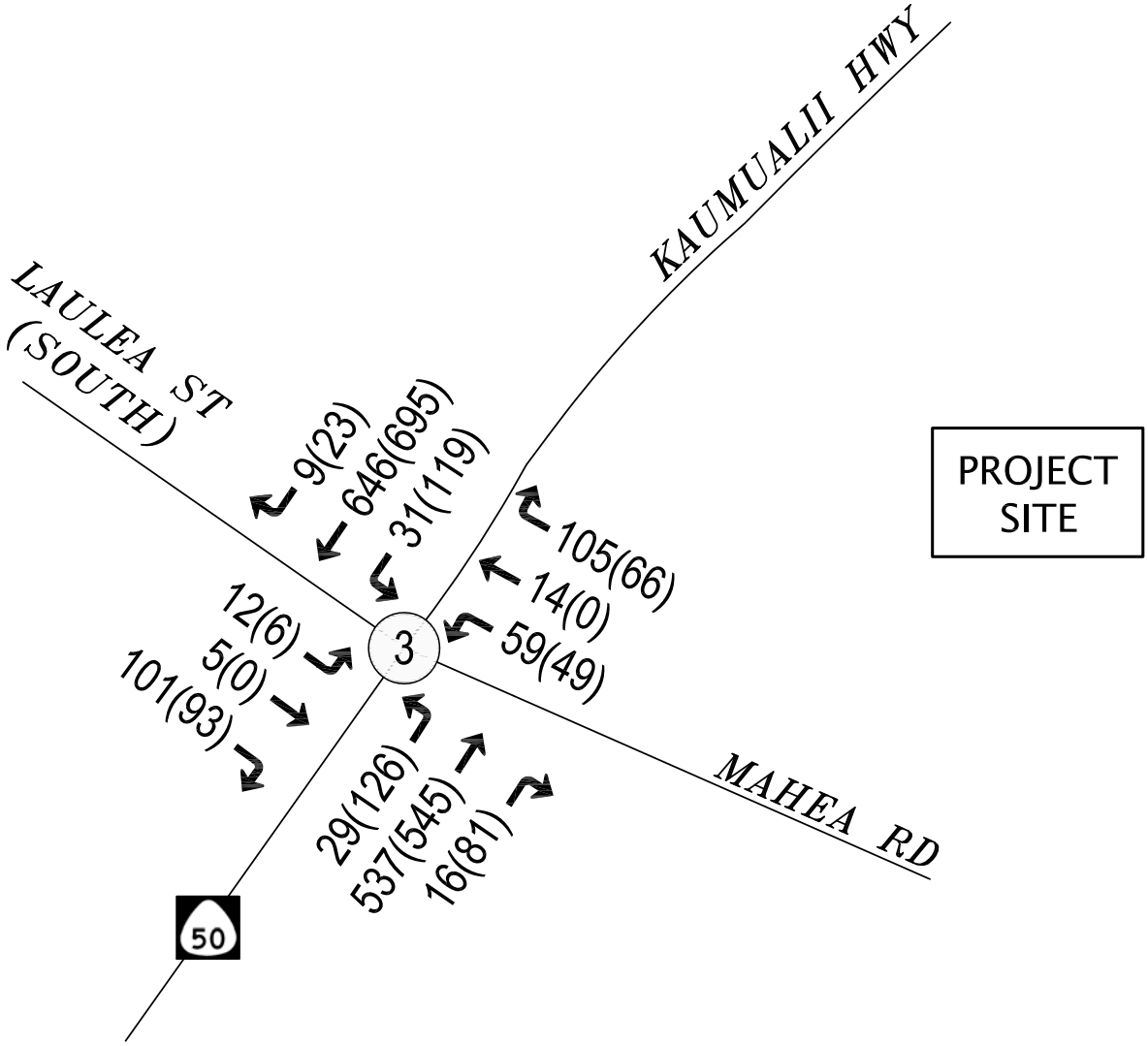


EXHIBIT 10
Future with Project Phases 1 and 2 Conditions
AM & PM Peak Hour Volumes

Hatch Mott MacDonald

I:\2013\Jobs\334377 - Lima Ola Subdivision TIA\CAD Exhibits\334377 - Volume Diagrams.dwg Future With Project Phases 1 And 2 2/18/2014 2:20 PM OAT49256

| | N-S Street | E-W Street | Existing Lane Configuration | Existing Intersection Control | Future with Project Phases 1-2 Conditions (Year 2030) | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | AM Peak Hr | | PM Peak Hr | |
| | | | | | Delay (sec) | LOS | Delay (sec) | LOS |
| 3 | Kaumualii Highway (Route 50) | Laulea Street (South) - Mahea Road | NB 1-L, 1-T/R<br>SB 1-L, 1-T, 1-R<br>EB 1-L/T, 1-R<br>WB 1-L/T/R | Two-Way Stop (Side Street) | 28.0<br>227.6 | D<br>F | 34.0<br>494.1 | D<br>F |
| | | | | *With Improvement* | *11.0* | *B* | *12.2* | *B* |

NOTES:
1. L, T, R = Left, Through, Right.
2. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound.
3. Analysis performed using 2010 Highway Capacity Manual methodologies.
4. "With Improvement" operations include the recommended improvement. See **Exhibit 12** for a summary of all recommended improvements.

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334377 LOS1.xlsx - LOS (Interim)

**EXHIBIT 11**
**Intersection Levels of Service - Project Phases 1 and 2**

| Category | Potential Impact | Recommendation | Responsibility | Implementation Trigger |
|---|---|---|---|---|
| Traffic Operations | Waialo (Route 541) - Eleele/ Kaumualii (Route 50) | 1) Add second westbound Kaumualii left turn lane;<br>2) Add second southbound through lane on Waialo south of intersection. | Kaua'i County | Westbound Kaumualii Highway (Route 50) left turn lane exceeds 300 vehicles during the AM or PM peak hour traffic periods (7:00 – 8:00 AM and 4:00 – 5:00 PM, respectively) for two consecutive years.<br>Verify after Phase 1 of the project is built and occupied. |
| | Kaumualii (Route 50)/ Halewili (Route 540) | 1) Add southbound Kaumualii median acceleration lane;<br>2) Add southbound Kaumualii left turn lane;<br>3) Consider extending median acceleration lane to meet westbound Kaumualii left turn lane (including use of channelizers) | Kaua'i County | Delays on Halewili Road (Route 540) approach to Kaumualii Highway (Route 50) exceed 200 seconds during the PM peak hour (4:00 – 5:00 PM).<br>Verify after Phases 1 and 2 of the project are built and occupied |
| | Kaumualii (Route 50)/ Laulea (South) - Mahea | 1) Signalize intersection;<br>2) Lengthen southbound Kaumualii left turn lane to 100 feet of vehicle storage. | Kaua'i County | Traffic volumes meet a minimum of two of the three MUTCD volume-based signal warrants.<br>Verify after Phase 1 of the project is built and occupied. |
| | Kaumualii (Route 50)/ Laulea (North) | 1) Signalize intersection;<br>2) Convert existing northbound Kaumualii median acceleration lane into a southbound left turn lane. | Kaua'i County | Traffic Signal: Traffic volumes at this intersection meet a minimum of two of the three MUTCD volume-based signal warrants.<br>Left turn lane: Implement with the fourth intersection approach under Phase 3.<br>Verify both after Phase 3 of the project is built and occupied. |
| Pedestrian Circulation | Discontinuous sidewalks between project site and remainder of Eleele community | 1) Construct a sidewalk or pedestrian/bicycle pathway along the northern frontage of Mahea Road between the project site and Kaumualii Highway (including through the Eleele Iluna project);<br>2) Consider extending the existing sidewalk along Laulea Street (North) one block east to Kaumualii;<br>3) Consider constructing a sidewalk or pedestrian pathway along the north-south internal roadway within the Eleele Iluna project (between project scecondary access and Mahea Road). | Kaua'i County, in coordination with project applicant for Eleele Iluna project | Before Phase 1 of the project is built and occupied |
| | Increased pedestrian crossing demand across Kaumualii (Route 50) | 1) Add pedestrian signal phases and countdown signals (north and east approaches) and missing crosswalk (east approach) at Kaumualii (Route 50)/Laulea (South) - Mahea.<br>2) Add pedestrian signal phases and countdown signals (south and west approaches) and missing crosswalks (north and west approaches) at Kumualii (Route 50)/Laulea (North).<br>3) Before implementation of traffic signals, implement pedestrian crossing improvement(s). | Kaua'i County | Signals: Incorporate into signal design.<br>Pedestrian Improvements: Before Phase 1 of the project is built and occupied. |
| Bicycle Circulation | None | None | None | None |
| Transit Usage | Lack of transit access to Eleele Shopping Center | Consider adding new Route 100 and 200 bus stops on Waialo Road (Route 541) near Eleele Shopping Center. | Kaua'i County | None |
| Project Access | Shorter-Term operations of project access | Implement above recommended improvements at Kaumualii (Route 50)/ Laulea (South) - Mahea. | Kaua'i County | See Above |
| | Potential quality-of-life concerns of existing Mahea Road and residents and future Eleele Iluna residents due to project traffic | Monitor resident concerns within existing neighborhoods and Eleele Iluna project with regards to project traffic | Kaua'i County | After Phase 1 of the project is built and occupied |

**EXHIBIT 12**
**Summary of Recommended Improvements**

# Appendix A

## Level of Service Descriptions:

A1. Signalized Intersections

A2. Unsignalized Intersections with Two-Way Stop Control

## APPENDIX A1

## LEVEL OF SERVICE (LOS) DESCRIPTION
## SIGNALIZED INTERSECTIONS

The capacity of an urban street is related primarily to the signal timing and the geometric characteristics of the facility as well as to the composition of traffic on the facility. Geometrics are a fixed characteristic of a facility. Thus, while traffic composition may vary somewhat over time, the capacity of a facility is generally a stable value that can be significantly improved only by initiating geometric improvements. A traffic signal essentially allocates time among conflicting traffic movements that seek to use the same space. The way in which time is allocated significantly affects the operation and the capacity of the intersection and its approaches.

The methodology for signalized intersection is designed to consider individual intersection approaches and individual lane groups within approaches. A lane group consists of one or more lanes on an intersection approach. The outputs from application of the method described in the HCM 2010 are reported on the basis of each lane. For a given lane group at a signalized intersection, three indications are displayed: green, yellow and red. The red indication may include a short period during which all indications are red, referred to as an all-red interval and the yellow indication forms the change and clearance interval between two green phases.

The methodology for analyzing the capacity and level of service must consider a wide variety of prevailing conditions, including the amount and distribution of traffic movements, traffic composition, geometric characteristics, and details of intersection signalization. The methodology addresses the capacity, LOS, and other performance measures for lane groups and the intersection approaches and the LOS for the intersection as a whole.

Capacity is evaluated in terms of the ratio of demand flow rate to capacity (v/c ratio), whereas LOS is evaluated on the basis of control delay per vehicle (in seconds per vehicle). The methodology does not take into account the potential impact of downstream congestion on intersection operation, nor does the methodology detect and adjust for the impacts of turn-pocket overflows on through traffic and intersection operation.

### LEVEL OF SERVICE (LOS) CRITERIA FOR SIGNALIZED INTERSECTIONS

(Reference 2010 Highway Capacity Manual)

| Level of Service | Control Delay (seconds / vehicle) |
|---|---|
| **A** | **<10** |
| **B** | **>10 - 20** |
| **C** | **>20 - 35** |
| **D** | **>35 - 55** |
| **E** | **>55 - 80** |
| **F** | **>80** |

## APPENDIX A2

## LEVEL OF SERVICE (LOS) DESCRIPTION
## UNSIGNALIZED INTERSECTIONS WITH TWO-WAY STOP CONTROL (TWSC)

TWSC intersections are widely used and stop signs are used to control vehicle movements at such intersections. At TWSC intersections, the stop-controlled approaches are referred to as the minor street approaches; they can be either public streets or private driveways. The intersection approaches that are not controlled by stop signs are referred to as the major street approaches. A three-leg intersection is considered to be a standard type of TWSC intersection if the single minor street approach (i.e. the stem of the T configuration) is controlled by a stop sign. Three-leg intersections where two of the three approaches are controlled by stop signs are a special form of unsignalized intersection control.

At TWSC intersections, drivers on the controlled approaches are required to select gaps in the major street flow through which to execute crossing or turning maneuvers on the basis of judgment. In the presence of a queue, each driver on the controlled approach must use some time to move into the front-of-queue position and prepare to evaluate gaps in the major street flow. Capacity analysis at TWSC intersections depends on a clear description and understanding of the interaction of drivers on the minor or stop-controlled approach with drivers on the major street. Both gap acceptance and empirical models have been developed to describe this interaction.

Thus, the capacity of the controlled legs is based on three factors:

- the distribution of gaps in the major street traffic stream;
- driver judgment in selecting gaps through which to execute the desired maneuvers; and
- the follow-up time required by each driver in a queue.

The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions, in the absence of incident, control, traffic or geometric delay. Average control delay for any particular minor movement is a function of the capacity of the approach and the degree of saturation and referred to as level of service.

### LEVEL OF SERVICE (LOS) CRITERIA FOR TWSC INTERSECTIONS

(Reference 2010 Highway Capacity Manual)

| Level of Service | Control Delay (seconds / vehicle) |
|---|---|
| **A** | **0 - 10** |
| **B** | **>10 - 15** |
| **C** | **>15 - 25** |
| **D** | **>25 - 35** |
| **E** | **>35 - 50** |
| **F** | **>50** |

# Appendix B

## Intersection
## Level of Service
## Calculations

## Existing
## Traffic Conditions

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 203 | 505 | 115 | 227 | 444 | 3 | 149 | 20 | 40 | 2 | 11 | 120 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 269 | 670 | 569 | 297 | 702 | 4 | 328 | 32 | 328 | 65 | 33 | 319 |
| Arrive On Green | 0.15 | 0.36 | 0.00 | 0.17 | 0.38 | 0.38 | 0.21 | 0.21 | 0.00 | 0.21 | 0.21 | 0.21 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1868 | 12 | 1004 | 153 | 1568 | 7 | 157 | 1525 |
| Grp Volume(v), veh/h | 221 | 549 | 0 | 247 | 0 | 486 | 184 | 0 | 0 | 144 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1879 | 1156 | 0 | 1568 | 1690 | 0 | 0 |
| Q Serve(g_s), s | 7.0 | 15.5 | 0.0 | 7.6 | 0.0 | 12.5 | 7.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 7.0 | 15.5 | 0.0 | 7.6 | 0.0 | 12.5 | 12.0 | 0.0 | 0.0 | 4.4 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 0.88 | | 1.00 | 0.01 | | 0.90 |
| Lane Grp Cap(c), veh/h | 269 | 670 | 569 | 297 | 0 | 706 | 360 | 0 | 328 | 417 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 0.82 | 0.00 | 0.83 | 0.00 | 0.69 | 0.51 | 0.00 | 0.00 | 0.35 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 337 | 708 | 601 | 344 | 0 | 721 | 360 | 0 | 328 | 417 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 23.5 | 16.6 | 0.0 | 23.1 | 0.0 | 15.1 | 24.8 | 0.0 | 0.0 | 19.7 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 10.0 | 8.4 | 0.0 | 12.3 | 0.0 | 3.6 | 0.5 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 3.5 | 7.5 | 0.0 | 4.1 | 0.0 | 5.6 | 2.6 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 33.5 | 25.0 | 0.0 | 35.5 | 0.0 | 18.6 | 25.3 | 0.0 | 0.0 | 19.9 | 0.0 | 0.0 |
| Lane Grp LOS | C | C | | D | | B | C | | | B | | |
| Approach Vol, veh/h | | 770 | | | 733 | | | 184 | | | 144 | |
| Approach Delay, s/veh | | 27.4 | | | 24.3 | | | 25.3 | | | 19.9 | |
| Approach LOS | | C | | | C | | | C | | | B | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 12.8 | 26.8 | | 13.5 | 27.5 | | | 17.0 | | | 17.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 11.0 | 22.0 | | 11.0 | 22.0 | | | 12.0 | | | 12.0 | |
| Max Q Clear Time (g_c+I1), s | 9.0 | 17.5 | | 9.6 | 14.5 | | | 14.0 | | | 6.4 | |
| Green Ext Time (p_c), s | 0.1 | 3.3 | | 0.1 | 5.2 | | | 0.0 | | | 0.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 25.4 |
| HCM 2010 LOS | C |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.5 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 21 | 2 | 487 | 60 | 4 | 653 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 1 | 1 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 22 | 2 | 518 | 64 | 4 | 695 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1222 | 520 | 0 | 0 | 519 | 0 |
| Stage 1 | 519 | - | - | - | - | - |
| Stage 2 | 703 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 198 | 556 | - | - | 1047 | - |
| Stage 1 | 597 | - | - | - | - | - |
| Stage 2 | 491 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 196 | 555 | - | - | 1046 | - |
| Mov Capacity-2 Maneuver | 196 | - | - | - | - | - |
| Stage 1 | 597 | - | - | - | - | - |
| Stage 2 | 488 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 24.5 | 0 | 0.1 |
| HCM LOS | C | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 196 | 555 | 1046 | - |
| HCM Control Delay, s | - | - | 25.7 | 11.5 | 8.456 | 0 |
| HCM Lane V/C Ratio | - | - | 0.11 | 0.00 | 0.00 | - |
| HCM Lane LOS | - | - | D | B | A | A |
| HCM 95th-tile Q, veh | - | - | 0.4 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 1.8 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 12 | 1 | 97 | 3 | 1 | 5 | 28 | 460 | 1 | 2 | 557 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 1 | 104 | 3 | 1 | 5 | 30 | 495 | 1 | 2 | 599 | 10 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1162 | 1159 | 599 | 1159 | 1158 | 495 | 599 | 0 | 0 | 496 | 0 | 0 |
| Stage 1 | 603 | 603 | - | 555 | 555 | - | - | - | - | - | - | - |
| Stage 2 | 559 | 556 | - | 604 | 603 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 172 | 196 | 502 | 152 | 172 | 559 | 978 | - | - | 1068 | - | - |
| Stage 1 | 486 | 488 | - | 485 | 483 | - | - | - | - | - | - | - |
| Stage 2 | 513 | 513 | - | 454 | 457 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 165 | 190 | 502 | 117 | 166 | 559 | 978 | - | - | 1068 | - | - |
| Mov Capacity-2 Maneuver | 165 | 190 | - | 117 | 166 | - | - | - | - | - | - | - |
| Stage 1 | 471 | 487 | - | 470 | 468 | - | - | - | - | - | - | - |
| Stage 2 | 491 | 497 | - | 358 | 456 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.4 | 22 | 0.5 | 0 |
| HCM LOS | C | C | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 978 | - | - | 318 | 502 | 222 | 1068 | - | - |
| HCM Control Delay, s | 8.798 | - | - | 18.4 | 13.3 | 22 | 8.378 | - | - |
| HCM Lane V/C Ratio | 0.03 | - | - | 0.15 | 0.14 | 0.04 | 0.00 | - | - |
| HCM Lane LOS | A | - | - | C | B | C | A | - | - |
| HCM 95th-tile Q, veh | 0.1 | - | - | 0.5 | 0.5 | 0.1 | 0.0 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 2.2 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 117 | 21 | 4 | 473 | 547 | 18 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | None | None | Yield | Yield |
| Storage Length | 0 | 90 | 270 | | | 275 |
| Median Width | 12 | | | 12 | 12 | |
| Grade, % | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 124 | 22 | 4 | 503 | 582 | 19 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Major/Minor | | | | Major 1 | Major 2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1094 | 582 | 582 | 0 | - | 0 |
| Stage 1 | 582 | - | - | - | - | - |
| Stage 2 | 512 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Capacity-1 Maneuver | 237 | 513 | 992 | - | - | - |
| Stage 1 | 559 | - | - | - | - | - |
| Stage 2 | 602 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | - | - | - |
| Mov Capacity-1 Maneuver | 236 | 513 | 992 | - | - | - |
| Mov Capacity-2 Maneuver | 372 | - | - | - | - | - |
| Stage 1 | 559 | - | - | - | - | - |
| Stage 2 | 600 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 18.4 | 0.1 | 0 |
| HCM LOS | C | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Cap, veh/h | 992 | - | 372 | 513 | - | - |
| HCM Control Delay, s | 8.645 | - | 19.5 | 12.3 | - | - |
| HCM Lane V/C Ratio | 0.00 | - | 0.34 | 0.04 | - | - |
| HCM Lane LOS | A | - | C | B | - | - |
| HCM 95th-tile Q, veh | 0.0 | - | 1.4 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 24 | 564 | 104 | 256 | 482 | 4 | 236 | 38 | 159 | 5 | 21 | 15 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | | 0.99 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 35 | 697 | 592 | 319 | 998 | 9 | 414 | 55 | 435 | 79 | 284 | 184 |
| Arrive On Green | 0.02 | 0.38 | 0.00 | 0.18 | 0.54 | 0.54 | 0.28 | 0.28 | 0.00 | 0.28 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1863 | 16 | 1222 | 198 | 1568 | 122 | 1021 | 663 |
| Grp Volume(v), veh/h | 29 | 680 | 0 | 308 | 0 | 586 | 330 | 0 | 0 | 49 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1879 | 1420 | 0 | 1568 | 1806 | 0 | 0 |
| Q Serve(g_s), s | 1.5 | 32.7 | 0.0 | 15.4 | 0.0 | 18.9 | 23.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.5 | 32.7 | 0.0 | 15.4 | 0.0 | 18.9 | 25.0 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 0.86 | | 1.00 | 0.12 | | 0.37 |
| Lane Grp Cap(c), veh/h | 35 | 697 | 592 | 319 | 0 | 1006 | 469 | 0 | 435 | 547 | 0 | 0 |
| V/C Ratio(X) | 0.83 | 0.98 | 0.00 | 0.97 | 0.00 | 0.58 | 0.70 | 0.00 | 0.00 | 0.09 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 98 | 697 | 592 | 319 | 0 | 1006 | 469 | 0 | 435 | 547 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 43.9 | 27.6 | 0.0 | 36.7 | 0.0 | 14.1 | 107.8 | 0.0 | 0.0 | 24.1 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 16.3 | 28.3 | 0.0 | 41.2 | 0.0 | 1.4 | 4.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.8 | 19.5 | 0.0 | 10.3 | 0.0 | 8.0 | 0.5 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 60.3 | 55.9 | 0.0 | 77.9 | 0.0 | 15.5 | 111.8 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 |
| Lane Grp LOS | E | E | | E | | B | F | | | C | | |
| Approach Vol, veh/h | | 709 | | | 894 | | | 330 | | | 49 | |
| Approach Delay, s/veh | | 56.1 | | | 37.0 | | | 111.8 | | | 24.2 | |
| Approach LOS | | E | | | D | | | F | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 5.8 | 40.0 | | 20.0 | 54.2 | | | 30.0 | | | 30.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 5.0 | 34.0 | | 16.0 | 45.0 | | | 25.0 | | | 25.0 | |
| Max Q Clear Time (g_c+I1), s | 3.5 | 34.7 | | 17.4 | 20.9 | | | 27.0 | | | 3.9 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 15.5 | | | 0.0 | | | 1.5 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 56.0 |
| HCM 2010 LOS | E |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 1.7 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 52 | 2 | 598 | 130 | 3 | 690 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 59 | 2 | 680 | 148 | 3 | 784 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1472 | 681 | 0 | 0 | 681 | 0 |
| Stage 1 | 681 | - | - | - | - | - |
| Stage 2 | 791 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 140 | 450 | - | - | 912 | - |
| Stage 1 | 503 | - | - | - | - | - |
| Stage 2 | 447 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 139 | 450 | - | - | 912 | - |
| Mov Capacity-2 Maneuver | 139 | - | - | - | - | - |
| Stage 1 | 503 | - | - | - | - | - |
| Stage 2 | 444 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 47.5 | 0 | 0 |
| HCM LOS | E | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 139 | 450 | 912 | - |
| HCM Control Delay, s | - | - | 48.8 | 13 | 8.962 | 0 |
| HCM Lane V/C Ratio | - | - | 0.42 | 0.01 | 0.00 | - |
| HCM Lane LOS | - | - | E | B | A | A |
| HCM 95th-tile Q, veh | - | - | 1.9 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 2.2 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 6 | 0 | 89 | 6 | 0 | 2 | 121 | 470 | 9 | 7 | 598 | 22 |
| Conflicting Peds, #/hr | 1 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 6 | 0 | 91 | 6 | 0 | 2 | 123 | 480 | 9 | 7 | 610 | 22 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1360 | 1364 | 613 | 1359 | 1359 | 487 | 612 | 0 | 0 | 491 | 0 | 0 |
| Stage 1 | 626 | 626 | - | 733 | 733 | - | - | - | - | - | - | - |
| Stage 2 | 734 | 738 | - | 626 | 626 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 126 | 148 | 492 | 108 | 128 | 565 | 967 | - | - | 1072 | - | - |
| Stage 1 | 472 | 477 | - | 380 | 393 | - | - | - | - | - | - | - |
| Stage 2 | 412 | 424 | - | 440 | 445 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 112 | 128 | 491 | 79 | 111 | 564 | 966 | - | - | 1071 | - | - |
| Mov Capacity-2 Maneuver | 112 | 128 | - | 79 | 111 | - | - | - | - | - | - | - |
| Stage 1 | 411 | 473 | - | 331 | 342 | - | - | - | - | - | - | - |
| Stage 2 | 358 | 369 | - | 356 | 441 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 15.1 | 43.8 | 1.9 | 0.1 |
| HCM LOS | C | E | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 966 | - | - | 313 | 491 | 101 | 1071 | - | - |
| HCM Control Delay, s | 9.272 | - | - | 18 | 13.4 | 43.8 | 8.384 | - | - |
| HCM Lane V/C Ratio | 0.13 | - | - | 0.12 | 0.12 | 0.08 | 0.01 | - | - |
| HCM Lane LOS | A | - | - | C | B | E | A | - | - |
| HCM 95th-tile Q, veh | 0.4 | - | - | 0.4 | 0.4 | 0.3 | 0.0 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 41 | 10 | 9 | 469 | 617 | 60 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | None | None | Yield | Yield |
| Storage Length | 0 | 90 | 270 | | | 275 |
| Median Width | 12 | | | 12 | 12 | |
| Grade, % | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 45 | 11 | 10 | 510 | 671 | 65 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Major/Minor | | | | Major 1 | Major 2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1200 | 671 | 671 | 0 | - | 0 |
| Stage 1 | 671 | - | - | - | - | - |
| Stage 2 | 529 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Capacity-1 Maneuver | 204 | 456 | 919 | - | - | - |
| Stage 1 | 508 | - | - | - | - | - |
| Stage 2 | 591 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | - | - | - |
| Mov Capacity-1 Maneuver | 202 | 456 | 919 | - | - | - |
| Mov Capacity-2 Maneuver | 340 | - | - | - | - | - |
| Stage 1 | 508 | - | - | - | - | - |
| Stage 2 | 585 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 16.4 | 0.2 | 0 |
| HCM LOS | C | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Cap, veh/h | 919 | - | 340 | 456 | - | - |
| HCM Control Delay, s | 8.959 | - | 17.2 | 13.1 | - | - |
| HCM Lane V/C Ratio | 0.01 | - | 0.13 | 0.02 | - | - |
| HCM Lane LOS | A | - | C | B | - | - |
| HCM 95th-tile Q, veh | 0.0 | - | 0.4 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

Appendix C

Intersection
Level of Service
Calculations

Future without Project
Traffic Conditions

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 216 | 648 | 122 | 246 | 591 | 3 | 159 | 21 | 45 | 2 | 12 | 128 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 282 | 682 | 580 | 316 | 721 | 3 | 306 | 25 | 316 | 63 | 32 | 308 |
| Arrive On Green | 0.16 | 0.37 | 0.00 | 0.18 | 0.39 | 0.39 | 0.20 | 0.20 | 0.00 | 0.20 | 0.20 | 0.20 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1871 | 9 | 950 | 126 | 1568 | 6 | 158 | 1525 |
| Grp Volume(v), veh/h | 235 | 704 | 0 | 267 | 0 | 645 | 196 | 0 | 0 | 154 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1880 | 1076 | 0 | 1568 | 1690 | 0 | 0 |
| Q Serve(g_s), s | 7.7 | 22.0 | 0.0 | 8.6 | 0.0 | 19.1 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 7.7 | 22.0 | 0.0 | 8.6 | 0.0 | 19.1 | 12.0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 0.88 | | 1.00 | 0.01 | | 0.90 |
| Lane Grp Cap(c), veh/h | 282 | 682 | 580 | 316 | 0 | 724 | 331 | 0 | 316 | 402 | 0 | 0 |
| V/C Ratio(X) | 0.83 | 1.03 | 0.00 | 0.85 | 0.00 | 0.89 | 0.59 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 325 | 682 | 580 | 331 | 0 | 724 | 331 | 0 | 316 | 402 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 24.2 | 18.7 | 0.0 | 23.7 | 0.0 | 17.1 | 32.2 | 0.0 | 0.0 | 20.9 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 13.2 | 42.9 | 0.0 | 16.3 | 0.0 | 13.9 | 1.9 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 4.1 | 16.9 | 0.0 | 5.0 | 0.0 | 10.3 | 0.2 | 0.0 | 0.0 | 1.9 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 37.4 | 61.7 | 0.0 | 40.0 | 0.0 | 31.0 | 34.1 | 0.0 | 0.0 | 21.2 | 0.0 | 0.0 |
| Lane Grp LOS | D | F | | D | | C | C | | | C | | |
| Approach Vol, veh/h | | 939 | | | 912 | | | 196 | | | 154 | |
| Approach Delay, s/veh | | 55.6 | | | 33.7 | | | 34.1 | | | 21.2 | |
| Approach LOS | | E | | | C | | | C | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 13.6 | 28.0 | | 14.5 | 28.9 | | | 17.0 | | | 17.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 11.0 | 22.0 | | 11.0 | 22.0 | | | 12.0 | | | 12.0 | |
| Max Q Clear Time (g_c+I1), s | 9.7 | 24.0 | | 10.6 | 21.1 | | | 14.0 | | | 7.0 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 0.8 | | | 0.0 | | | 0.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 42.2 |
| HCM 2010 LOS | D |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.8 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 27 | 3 | 619 | 76 | 5 | 813 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 1 | 1 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 29 | 3 | 659 | 81 | 5 | 865 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1536 | 661 | 0 | 0 | 660 | 0 |
| Stage 1 | 660 | - | - | - | - | - |
| Stage 2 | 876 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 128 | 462 | - | - | 928 | - |
| Stage 1 | 514 | - | - | - | - | - |
| Stage 2 | 407 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 127 | 461 | - | - | 927 | - |
| Mov Capacity-2 Maneuver | 127 | - | - | - | - | - |
| Stage 1 | 514 | - | - | - | - | - |
| Stage 2 | 403 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 38.6 | 0 | 0.1 |
| HCM LOS | E | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 127 | 461 | 927 | - |
| HCM Control Delay, s | - | - | 41.4 | 12.9 | 8.906 | 0 |
| HCM Lane V/C Ratio | - | - | 0.23 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | E | B | A | A |
| HCM 95th-tile Q, veh | - | - | 0.8 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 2.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 13 | 1 | 103 | 8 | 1 | 40 | 29 | 587 | 1 | 12 | 702 | 10 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 14 | 1 | 111 | 9 | 1 | 43 | 31 | 631 | 1 | 13 | 755 | 11 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1497 | 1476 | 755 | 1475 | 1475 | 632 | 755 | 0 | 0 | 632 | 0 | 0 |
| Stage 1 | 781 | 781 | - | 694 | 694 | - | - | - | - | - | - | - |
| Stage 2 | 716 | 695 | - | 781 | 781 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 101 | 126 | 409 | 89 | 107 | 464 | 855 | - | - | 951 | - | - |
| Stage 1 | 388 | 405 | - | 401 | 411 | - | - | - | - | - | - | - |
| Stage 2 | 421 | 444 | - | 356 | 372 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 87 | 120 | 409 | 62 | 102 | 464 | 855 | - | - | 951 | - | - |
| Mov Capacity-2 Maneuver | 87 | 120 | - | 62 | 102 | - | - | - | - | - | - | - |
| Stage 1 | 374 | 399 | - | 386 | 396 | - | - | - | - | - | - | - |
| Stage 2 | 367 | 428 | - | 255 | 367 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 21.3 | 26.7 | 0.4 | 0.1 |
| HCM LOS | C | D | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 855 | - | - | 200 | 409 | 218 | 951 | - | - |
| HCM Control Delay, s | 9.37 | - | - | 29.2 | 15.7 | 26.7 | 8.838 | - | - |
| HCM Lane V/C Ratio | 0.04 | - | - | 0.26 | 0.18 | 0.24 | 0.01 | - | - |
| HCM Lane LOS | A | - | - | D | C | D | A | - | - |
| HCM 95th-tile Q, veh | 0.1 | - | - | 1.0 | 0.7 | 0.9 | 0.0 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 2.6 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 125 | 22 | 4 | 636 | 702 | 19 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | None | None | Yield | Yield |
| Storage Length | 0 | 90 | 270 | | | 275 |
| Median Width | 12 | | | 12 | 12 | |
| Grade, % | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 133 | 23 | 4 | 677 | 747 | 20 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Major/Minor | | | | Major 1 | Major 2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1432 | 747 | 747 | 0 | - | 0 |
| Stage 1 | 747 | - | - | - | - | - |
| Stage 2 | 685 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Capacity-1 Maneuver | 148 | 413 | 861 | - | - | - |
| Stage 1 | 468 | - | - | - | - | - |
| Stage 2 | 500 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | - | - | - |
| Mov Capacity-1 Maneuver | 147 | 413 | 861 | - | - | - |
| Mov Capacity-2 Maneuver | 287 | - | - | - | - | - |
| Stage 1 | 468 | - | - | - | - | - |
| Stage 2 | 498 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 25.8 | 0.1 | 0 |
| HCM LOS | D | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Cap, veh/h | 861 | - | 287 | 413 | - | - |
| HCM Control Delay, s | 9.202 | - | 27.9 | 14.2 | - | - |
| HCM Lane V/C Ratio | 0.01 | - | 0.46 | 0.06 | - | - |
| HCM Lane LOS | A | - | D | B | - | - |
| HCM 95th-tile Q, veh | 0.0 | - | 2.3 | 0.2 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 26 | 720 | 111 | 275 | 663 | 4 | 251 | 40 | 174 | 5 | 22 | 16 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | | 0.99 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 38 | 697 | 592 | 319 | 997 | 6 | 414 | 54 | 435 | 75 | 288 | 183 |
| Arrive On Green | 0.02 | 0.38 | 0.00 | 0.18 | 0.53 | 0.53 | 0.28 | 0.28 | 0.00 | 0.28 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1868 | 12 | 1224 | 194 | 1568 | 111 | 1035 | 660 |
| Grp Volume(v), veh/h | 31 | 867 | 0 | 331 | 0 | 804 | 350 | 0 | 0 | 52 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1879 | 1418 | 0 | 1568 | 1806 | 0 | 0 |
| Q Serve(g_s), s | 1.6 | 34.0 | 0.0 | 16.0 | 0.0 | 31.4 | 23.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 34.0 | 0.0 | 16.0 | 0.0 | 31.4 | 25.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 0.86 | | 1.00 | 0.12 | | 0.37 |
| Lane Grp Cap(c), veh/h | 38 | 697 | 592 | 319 | 0 | 1004 | 468 | 0 | 435 | 546 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 1.24 | 0.00 | 1.04 | 0.00 | 0.80 | 0.75 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 98 | 697 | 592 | 319 | 0 | 1004 | 468 | 0 | 435 | 546 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 43.9 | 28.0 | 0.0 | 37.0 | 0.0 | 17.1 | 109.1 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 14.9 | 121.9 | 0.0 | 61.0 | 0.0 | 5.4 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.8 | 38.1 | 0.0 | 12.4 | 0.0 | 14.2 | 0.8 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 58.8 | 149.9 | 0.0 | 98.0 | 0.0 | 22.4 | 114.9 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 |
| Lane Grp LOS | E | F | | F | | C | F | | | C | | |
| Approach Vol, veh/h | | 898 | | | 1135 | | | 350 | | | 52 | |
| Approach Delay, s/veh | | 146.7 | | | 44.5 | | | 114.9 | | | 24.2 | |
| Approach LOS | | F | | | D | | | F | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 5.9 | 40.0 | | 20.0 | 54.1 | | | 30.0 | | | 30.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 5.0 | 34.0 | | 16.0 | 45.0 | | | 25.0 | | | 25.0 | |
| Max Q Clear Time (g_c+I1), s | 3.6 | 36.0 | | 18.0 | 33.4 | | | 27.0 | | | 4.0 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 10.4 | | | 0.0 | | | 1.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 91.9 |
| HCM 2010 LOS | F |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 6.1 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 66 | 3 | 738 | 169 | 4 | 876 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 75 | 3 | 839 | 192 | 5 | 995 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1845 | 840 | 0 | 0 | 840 | 0 |
| Stage 1 | 840 | - | - | - | - | - |
| Stage 2 | 1005 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 82 | 365 | - | - | 795 | - |
| Stage 1 | 424 | - | - | - | - | - |
| Stage 2 | 354 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 81 | 365 | - | - | 795 | - |
| Mov Capacity-2 Maneuver | 81 | - | - | - | - | - |
| Stage 1 | 424 | - | - | - | - | - |
| Stage 2 | 349 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 163.2 | 0 | 0 |
| HCM LOS | F | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 81 | 365 | 795 | - |
| HCM Control Delay, s | - | - | 169.9 | 15 | 9.554 | 0 |
| HCM Lane V/C Ratio | - | - | 0.93 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | F | C | A | A |
| HCM 95th-tile Q, veh | - | - | 4.9 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 3.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 6 | 0 | 95 | 11 | 0 | 30 | 129 | 592 | 15 | 52 | 758 | 23 |
| Conflicting Peds, #/hr | 1 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 6 | 0 | 97 | 11 | 0 | 31 | 132 | 604 | 15 | 53 | 773 | 23 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1774 | 1767 | 776 | 1759 | 1759 | 615 | 775 | 0 | 0 | 621 | 0 | 0 |
| Stage 1 | 882 | 882 | - | 877 | 877 | - | - | - | - | - | - | - |
| Stage 2 | 892 | 885 | - | 882 | 882 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 65 | 84 | 397 | 54 | 70 | 475 | 841 | - | - | 960 | - | - |
| Stage 1 | 341 | 364 | - | 311 | 332 | - | - | - | - | - | - | - |
| Stage 2 | 337 | 363 | - | 309 | 330 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 51 | 67 | 396 | 34 | 56 | 474 | 840 | - | - | 959 | - | - |
| Mov Capacity-2 Maneuver | 51 | 67 | - | 34 | 56 | - | - | - | - | - | - | - |
| Stage 1 | 287 | 343 | - | 262 | 279 | - | - | - | - | - | - | - |
| Stage 2 | 265 | 305 | - | 220 | 311 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 20.6 | 59.6 | 1.8 | 0.6 |
| HCM LOS | C | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 840 | - | - | 191 | 396 | 106 | 959 | - | - |
| HCM Control Delay, s | 10.08 | - | - | 28.5 | 15.9 | 59.6 | 8.974 | - | - |
| HCM Lane V/C Ratio | 0.16 | - | - | 0.20 | 0.16 | 0.40 | 0.06 | - | - |
| HCM Lane LOS | B | - | - | D | C | F | A | - | - |
| HCM 95th-tile Q, veh | 0.6 | - | - | 0.7 | 0.6 | 1.6 | 0.2 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.8 |

| Movement | EBL | EBR | NBL | NBT | SBT | SBR |
|---|---|---|---|---|---|---|
| Vol, veh/h | 44 | 11 | 10 | 615 | 822 | 64 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | None | None | Yield | Yield |
| Storage Length | 0 | 90 | 270 | | | 275 |
| Median Width | 12 | | | 12 | 12 | |
| Grade, % | 0% | | | 0% | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 48 | 12 | 11 | 668 | 893 | 70 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Major/Minor | | | | Major 1 | Major 2 | |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1583 | 893 | 893 | 0 | - | 0 |
| Stage 1 | 893 | - | - | - | - | - |
| Stage 2 | 690 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | 2.218 | - | - | - |
| Pot Capacity-1 Maneuver | 120 | 340 | 759 | - | - | - |
| Stage 1 | 400 | - | - | - | - | - |
| Stage 2 | 498 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | - | - | - |
| Mov Capacity-1 Maneuver | 118 | 340 | 759 | - | - | - |
| Mov Capacity-2 Maneuver | 254 | - | - | - | - | - |
| Stage 1 | 400 | - | - | - | - | - |
| Stage 2 | 491 | - | - | - | - | - |

| Approach | EB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 21.1 | 0.2 | 0 |
| HCM LOS | C | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | EBLn1 | EBLn2 | SBT | SBR |
|---|---|---|---|---|---|---|
| Cap, veh/h | 759 | - | 254 | 340 | - | - |
| HCM Control Delay, s | 9.812 | - | 22.4 | 16 | - | - |
| HCM Lane V/C Ratio | 0.01 | - | 0.19 | 0.04 | - | - |
| HCM Lane LOS | A | - | C | C | - | - |
| HCM 95th-tile Q, veh | 0.0 | - | 0.7 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

Appendix D

Excerpts from
*Trip Generation Manual*, 9th Edition,
Institute of Transportation Engineers, 2012

# TRIP GENERATION MANUAL

## 9th Edition • Volume 2: Data

## Trip Generation Rates, Plots and Equations

- Port and Terminal (Land Uses 000–099)
- Industrial (Land Uses 100–199)
- Residential (Land Uses 200–299)
- Lodging (Land Uses 300–399)
- Recreational (Land Uses 400–499)

Institute of Transportation Engineers

# Land Use: 210
# Single-Family Detached Housing

## Description

Single-family detached housing includes all single-family detached homes on individual lots. A typical site surveyed is a suburban subdivision.

## Additional Data

The number of vehicles and residents had a high correlation with average weekday vehicle trip ends. The use of these variables was limited, however, because the number of vehicles and residents was often difficult to obtain or predict. The number of dwelling units was generally used as the independent variable of choice because it was usually readily available, easy to project and had a high correlation with average weekday vehicle trip ends.

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

Single-family detached units had the highest trip generation rate per dwelling unit of all residential uses because they were the largest units in size and had more residents and more vehicles per unit than other residential land uses; they were generally located farther away from shopping centers, employment areas and other trip attractors than other residential land uses; and they generally had fewer alternative modes of transportation available because they were typically not as concentrated as other residential land uses.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the late 1960s and the 2000s throughout the United States and Canada.

## Source Numbers

1, 4, 5, 6, 7, 8, 11, 12, 13, 14, 16, 19, 20, 21, 26, 34, 35, 36, 38, 40, 71, 72, 84, 91, 98, 100, 105, 108, 110, 114, 117, 119, 157, 167, 177, 187, 192, 207, 211, 246, 275, 283, 293, 300, 319, 320, 357, 384, 435, 550, 552, 579, 598, 601, 603, 611, 614, 637, 711, 735

# Single-Family Detached Housing
(210)

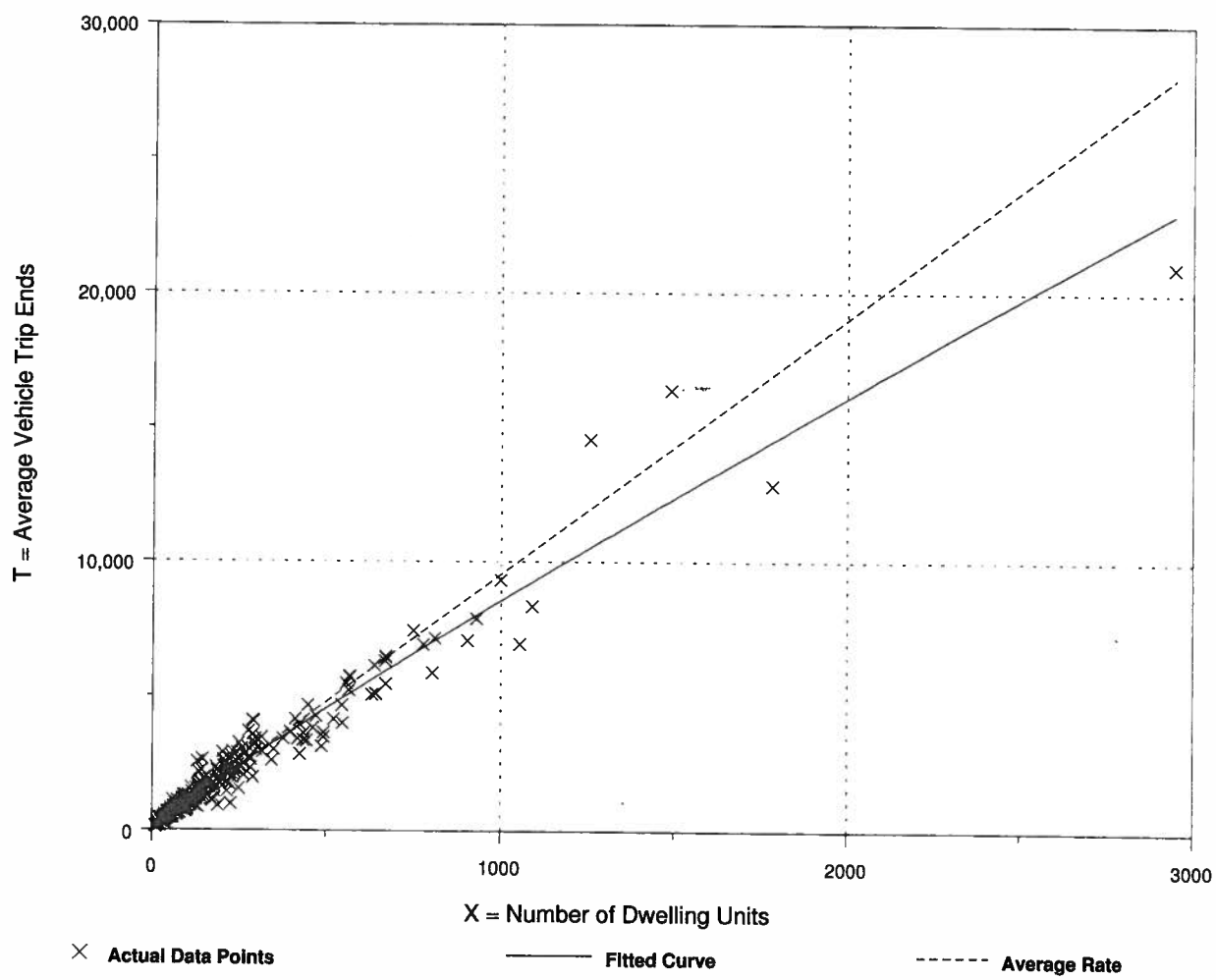
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday**

Number of Studies: 355
Avg. Number of Dwelling Units: 198
Directional Distribution: 50% entering, 50% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 9.52 | 4.31 - 21.85 | 3.70 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.92 Ln(X) + 2.72**

**$R^2$ = 0.95**

# Single-Family Detached Housing
(210)

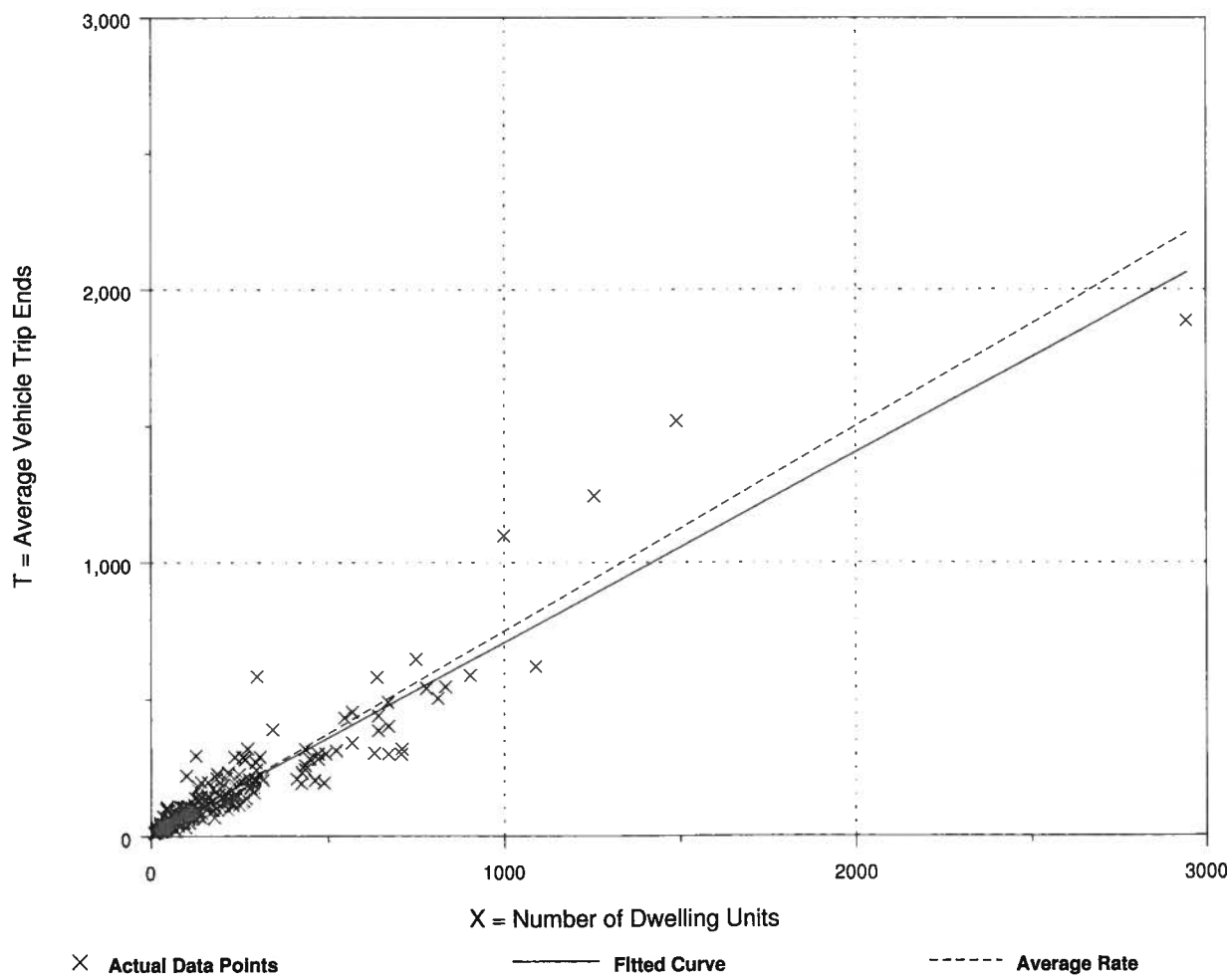
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**

Number of Studies: 292
Avg. Number of Dwelling Units: 194
Directional Distribution: 25% entering, 75% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.75 | 0.33 - 2.27 | 0.90 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.70(X) + 9.74**

**$R^2$ = 0.89**

# Single-Family Detached Housing
(210)

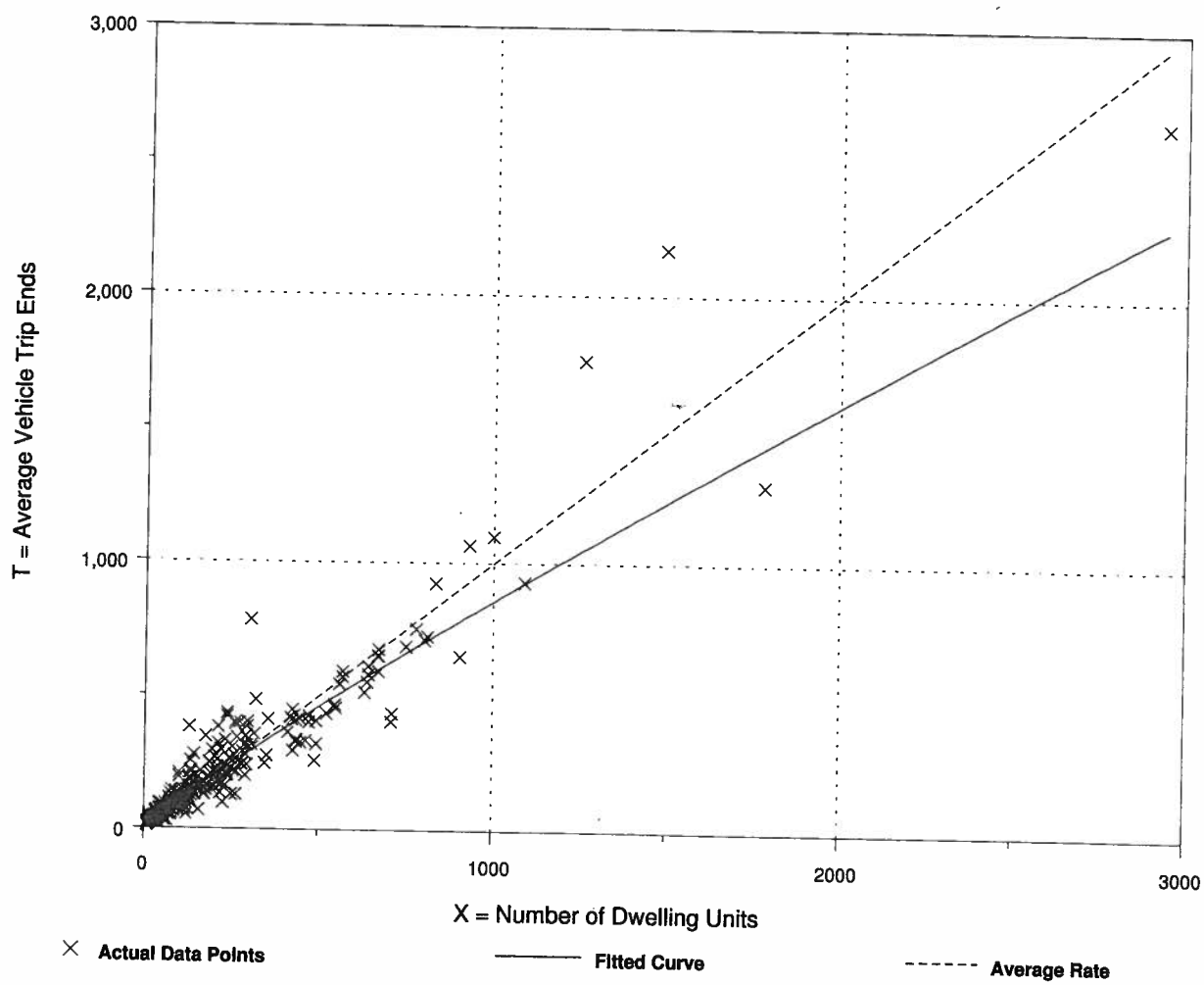
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**

Number of Studies: 321
Avg. Number of Dwelling Units: 207
Directional Distribution: 63% entering, 37% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 1.00 | 0.42 - 2.98 | 1.05 |

## Data Plot and Equation




**Fitted Curve Equation: Ln(T) = 0.90 Ln(X) + 0.51**

**$R^2$ = 0.91**

# Land Use: 220
# Apartment

## Description

Apartments are rental dwelling units located within the same building with at least three other dwelling units, for example, quadraplexes and all types of apartment buildings. The studies included in this land use did not identify whether the apartments were low-rise, mid-rise, or high-rise. Low-rise apartment (Land Use 221), high-rise apartment (Land Use 222) and mid-rise apartment (Land Use 223) are related uses.

## Additional Data

This land use included data from a wide variety of units with different sizes, price ranges, locations and ages. Consequently, there was a wide variation in trips generated within this category. Other factors, such as geographic location and type of adjacent and nearby development, may also have had an effect on the site trip generation.

The peak hour of the generator typically coincided with the peak hour of the adjacent street traffic.

The sites were surveyed between the late 1960s and the 2000s throughout the United States and Canada.

***Many of the studies included in this land use did not indicate the total number of bedrooms. To assist in the future analysis of this land use, it is important that this information be collected and included in trip generation data submissions.***

## Source Numbers

2, 4, 5, 6, 9, 10, 11, 12, 13, 14, 16, 19, 20, 34, 35, 40, 72, 91, 100, 108, 188, 192, 204, 211, 253, 283, 357, 436, 525, 530, 579, 583, 638

# Apartment
# (220)

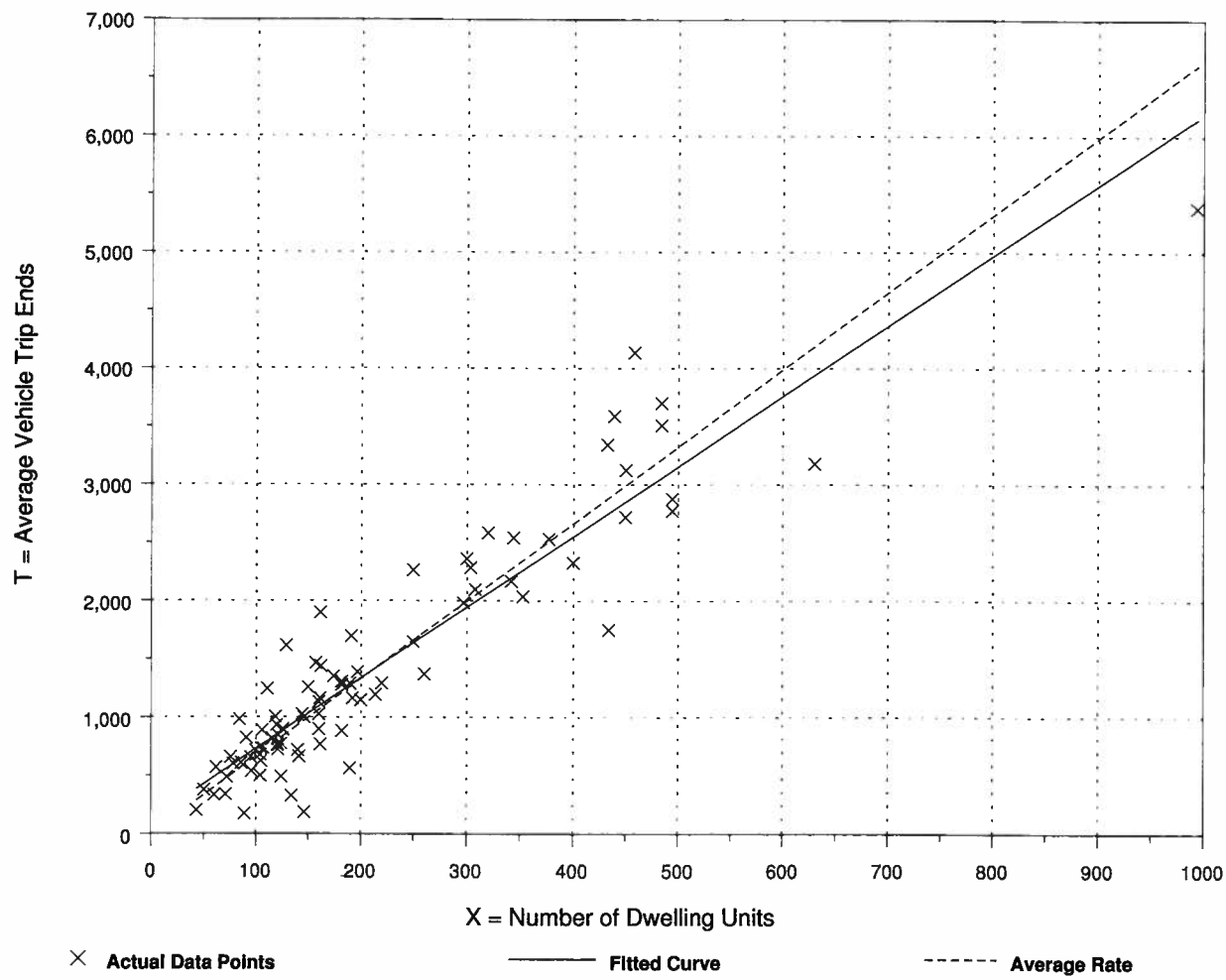
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday**

Number of Studies: 88
Avg. Number of Dwelling Units: 210
Directional Distribution: 50% entering, 50% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 6.65 | 1.27 - 12.50 | 3.07 |

## Data Plot and Equation




**Fitted Curve Equation: T = 6.06(X) + 123.56** $R^2 = 0.87$

# Apartment
# (220)

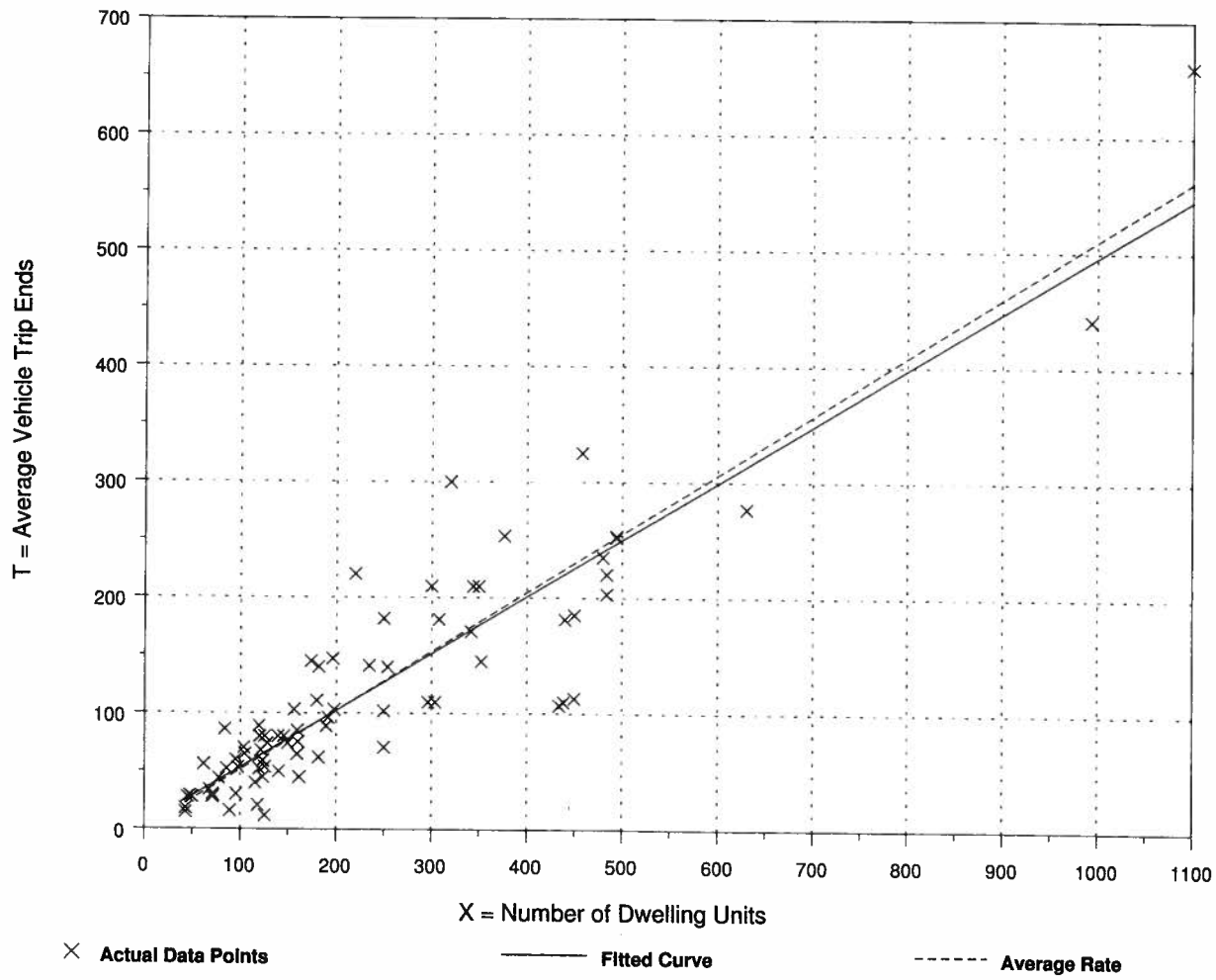
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**

Number of Studies: 78
Avg. Number of Dwelling Units: 235
Directional Distribution: 20% entering, 80% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.51 | 0.10 - 1.02 | 0.73 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.49(X) + 3.73**

**$R^2$ = 0.83**

# Apartment
(220)

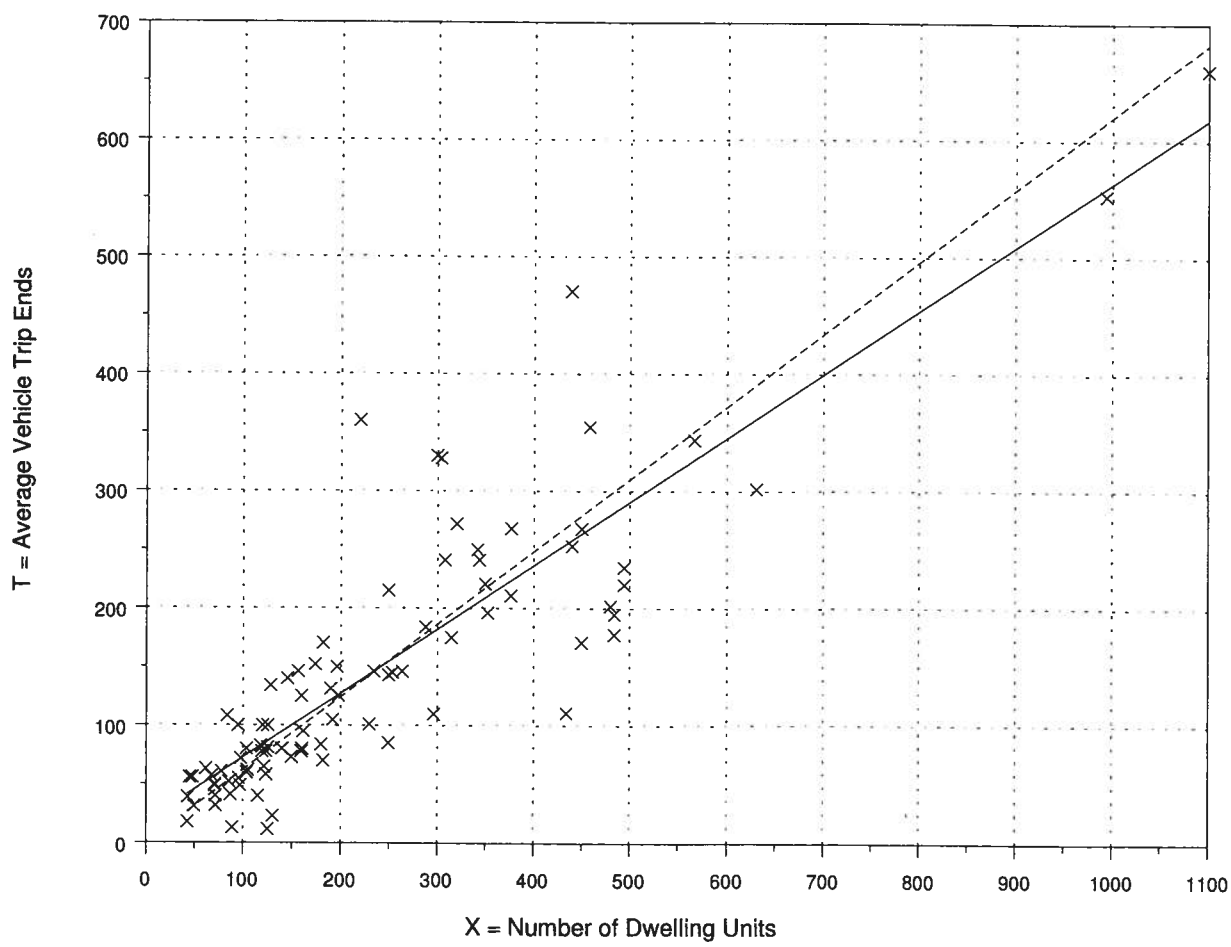
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**

Number of Studies: 90
Avg. Number of Dwelling Units: 233
Directional Distribution: 65% entering, 35% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.62 | 0.10 - 1.64 | 0.82 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.55(X) + 17.65**

**$R^2$ = 0.77**

# Land Use: 252
# Senior Adult Housing—Attached

## Description

Senior adult housing consists of attached independent living developments, including retirement communities, age-restricted housing and active adult communities. These developments may include limited social or recreational services. However, they generally lack centralized dining and on-site medical facilities. Residents in these communities live independently, are typically active (requiring little to no medical supervision) and may or may not be retired. Senior adult housing—detached (Land Use 251), congregate care facility (Land Use 253) and continuing care retirement community (Land Use 255) are related uses.

## Additional Data

The peak hour of the generator typically did not coincide with the peak hour of the adjacent street traffic. The A.M. peak hour of the generator typically ranged from 8:30 a.m. to 12:00 p.m. and the P.M. peak hour of the generator typically ranged from 1:00 p.m. to 6:00 p.m. **It should also be noted that in some cases, because of the limited sample size and variation in the data received, the projected trip generation estimate for the independent variable "dwelling units" exceeds the trip generation estimate for the independent variable "occupied dwelling units". By definition, this is impossible; therefore, knowledge of the project site and engineering judgment should be used to select the appropriate trip generation approximation.**

The sites were surveyed between the 1980s and the 2000s in California, Illinois, Maryland, New Hampshire, New Jersey, Pennsylvania and Canada.

## Source Numbers

237, 272, 501, 576, 602, 703, 734, 741

# Senior Adult Housing - Attached
(252)

**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday**

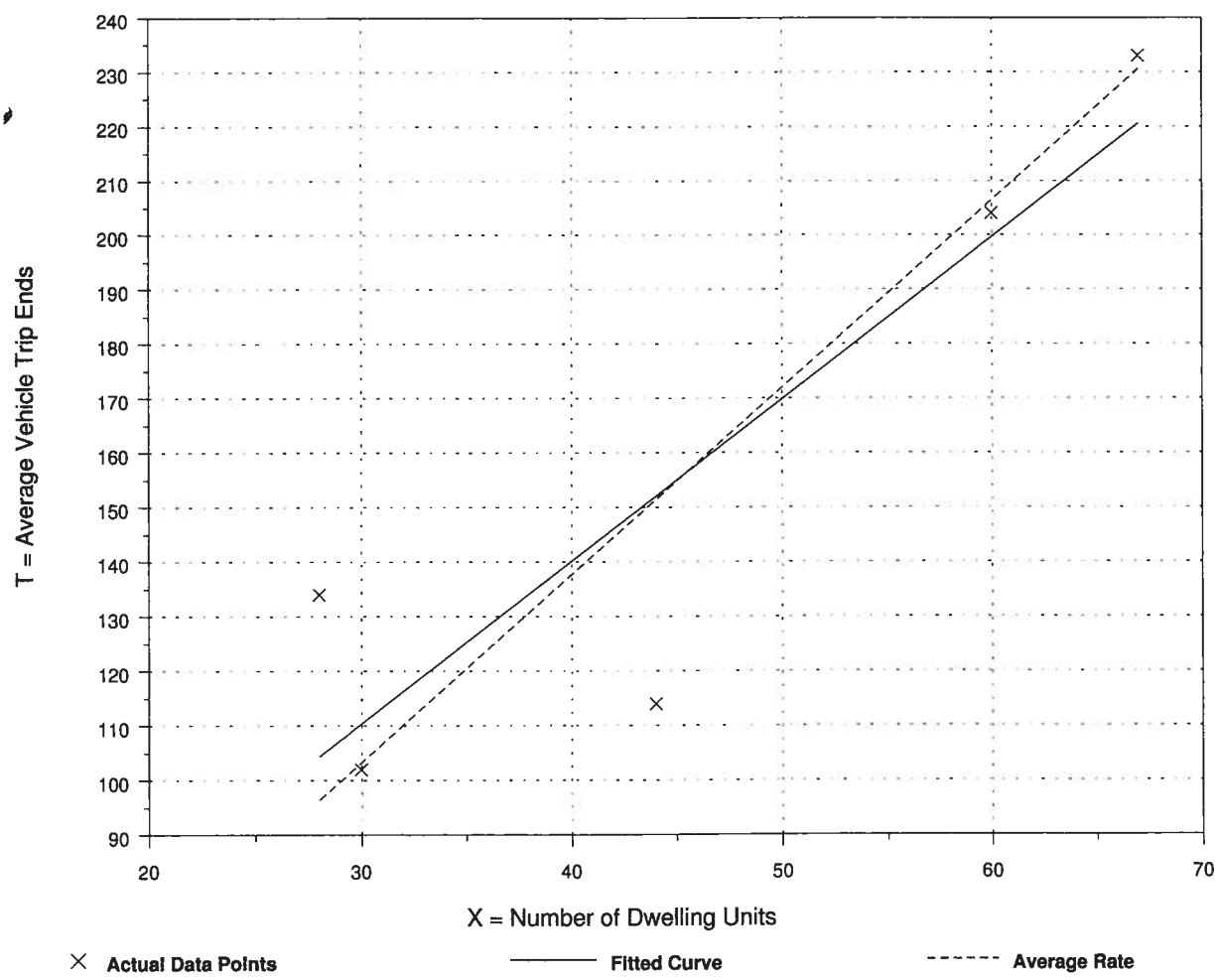
Number of Studies: 5
Avg. Number of Dwelling Units: 46
Directional Distribution: 50% entering, 50% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 3.44 | 2.59 - 4.79 | 1.93 |

## Data Plot and Equation

***Caution - Use Carefully - Small Sample Size***




× **Actual Data Points** ——— **Fitted Curve** - - - - - - **Average Rate**

**Fitted Curve Equation: T = 2.98(X) + 21.05** **$R^2$ = 0.81**

# Senior Adult Housing - Attached
(252)

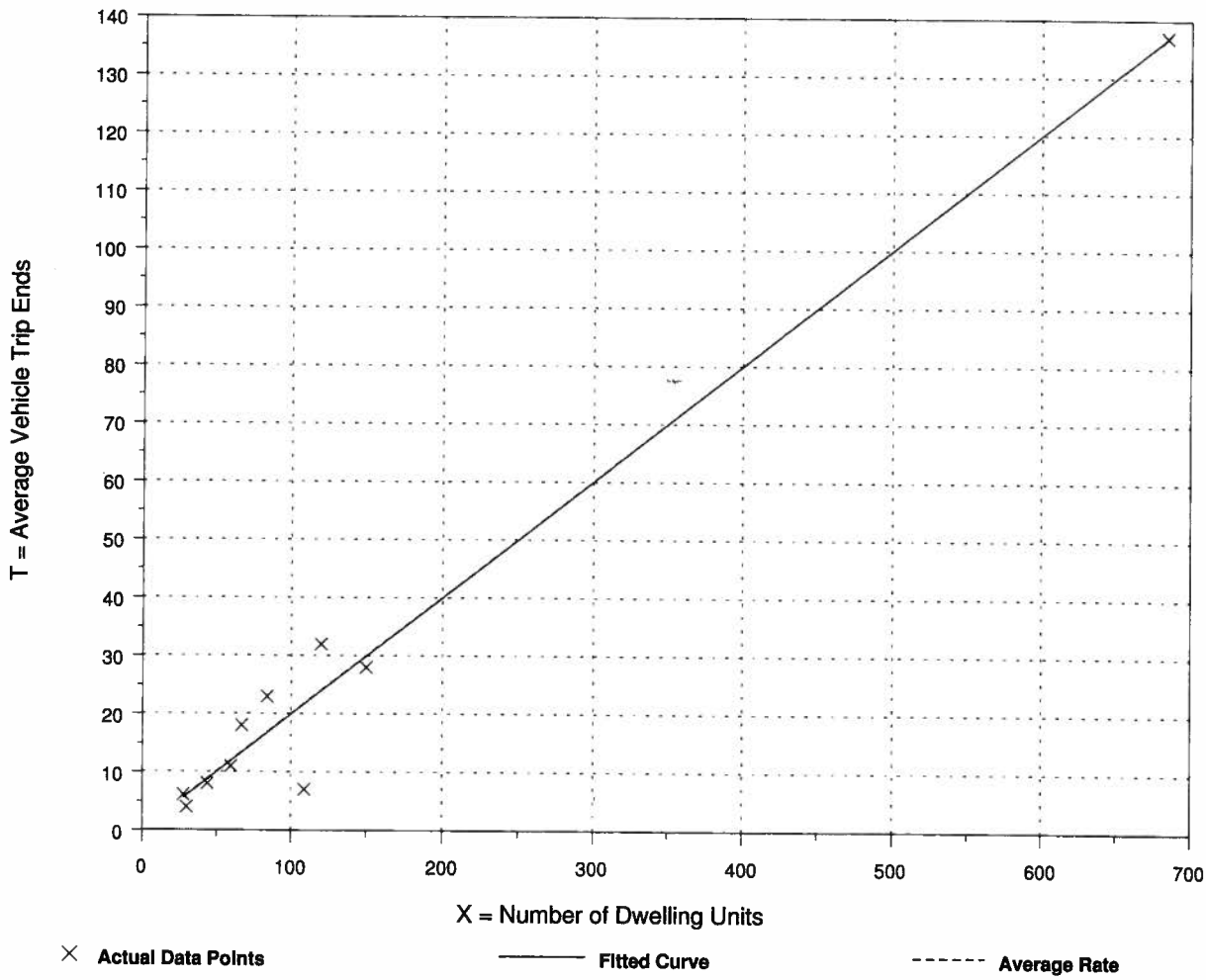
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 7 and 9 a.m.**

Number of Studies: 10
Avg. Number of Dwelling Units: 138
Directional Distribution: 34% entering, 66% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.20 | 0.06 - 0.27 | 0.45 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.20(X) - 0.13**

**$R^2$ = 0.98**

# Senior Adult Housing - Attached
(252)

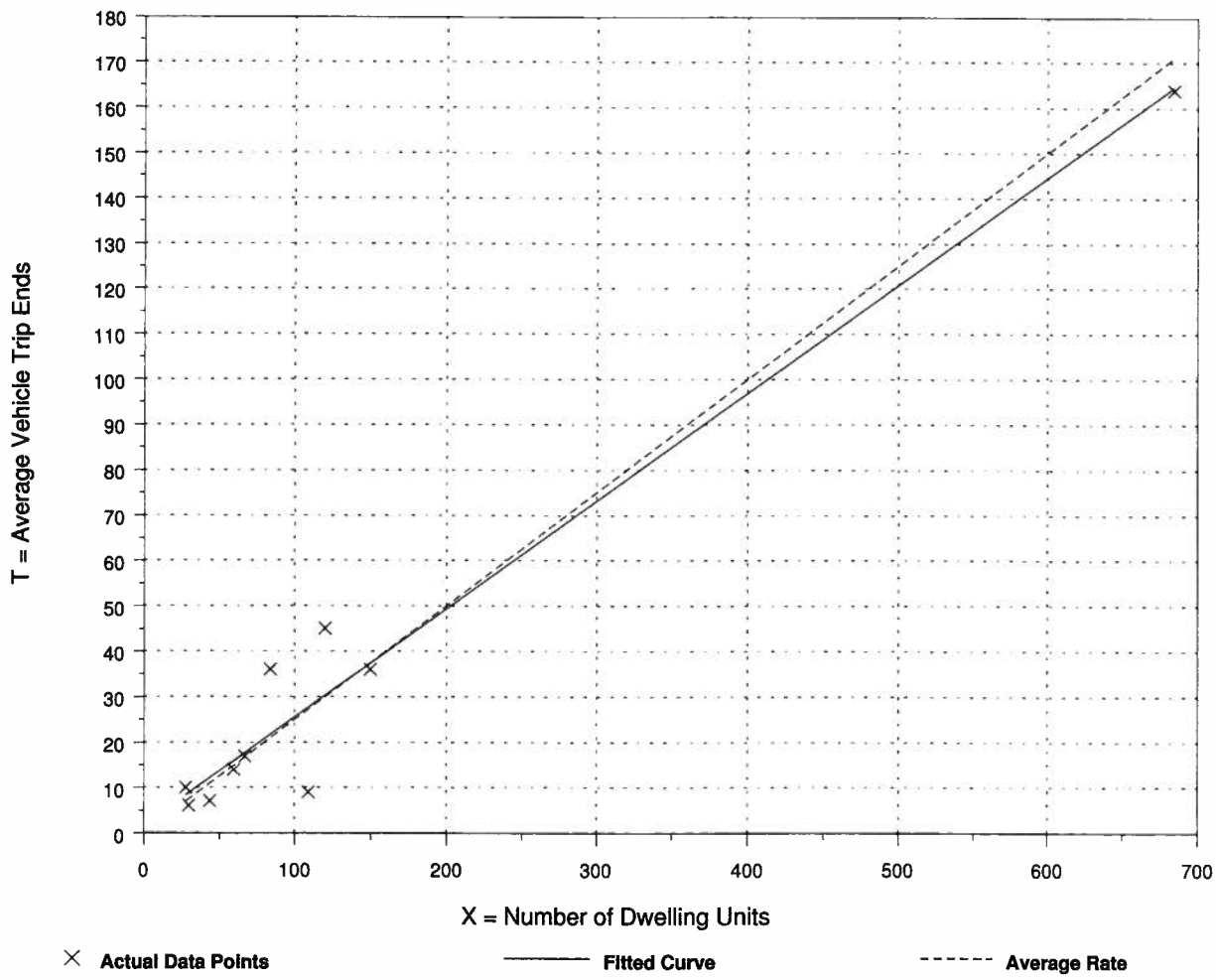
**Average Vehicle Trip Ends vs: Dwelling Units**
**On a: Weekday,**
**Peak Hour of Adjacent Street Traffic,**
**One Hour Between 4 and 6 p.m.**

Number of Studies: 10
Avg. Number of Dwelling Units: 138
Directional Distribution: 54% entering, 46% exiting

## Trip Generation per Dwelling Unit

| Average Rate | Range of Rates | Standard Deviation |
|---|---|---|
| 0.25 | 0.08 - 0.43 | 0.50 |

## Data Plot and Equation




**Fitted Curve Equation: T = 0.24(X) + 1.64**

**$R^2$ = 0.96**

Appendix E

Intersection
Level of Service
Calculations

Future with Project
Traffic Conditions

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 216 | 663 | 122 | 278 | 645 | 3 | 159 | 21 | 54 | 2 | 12 | 128 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 282 | 676 | 575 | 328 | 729 | 3 | 302 | 25 | 314 | 62 | 32 | 305 |
| Arrive On Green | 0.16 | 0.37 | 0.00 | 0.18 | 0.39 | 0.39 | 0.20 | 0.20 | 0.00 | 0.20 | 0.20 | 0.20 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1872 | 8 | 945 | 126 | 1568 | 6 | 158 | 1526 |
| Grp Volume(v), veh/h | 235 | 721 | 0 | 302 | 0 | 704 | 196 | 0 | 0 | 154 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1880 | 1070 | 0 | 1568 | 1690 | 0 | 0 |
| Q Serve(g_s), s | 7.8 | 22.0 | 0.0 | 9.9 | 0.0 | 21.9 | 7.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 7.8 | 22.0 | 0.0 | 9.9 | 0.0 | 21.9 | 12.0 | 0.0 | 0.0 | 5.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 0.88 | | 1.00 | 0.01 | | 0.90 |
| Lane Grp Cap(c), veh/h | 282 | 676 | 575 | 328 | 0 | 732 | 327 | 0 | 314 | 399 | 0 | 0 |
| V/C Ratio(X) | 0.83 | 1.07 | 0.00 | 0.92 | 0.00 | 0.96 | 0.60 | 0.00 | 0.00 | 0.39 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 322 | 676 | 575 | 328 | 0 | 732 | 327 | 0 | 314 | 399 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 24.4 | 19.0 | 0.0 | 24.1 | 0.0 | 17.9 | 33.2 | 0.0 | 0.0 | 21.2 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 13.6 | 53.6 | 0.0 | 29.4 | 0.0 | 24.4 | 2.1 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 4.2 | 18.5 | 0.0 | 6.7 | 0.0 | 13.6 | 0.2 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 38.0 | 72.6 | 0.0 | 53.5 | 0.0 | 42.3 | 35.3 | 0.0 | 0.0 | 21.4 | 0.0 | 0.0 |
| Lane Grp LOS | D | F | | D | | D | D | | | C | | |
| Approach Vol, veh/h | | 956 | | | 1006 | | | 196 | | | 154 | |
| Approach Delay, s/veh | | 64.1 | | | 45.6 | | | 35.3 | | | 21.4 | |
| Approach LOS | | E | | | D | | | D | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 13.6 | 28.0 | | 15.0 | 29.4 | | | 17.0 | | | 17.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 11.0 | 22.0 | | 11.0 | 22.0 | | | 12.0 | | | 12.0 | |
| Max Q Clear Time (g_c+I1), s | 9.8 | 24.0 | | 11.9 | 23.9 | | | 14.0 | | | 7.0 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 0.0 | | | 0.0 | | | 0.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 50.8 |
| HCM 2010 LOS | D |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.9 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 27 | 3 | 643 | 76 | 5 | 899 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 1 | 1 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 29 | 3 | 684 | 81 | 5 | 956 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1652 | 686 | 0 | 0 | 685 | 0 |
| Stage 1 | 685 | - | - | - | - | - |
| Stage 2 | 967 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 108 | 447 | - | - | 908 | - |
| Stage 1 | 500 | - | - | - | - | - |
| Stage 2 | 369 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 107 | 446 | - | - | 907 | - |
| Mov Capacity-2 Maneuver | 107 | - | - | - | - | - |
| Stage 1 | 500 | - | - | - | - | - |
| Stage 2 | 364 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 46.9 | 0 | 0 |
| HCM LOS | E | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 107 | 446 | 907 | - |
| HCM Control Delay, s | - | - | 50.6 | 13.1 | 8.993 | 0 |
| HCM Lane V/C Ratio | - | - | 0.27 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | F | B | A | A |
| HCM 95th-tile Q, veh | - | - | 1.0 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 43.4 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 15 | 5 | 103 | 65 | 15 | 76 | 29 | 595 | 17 | 22 | 731 | 17 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 16 | 5 | 111 | 70 | 16 | 82 | 31 | 640 | 18 | 24 | 786 | 18 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1593 | 1553 | 786 | 1547 | 1544 | 649 | 786 | 0 | 0 | 658 | 0 | 0 |
| Stage 1 | 833 | 833 | - | 711 | 711 | - | - | - | - | - | - | - |
| Stage 2 | 760 | 720 | - | 836 | 833 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 86 | 113 | 392 | 78 | 97 | 453 | 833 | - | - | 930 | - | - |
| Stage 1 | 363 | 384 | - | 392 | 403 | - | - | - | - | - | - | - |
| Stage 2 | 398 | 432 | - | 329 | 350 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 58 | 106 | 392 | # 51 | 91 | 453 | 833 | - | - | 930 | - | - |
| Mov Capacity-2 Maneuver | 58 | 106 | - | # 51 | 91 | - | - | - | - | - | - | - |
| Stage 1 | 349 | 374 | - | 377 | 388 | - | - | - | - | - | - | - |
| Stage 2 | 301 | 416 | - | 227 | 341 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 30.7 | $ 442.4 | 0.4 | 0.3 |
| HCM LOS | D | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 833 | - | - | 138 | 392 | 97 | 930 | - | - |
| HCM Control Delay, s | 9.49 | - | - | 49 | 16.3 | $ 442.4 | 8.972 | - | - |
| HCM Lane V/C Ratio | 0.04 | - | - | 0.42 | 0.19 | 1.73 | 0.03 | - | - |
| HCM Lane LOS | A | - | - | E | C | F | A | - | - |
| HCM 95th-tile Q, veh | 0.1 | - | - | 1.9 | 0.7 | 13.5 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 46.3 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 125 | 0 | 22 | 36 | 0 | 72 | 4 | 672 | 10 | 21 | 712 | 19 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 90 | 0 | | 0 | 270 | | 0 | 0 | | 275 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.94 | 0.92 | 0.94 | 0.92 | 0.92 | 0.92 | 0.94 | 0.94 | 0.92 | 0.92 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 133 | 0 | 23 | 39 | 0 | 78 | 4 | 715 | 11 | 23 | 757 | 20 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1571 | 1537 | 757 | 1532 | 1532 | 720 | 757 | 0 | 0 | 726 | 0 | 0 |
| Stage 1 | 803 | 803 | - | 729 | 729 | - | - | - | - | - | - | - |
| Stage 2 | 768 | 734 | - | 803 | 803 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | # 90 | 116 | 408 | 95 | 117 | 428 | 854 | - | - | 877 | - | - |
| Stage 1 | 377 | 396 | - | 414 | 428 | - | - | - | - | - | - | - |
| Stage 2 | 394 | 426 | - | 377 | 396 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | # 71 | 110 | 408 | 86 | 111 | 428 | 854 | - | - | 877 | - | - |
| Mov Capacity-2 Maneuver | # 71 | 110 | - | 86 | 111 | - | - | - | - | - | - | - |
| Stage 1 | 375 | 378 | - | 412 | 426 | - | - | - | - | - | - | - |
| Stage 2 | 320 | 424 | - | 339 | 378 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | $ 491.7 | 53.8 | 0.1 | 0.3 |
| HCM LOS | F | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 854 | - | - | 74 | 408 | 184 | 877 | - | - |
| HCM Control Delay, s | 9.237 | - | - | $ 53.8 | 14.2 | 53.8 | 9.215 | 0 | - |
| HCM Lane V/C Ratio | 0.01 | - | - | 1.90 | 0.04 | 0.64 | 0.03 | - | - |
| HCM Lane LOS | A | - | - | F | B | F | A | A | - |
| HCM 95th-tile Q, veh | 0.0 | - | - | 12.6 | 0.1 | 3.7 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 26 | 774 | 111 | 306 | 694 | 4 | 251 | 40 | 229 | 5 | 22 | 16 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | | 0.99 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 38 | 697 | 592 | 319 | 998 | 6 | 414 | 54 | 435 | 75 | 288 | 183 |
| Arrive On Green | 0.02 | 0.38 | 0.00 | 0.18 | 0.53 | 0.53 | 0.28 | 0.28 | 0.00 | 0.28 | 0.28 | 0.28 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 1792 | 1868 | 11 | 1224 | 194 | 1568 | 111 | 1035 | 660 |
| Grp Volume(v), veh/h | 31 | 933 | 0 | 369 | 0 | 841 | 350 | 0 | 0 | 52 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1792 | 0 | 1879 | 1418 | 0 | 1568 | 1806 | 0 | 0 |
| Q Serve(g_s), s | 1.6 | 34.0 | 0.0 | 16.0 | 0.0 | 34.0 | 23.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 1.6 | 34.0 | 0.0 | 16.0 | 0.0 | 34.0 | 25.0 | 0.0 | 0.0 | 2.0 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 0.86 | | 1.00 | 0.12 | | 0.37 |
| Lane Grp Cap(c), veh/h | 38 | 697 | 592 | 319 | 0 | 1004 | 468 | 0 | 435 | 546 | 0 | 0 |
| V/C Ratio(X) | 0.82 | 1.34 | 0.00 | 1.16 | 0.00 | 0.84 | 0.75 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 98 | 697 | 592 | 319 | 0 | 1004 | 468 | 0 | 435 | 546 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 43.9 | 28.0 | 0.0 | 37.0 | 0.0 | 17.7 | 109.1 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 14.9 | 162.3 | 0.0 | 100.6 | 0.0 | 7.0 | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.8 | 45.9 | 0.0 | 15.9 | 0.0 | 15.7 | 0.8 | 0.0 | 0.0 | 0.9 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 58.8 | 190.3 | 0.0 | 137.6 | 0.0 | 24.7 | 114.9 | 0.0 | 0.0 | 24.2 | 0.0 | 0.0 |
| Lane Grp LOS | E | F | | F | | C | F | | | C | | |
| Approach Vol, veh/h | | 964 | | | 1210 | | | 350 | | | 52 | |
| Approach Delay, s/veh | | 186.0 | | | 59.1 | | | 114.9 | | | 24.2 | |
| Approach LOS | | F | | | E | | | F | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 5.9 | 40.0 | | 20.0 | 54.1 | | | 30.0 | | | 30.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 5.0 | 34.0 | | 16.0 | 45.0 | | | 25.0 | | | 25.0 | |
| Max Q Clear Time (g_c+I1), s | 3.6 | 36.0 | | 18.0 | 36.0 | | | 27.0 | | | 4.0 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 8.4 | | | 0.0 | | | 1.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 113.5 |
| HCM 2010 LOS | F |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 9.6 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 66 | 3 | 843 | 169 | 4 | 938 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 75 | 3 | 958 | 192 | 5 | 1066 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 2034 | 959 | 0 | 0 | 959 | 0 |
| Stage 1 | 959 | - | - | - | - | - |
| Stage 2 | 1075 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | # 63 | 312 | - | - | 717 | - |
| Stage 1 | 372 | - | - | - | - | - |
| Stage 2 | 328 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | # 62 | 312 | - | - | 717 | - |
| Mov Capacity-2 Maneuver | # 62 | - | - | - | - | - |
| Stage 1 | 372 | - | - | - | - | - |
| Stage 2 | 322 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 282.1 | 0 | 0 |
| HCM LOS | F | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 62 | 312 | 717 | - |
| HCM Control Delay, s | - | - | 294.2 | 16.7 | 10.053 | 0 |
| HCM Lane V/C Ratio | - | - | 1.21 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | F | C | B | A |
| HCM 95th-tile Q, veh | - | - | 6.2 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 45.1 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 6 | 0 | 95 | 52 | 0 | 51 | 129 | 628 | 87 | 89 | 779 | 23 |
| Conflicting Peds, #/hr | 1 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 6 | 0 | 97 | 53 | 0 | 52 | 132 | 641 | 89 | 91 | 795 | 23 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1955 | 1974 | 798 | 1929 | 1929 | 688 | 797 | 0 | 0 | 732 | 0 | 0 |
| Stage 1 | 979 | 979 | - | 950 | 950 | - | - | - | - | - | - | - |
| Stage 2 | 976 | 995 | - | 979 | 979 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 48 | 62 | 386 | # 40 | 54 | 430 | 825 | - | - | 873 | - | - |
| Stage 1 | 301 | 328 | - | 281 | 305 | - | - | - | - | - | - | - |
| Stage 2 | 302 | 323 | - | 270 | 294 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 34 | 46 | 385 | # 24 | 40 | 429 | 824 | - | - | 872 | - | - |
| Mov Capacity-2 Maneuver | 34 | 46 | - | # 24 | 40 | - | - | - | - | - | - | - |
| Stage 1 | 252 | 293 | - | 236 | 256 | - | - | - | - | - | - | - |
| Stage 2 | 223 | 271 | - | 181 | 263 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 24.4 | $ 803.1 | 1.6 | 1 |
| HCM LOS | C | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 824 | - | - | 146 | 385 | 45 | 872 | - | - |
| HCM Control Delay, s | 10.198 | - | - | 38.2 | 16.2 | $ 803.1 | 9.608 | - | - |
| HCM Lane V/C Ratio | 0.16 | - | - | 0.26 | 0.17 | 2.34 | 0.10 | - | - |
| HCM Lane LOS | B | - | - | E | C | F | A | - | - |
| HCM 95th-tile Q, veh | 0.6 | - | - | 1.0 | 0.6 | 11.1 | 0.3 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 11.7 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 44 | 0 | 11 | 21 | 0 | 42 | 10 | 636 | 36 | 74 | 859 | 64 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 90 | 0 | | 0 | 270 | | 0 | 0 | | 275 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 0% | | | 0% | | | 0% | |
| Peak Hour Factor | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 48 | 0 | 12 | 23 | 0 | 46 | 11 | 691 | 39 | 80 | 934 | 70 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 0 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1850 | 1847 | 934 | 1828 | 1828 | 711 | 934 | 0 | 0 | 730 | 0 | 0 |
| Stage 1 | 1095 | 1095 | - | 733 | 733 | - | - | - | - | - | - | - |
| Stage 2 | 755 | 752 | - | 1095 | 1095 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 57 | 75 | 322 | 59 | 77 | 433 | 733 | - | - | 874 | - | - |
| Stage 1 | 259 | 290 | - | 412 | 426 | - | - | - | - | - | - | - |
| Stage 2 | 401 | 418 | - | 259 | 290 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | # 42 | 58 | 322 | 47 | 60 | 433 | 733 | - | - | 874 | - | - |
| Mov Capacity-2 Maneuver | # 42 | 58 | - | 47 | 60 | - | - | - | - | - | - | - |
| Stage 1 | 255 | 229 | - | 406 | 420 | - | - | - | - | - | - | - |
| Stage 2 | 353 | 412 | - | 197 | 229 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 284.3 | 73.2 | 0.1 | 0.7 |
| HCM LOS | F | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 733 | - | - | 45 | 322 | 116 | 874 | - | - |
| HCM Control Delay, s | 9.985 | - | - | $ 73.2 | 16.5 | 73.2 | 9.536 | 0 | - |
| HCM Lane V/C Ratio | 0.01 | - | - | 1.15 | 0.03 | 0.59 | 0.09 | - | - |
| HCM Lane LOS | A | - | - | F | C | F | A | A | - |
| HCM 95th-tile Q, veh | 0.0 | - | - | 4.9 | 0.1 | 2.9 | 0.3 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 216 | 663 | 122 | 278 | 645 | 3 | 159 | 21 | 54 | 2 | 12 | 128 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 273 | 882 | 750 | 354 | 795 | 3 | 298 | 28 | 359 | 48 | 36 | 347 |
| Arrive On Green | 0.16 | 0.48 | 0.00 | 0.10 | 0.42 | 0.42 | 0.23 | 0.23 | 0.00 | 0.23 | 0.23 | 0.23 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 3476 | 1872 | 8 | 924 | 123 | 1568 | 5 | 158 | 1517 |
| Grp Volume(v), veh/h | 235 | 721 | 0 | 302 | 0 | 704 | 196 | 0 | 0 | 154 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1738 | 0 | 1880 | 1047 | 0 | 1568 | 1680 | 0 | 0 |
| Q Serve(g_s), s | 10.3 | 26.3 | 0.0 | 6.7 | 0.0 | 27.1 | 11.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 10.3 | 26.3 | 0.0 | 6.7 | 0.0 | 27.1 | 18.0 | 0.0 | 0.0 | 6.4 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.00 | 0.88 | | 1.00 | 0.01 | | 0.90 |
| Lane Grp Cap(c), veh/h | 273 | 882 | 750 | 354 | 0 | 799 | 326 | 0 | 359 | 431 | 0 | 0 |
| V/C Ratio(X) | 0.86 | 0.82 | 0.00 | 0.85 | 0.00 | 0.88 | 0.60 | 0.00 | 0.00 | 0.36 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 290 | 915 | 778 | 354 | 0 | 813 | 326 | 0 | 359 | 431 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 32.4 | 17.6 | 0.0 | 34.7 | 0.0 | 20.8 | 64.2 | 0.0 | 0.0 | 25.8 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 20.1 | 6.5 | 0.0 | 17.2 | 0.0 | 11.8 | 2.2 | 0.0 | 0.0 | 0.2 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 5.8 | 12.4 | 0.0 | 3.7 | 0.0 | 14.1 | 0.2 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 52.5 | 24.1 | 0.0 | 51.9 | 0.0 | 32.6 | 66.4 | 0.0 | 0.0 | 26.0 | 0.0 | 0.0 |
| Lane Grp LOS | D | C | | D | | C | E | | | C | | |
| Approach Vol, veh/h | | 956 | | | 1006 | | | 196 | | | 154 | |
| Approach Delay, s/veh | | 31.1 | | | 38.4 | | | 66.4 | | | 26.0 | |
| Approach LOS | | C | | | D | | | E | | | C | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 16.2 | 43.6 | | 12.0 | 39.4 | | | 23.0 | | | 23.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 13.0 | 39.0 | | 8.0 | 34.0 | | | 18.0 | | | 18.0 | |
| Max Q Clear Time (g_c+I1), s | 12.3 | 28.3 | | 8.7 | 29.1 | | | 20.0 | | | 8.4 | |
| Green Ext Time (p_c), s | 0.0 | 8.8 | | 0.0 | 4.3 | | | 0.0 | | | 1.0 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 36.9 |
| HCM 2010 LOS | D |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 0.4 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 27 | 3 | 643 | 76 | 5 | 899 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 1 | 1 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 0 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 29 | 3 | 684 | 81 | 5 | 956 |
| Number of Lanes | 1 | 1 | 1 | 1 | 0 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 1652 | 686 | 0 | 0 | 685 | 0 |
| Stage 1 | 685 | - | - | - | - | - |
| Stage 2 | 967 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | 108 | 447 | - | - | 908 | - |
| Stage 1 | 500 | - | - | - | - | - |
| Stage 2 | 369 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | 107 | 446 | - | - | 907 | - |
| Mov Capacity-2 Maneuver | 240 | - | - | - | - | - |
| Stage 1 | 500 | - | - | - | - | - |
| Stage 2 | 364 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 21.1 | 0 | 0 |
| HCM LOS | C | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 240 | 446 | 907 | - |
| HCM Control Delay, s | - | - | 22 | 13.1 | 8.993 | 0 |
| HCM Lane V/C Ratio | - | - | 0.12 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | C | B | A | A |
| HCM 95th-tile Q, veh | - | - | 0.4 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 15 | 5 | 103 | 65 | 15 | 76 | 29 | 595 | 17 | 22 | 731 | 17 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 288 | 73 | 262 | 197 | 48 | 133 | 49 | 1005 | 28 | 40 | 1039 | 883 |
| Arrive On Green | 0.17 | 0.17 | 0.00 | 0.17 | 0.17 | 0.17 | 0.03 | 0.56 | 0.56 | 0.02 | 0.56 | 0.00 |
| Sat Flow, veh/h | 945 | 440 | 1583 | 555 | 290 | 805 | 1756 | 1785 | 50 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 21 | 0 | 0 | 168 | 0 | 0 | 31 | 0 | 658 | 24 | 786 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1385 | 0 | 1583 | 1650 | 0 | 0 | 1756 | 0 | 1835 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 3.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 11.8 | 0.6 | 15.6 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 0.0 | 0.0 | 4.5 | 0.0 | 0.0 | 0.8 | 0.0 | 11.8 | 0.6 | 15.6 | 0.0 |
| Prop In Lane | 0.76 | | 1.00 | 0.42 | | 0.49 | 1.00 | | 0.03 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 361 | 0 | 262 | 379 | 0 | 0 | 49 | 0 | 1034 | 40 | 1039 | 883 |
| V/C Ratio(X) | 0.06 | 0.00 | 0.00 | 0.44 | 0.00 | 0.00 | 0.63 | 0.00 | 0.64 | 0.59 | 0.76 | 0.00 |
| Avail Cap(c_a), veh/h | 361 | 0 | 262 | 379 | 0 | 0 | 145 | 0 | 1368 | 147 | 1388 | 1180 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 17.1 | 0.0 | 0.0 | 18.7 | 0.0 | 0.0 | 23.2 | 0.0 | 7.2 | 23.4 | 8.2 | 0.0 |
| Incr Delay (d2), s/veh | 0.1 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 12.3 | 0.0 | 0.7 | 13.1 | 1.7 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.2 | 0.0 | 0.0 | 1.8 | 0.0 | 0.0 | 0.5 | 0.0 | 3.8 | 0.4 | 5.3 | 0.0 |
| Lane Grp Delay (d), s/veh | 17.2 | 0.0 | 0.0 | 19.5 | 0.0 | 0.0 | 35.5 | 0.0 | 7.8 | 36.5 | 9.9 | 0.0 |
| Lane Grp LOS | B | | | B | | | D | | A | D | A | |
| Approach Vol, veh/h | | 21 | | | 168 | | | 689 | | | 810 | |
| Approach Delay, s/veh | | 17.2 | | | 19.5 | | | 9.1 | | | 10.7 | |
| Approach LOS | | B | | | B | | | A | | | B | |

| Timer | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Phs Duration (G+Y+Rc), s | | 12.0 | | | 12.0 | | 5.4 | 31.2 | | 5.1 | 31.0 | |
| Change Period (Y+Rc), s | | 4.0 | | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Max Green Setting (Gmax), s | | 8.0 | | | 8.0 | | 4.0 | 36.0 | | 4.0 | 36.0 | |
| Max Q Clear Time (g_c+I1), s | | 10.0 | | | 6.5 | | 2.8 | 13.8 | | 2.6 | 17.6 | |
| Green Ext Time (p_c), s | | 0.0 | | | 0.1 | | 0.0 | 10.4 | | 0.0 | 9.4 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 11.0 |
| HCM 2010 LOS | B |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 125 | 0 | 22 | 36 | 0 | 72 | 4 | 672 | 10 | 21 | 712 | 19 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 400 | 0 | 280 | 180 | 32 | 212 | 8 | 979 | 15 | 39 | 1030 | 875 |
| Arrive On Green | 0.18 | 0.00 | 0.00 | 0.18 | 0.00 | 0.18 | 0.00 | 0.53 | 0.53 | 0.02 | 0.55 | 0.00 |
| Sat Flow, veh/h | 1359 | 0 | 1583 | 417 | 182 | 1199 | 1774 | 1830 | 28 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 133 | 0 | 0 | 117 | 0 | 0 | 4 | 0 | 726 | 23 | 757 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1359 | 0 | 1583 | 1798 | 0 | 0 | 1774 | 0 | 1858 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 5.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 13.5 | 0.6 | 13.8 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 0.0 | 0.0 | 2.8 | 0.0 | 0.0 | 0.1 | 0.0 | 13.5 | 0.6 | 13.8 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 0.33 | | 0.67 | 1.00 | | 0.02 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 400 | 0 | 280 | 425 | 0 | 0 | 8 | 0 | 994 | 39 | 1030 | 875 |
| V/C Ratio(X) | 0.33 | 0.00 | 0.00 | 0.28 | 0.00 | 0.00 | 0.52 | 0.00 | 0.73 | 0.58 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 400 | 0 | 280 | 425 | 0 | 0 | 157 | 0 | 1275 | 157 | 1279 | 1087 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 18.2 | 0.0 | 0.0 | 16.4 | 0.0 | 0.0 | 22.4 | 0.0 | 8.0 | 21.9 | 7.6 | 0.0 |
| Incr Delay (d2), s/veh | 0.5 | 0.0 | 0.0 | 0.3 | 0.0 | 0.0 | 45.3 | 0.0 | 1.6 | 13.0 | 1.7 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 1.4 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 0.1 | 0.0 | 4.7 | 0.4 | 4.7 | 0.0 |
| Lane Grp Delay (d), s/veh | 18.7 | 0.0 | 0.0 | 16.8 | 0.0 | 0.0 | 67.7 | 0.0 | 9.6 | 34.8 | 9.3 | 0.0 |
| Lane Grp LOS | B | | | B | | | E | | A | C | A | |
| Approach Vol, veh/h | | 133 | | | 117 | | | 730 | | | 780 | |
| Approach Delay, s/veh | | 18.7 | | | 16.8 | | | 9.9 | | | 10.1 | |
| Approach LOS | | B | | | B | | | A | | | B | |

| Timer | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | | 8 | | 5 | 2 | | 1 | 6 | |
| Phs Duration (G+Y+Rc), s | | 12.0 | | | 12.0 | | 4.2 | 28.2 | | 5.0 | 29.0 | |
| Change Period (Y+Rc), s | | 4.0 | | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Max Green Setting (Gmax), s | | 8.0 | | | 8.0 | | 4.0 | 31.0 | | 4.0 | 31.0 | |
| Max Q Clear Time (g_c+I1), s | | 10.0 | | | 4.8 | | 2.1 | 15.5 | | 2.6 | 15.8 | |
| Green Ext Time (p_c), s | | 0.0 | | | 0.4 | | 0.0 | 8.7 | | 0.0 | 8.6 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 11.1 |
| HCM 2010 LOS | B |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 26 | 774 | 111 | 306 | 694 | 4 | 251 | 40 | 229 | 5 | 22 | 16 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 0.99 | | 1.00 | 1.00 | | 0.99 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 | 184.4 | 184.4 | 184.4 | 188.1 | 188.1 | 188.1 |
| Lanes | 1 | 1 | 1 | 2 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| Cap, veh/h | 39 | 936 | 796 | 374 | 1108 | 7 | 372 | 51 | 422 | 66 | 275 | 178 |
| Arrive On Green | 0.02 | 0.51 | 0.00 | 0.11 | 0.59 | 0.59 | 0.27 | 0.27 | 0.00 | 0.27 | 0.27 | 0.27 |
| Sat Flow, veh/h | 1756 | 1844 | 1568 | 3476 | 1868 | 11 | 1191 | 189 | 1568 | 131 | 1020 | 663 |
| Grp Volume(v), veh/h | 31 | 933 | 0 | 369 | 0 | 841 | 350 | 0 | 0 | 52 | 0 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1756 | 1844 | 1568 | 1738 | 0 | 1879 | 1380 | 0 | 1568 | 1814 | 0 | 0 |
| Q Serve(g_s), s | 2.3 | 65.5 | 0.0 | 13.8 | 0.0 | 42.8 | 32.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Cycle Q Clear(g_c), s | 2.3 | 65.5 | 0.0 | 13.8 | 0.0 | 42.8 | 35.0 | 0.0 | 0.0 | 2.9 | 0.0 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 1.00 | | 0.01 | 0.86 | | 1.00 | 0.12 | | 0.37 |
| Lane Grp Cap(c), veh/h | 39 | 936 | 796 | 374 | 0 | 1115 | 423 | 0 | 422 | 519 | 0 | 0 |
| V/C Ratio(X) | 0.80 | 1.00 | 0.00 | 0.99 | 0.00 | 0.75 | 0.83 | 0.00 | 0.00 | 0.10 | 0.00 | 0.00 |
| Avail Cap(c_a), veh/h | 54 | 936 | 796 | 374 | 0 | 1115 | 423 | 0 | 422 | 519 | 0 | 0 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Upstream Filter(I) | 1.00 | 1.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 |
| Uniform Delay (d), s/veh | 63.3 | 31.9 | 0.0 | 57.9 | 0.0 | 19.5 | 173.6 | 0.0 | 0.0 | 35.8 | 0.0 | 0.0 |
| Incr Delay (d2), s/veh | 29.3 | 28.5 | 0.0 | 42.5 | 0.0 | 3.5 | 12.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 1.4 | 36.2 | 0.0 | 8.3 | 0.0 | 19.6 | 1.4 | 0.0 | 0.0 | 1.3 | 0.0 | 0.0 |
| Lane Grp Delay (d), s/veh | 92.6 | 60.4 | 0.0 | 100.4 | 0.0 | 23.0 | 185.6 | 0.0 | 0.0 | 35.8 | 0.0 | 0.0 |
| Lane Grp LOS | F | E | | F | | C | F | | | D | | |
| Approach Vol, veh/h | | 964 | | | 1210 | | | 350 | | | 52 | |
| Approach Delay, s/veh | | 61.5 | | | 46.6 | | | 185.6 | | | 35.8 | |
| Approach LOS | | E | | | D | | | F | | | D | |

| Timer | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Assigned Phs | 7 | 4 | | 3 | 8 | | | 2 | | | 6 | |
| Phs Duration (G+Y+Rc), s | 6.9 | 72.0 | | 18.0 | 83.1 | | | 40.0 | | | 40.0 | |
| Change Period (Y+Rc), s | 4.0 | 6.0 | | 4.0 | 6.0 | | | 5.0 | | | 5.0 | |
| Max Green Setting (Gmax), s | 4.0 | 66.0 | | 14.0 | 76.0 | | | 35.0 | | | 35.0 | |
| Max Q Clear Time (g_c+I1), s | 4.3 | 67.5 | | 15.8 | 44.8 | | | 37.0 | | | 4.9 | |
| Green Ext Time (p_c), s | 0.0 | 0.0 | | 0.0 | 25.9 | | | 0.0 | | | 1.7 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 70.8 |
| HCM 2010 LOS | E |

Notes

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 1.2 |

| Movement | WBL | WBR | NBT | NBR | SBL | SBT |
|---|---|---|---|---|---|---|
| Vol, veh/h | 66 | 3 | 843 | 169 | 4 | 938 |
| Conflicting Peds, #/hr | 0 | 1 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Free | Free | None | None |
| Storage Length | 0 | 50 | | 180 | 100 | |
| Median Width | 12 | | 12 | | | 12 |
| Grade, % | 0% | | 4% | | | -4% |
| Peak Hour Factor | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 | 0.88 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 75 | 3 | 958 | 192 | 5 | 1066 |
| Number of Lanes | 1 | 1 | 1 | 1 | 1 | 1 |

| Major/Minor | | | Major 1 | | | Major 2 |
|---|---|---|---|---|---|---|
| Conflicting Flow All | 2034 | 959 | 0 | 0 | 959 | 0 |
| Stage 1 | 959 | - | - | - | - | - |
| Stage 2 | 1075 | - | - | - | - | - |
| Follow-up Headway | 3.518 | 3.318 | - | - | 2.218 | - |
| Pot Capacity-1 Maneuver | # 63 | 312 | - | - | 717 | - |
| Stage 1 | 372 | - | - | - | - | - |
| Stage 2 | 328 | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | - | - | 0 | - |
| Mov Capacity-1 Maneuver | # 63 | 312 | - | - | 717 | - |
| Mov Capacity-2 Maneuver | 187 | - | - | - | - | - |
| Stage 1 | 372 | - | - | - | - | - |
| Stage 2 | 326 | - | - | - | - | - |

| Approach | WB | NB | SB |
|---|---|---|---|
| HCM Control Delay, s | 35.7 | 0 | 0 |
| HCM LOS | E | - | - |

| Minor Lane / Major Mvmt | NBT | NBR | WBLn1 | WBLn2 | SBL | SBT |
|---|---|---|---|---|---|---|
| Cap, veh/h | - | - | 187 | 312 | 717 | - |
| HCM Control Delay, s | - | - | 36.6 | 16.7 | 10.053 | - |
| HCM Lane V/C Ratio | - | - | 0.40 | 0.01 | 0.01 | - |
| HCM Lane LOS | - | - | E | C | B | - |
| HCM 95th-tile Q, veh | - | - | 1.8 | 0.0 | 0.0 | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 6 | 0 | 95 | 52 | 0 | 51 | 129 | 628 | 87 | 89 | 779 | 23 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 271 | 0 | 116 | 188 | 0 | 67 | 169 | 946 | 131 | 115 | 1053 | 895 |
| Arrive On Green | 0.07 | 0.00 | 0.00 | 0.07 | 0.00 | 0.07 | 0.10 | 0.60 | 0.60 | 0.06 | 0.57 | 0.00 |
| Sat Flow, veh/h | 1524 | 0 | 1583 | 931 | 0 | 913 | 1756 | 1585 | 220 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 6 | 0 | 0 | 105 | 0 | 0 | 132 | 0 | 730 | 91 | 795 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1524 | 0 | 1583 | 1844 | 0 | 0 | 1756 | 0 | 1805 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 0.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 3.3 | 0.0 | 12.4 | 2.3 | 14.6 | 0.0 |
| Cycle Q Clear(g_c), s | 3.3 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 | 3.3 | 0.0 | 12.4 | 2.3 | 14.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 0.50 | | 0.50 | 1.00 | | 0.12 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 271 | 0 | 116 | 255 | 0 | 0 | 169 | 0 | 1077 | 115 | 1053 | 895 |
| V/C Ratio(X) | 0.02 | 0.00 | 0.00 | 0.41 | 0.00 | 0.00 | 0.78 | 0.00 | 0.68 | 0.79 | 0.75 | 0.00 |
| Avail Cap(c_a), veh/h | 271 | 0 | 140 | 277 | 0 | 0 | 272 | 0 | 1356 | 196 | 1317 | 1119 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 19.5 | 0.0 | 0.0 | 20.6 | 0.0 | 0.0 | 20.0 | 0.0 | 6.2 | 20.9 | 7.5 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 7.7 | 0.0 | 1.0 | 11.5 | 2.0 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.1 | 0.0 | 0.0 | 1.2 | 0.0 | 0.0 | 1.6 | 0.0 | 3.5 | 1.3 | 4.8 | 0.0 |
| Lane Grp Delay (d), s/veh | 19.5 | 0.0 | 0.0 | 21.7 | 0.0 | 0.0 | 27.7 | 0.0 | 7.1 | 32.4 | 9.4 | 0.0 |
| Lane Grp LOS | B | | | C | | | C | | A | C | A | |
| Approach Vol, veh/h | | 6 | | | 105 | | | 862 | | | 886 | |
| Approach Delay, s/veh | | 19.5 | | | 21.7 | | | 10.3 | | | 11.8 | |
| Approach LOS | | B | | | C | | | B | | | B | |

| Timer | | | | | | | |
|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | 8 | 5 | 2 | | 1 | 6 | |
| Phs Duration (G+Y+Rc), s | | 7.3 | | 7.3 | 8.4 | 31.0 | | 6.9 | 29.6 | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Max Green Setting (Gmax), s | | 4.0 | | 4.0 | 7.0 | 34.0 | | 5.0 | 32.0 | |
| Max Q Clear Time (g_c+I1), s | | 5.3 | | 4.5 | 5.3 | 14.4 | | 4.3 | 16.6 | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | 0.0 | 10.4 | | 0.0 | 8.9 | |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 11.7 |
| HCM 2010 LOS | B |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 44 | 0 | 11 | 21 | 0 | 42 | 10 | 636 | 36 | 74 | 859 | 64 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 284 | 0 | 133 | 145 | 8 | 103 | 20 | 1059 | 60 | 101 | 1214 | 1032 |
| Arrive On Green | 0.08 | 0.00 | 0.00 | 0.08 | 0.00 | 0.08 | 0.01 | 0.61 | 0.61 | 0.06 | 0.65 | 0.00 |
| Sat Flow, veh/h | 1576 | 0 | 1583 | 518 | 92 | 1220 | 1774 | 1747 | 99 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 48 | 0 | 0 | 69 | 0 | 0 | 11 | 0 | 730 | 80 | 934 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1576 | 0 | 1583 | 1830 | 0 | 0 | 1774 | 0 | 1845 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 2.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | 0.0 | 12.2 | 2.1 | 16.6 | 0.0 |
| Cycle Q Clear(g_c), s | 4.0 | 0.0 | 0.0 | 1.7 | 0.0 | 0.0 | 0.3 | 0.0 | 12.2 | 2.1 | 16.6 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 0.33 | | 0.67 | 1.00 | | 0.05 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 284 | 0 | 133 | 255 | 0 | 0 | 20 | 0 | 1119 | 101 | 1214 | 1032 |
| V/C Ratio(X) | 0.17 | 0.00 | 0.00 | 0.27 | 0.00 | 0.00 | 0.55 | 0.00 | 0.65 | 0.79 | 0.77 | 0.00 |
| Avail Cap(c_a), veh/h | 284 | 0 | 133 | 255 | 0 | 0 | 149 | 0 | 1437 | 261 | 1568 | 1333 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 20.5 | 0.0 | 0.0 | 20.7 | 0.0 | 0.0 | 23.4 | 0.0 | 6.1 | 22.1 | 5.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.3 | 0.0 | 0.0 | 0.6 | 0.0 | 0.0 | 20.9 | 0.0 | 0.7 | 12.8 | 1.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.5 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 0.2 | 0.0 | 3.5 | 1.2 | 4.8 | 0.0 |
| Lane Grp Delay (d), s/veh | 20.8 | 0.0 | 0.0 | 21.3 | 0.0 | 0.0 | 44.3 | 0.0 | 6.8 | 35.0 | 7.6 | 0.0 |
| Lane Grp LOS | C | | | C | | | D | | A | C | A | |
| Approach Vol, veh/h | | 48 | | | 69 | | | 741 | | | 1014 | |
| Approach Delay, s/veh | | 20.8 | | | 21.3 | | | 7.3 | | | 9.7 | |
| Approach LOS | | C | | | C | | | A | | | A | |

| Timer | | | | | | | |
|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | 8 | 5 | 2 | 1 | 6 |
| Phs Duration (G+Y+Rc), s | | 8.0 | | 8.0 | 4.5 | 32.8 | 6.7 | 35.0 |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 4.0 | | 4.0 | 4.0 | 37.0 | 7.0 | 40.0 |
| Max Q Clear Time (g_c+I1), s | | 6.0 | | 3.7 | 2.3 | 14.2 | 4.1 | 18.6 |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | 0.0 | 12.8 | 0.0 | 12.3 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 9.5 |
| HCM 2010 LOS | A |

Notes

Appendix F

Intersection
Level of Service
Calculations

Future with Project Phases 1 and 2
Traffic Conditions

# 3: Kaumualii Hwy (Route 50) & Laulea St (S)/Mahea Rd

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 28 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 12 | 5 | 101 | 59 | 14 | 105 | 29 | 537 | 16 | 31 | 646 | 9 |
| Conflicting Peds, #/hr | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 | 0.93 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 13 | 5 | 109 | 63 | 15 | 113 | 31 | 577 | 17 | 33 | 695 | 10 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1473 | 1418 | 695 | 1412 | 1409 | 586 | 695 | 0 | 0 | 595 | 0 | 0 |
| Stage 1 | 761 | 761 | - | 648 | 648 | - | - | - | - | - | - | - |
| Stage 2 | 712 | 657 | - | 764 | 761 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 105 | 137 | 442 | 99 | 118 | 494 | 901 | - | - | 981 | - | - |
| Stage 1 | 398 | 414 | - | 427 | 434 | - | - | - | - | - | - | - |
| Stage 2 | 423 | 462 | - | 364 | 380 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 69 | 128 | 442 | 69 | 110 | 494 | 901 | - | - | 981 | - | - |
| Mov Capacity-2 Maneuver | 69 | 128 | - | 69 | 110 | - | - | - | - | - | - | - |
| Stage 1 | 384 | 400 | - | 412 | 419 | - | - | - | - | - | - | - |
| Stage 2 | 304 | 446 | - | 262 | 367 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 23.2 | 227.6 | 0.5 | 0.4 |
| HCM LOS | C | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 901 | - | - | 175 | 442 | 149 | 981 | - | - |
| HCM Control Delay, s | 9.139 | - | - | 34.6 | 14.7 | 227.6 | 8.799 | - | - |
| HCM Lane V/C Ratio | 0.04 | - | - | 0.31 | 0.16 | 1.28 | 0.03 | - | - |
| HCM Lane LOS | A | - | - | D | B | F | A | - | - |
| HCM 95th-tile Q, veh | 0.1 | - | - | 1.3 | 0.6 | 11.5 | 0.1 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Intersection | |
|---|---|
| Intersection Delay, s/veh | 34 |

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Vol, veh/h | 6 | 0 | 93 | 49 | 0 | 66 | 126 | 545 | 81 | 119 | 695 | 23 |
| Conflicting Peds, #/hr | 1 | 0 | 2 | 2 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 |
| Sign Control | Stop | Stop | Stop | Stop | Stop | Stop | Free | Free | Free | Free | Free | Free |
| RT Channelized | Yield | Yield | Yield | None | None | None | None | None | None | Yield | Yield | Yield |
| Storage Length | 0 | | 50 | 0 | | 0 | 110 | | 0 | 50 | | 100 |
| Median Width | | 0 | | | 0 | | | 12 | | | 12 | |
| Grade, % | | 0% | | | 2% | | | 2% | | | 0% | |
| Peak Hour Factor | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| Heavy Vehicles, % | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Mvmt Flow | 6 | 0 | 95 | 50 | 0 | 67 | 129 | 556 | 83 | 121 | 709 | 23 |
| Number of Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |

| Major/Minor | | Minor 2 | | | Minor 1 | | | Major 1 | | | Major 2 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Conflicting Flow All | 1844 | 1852 | 712 | 1811 | 1811 | 600 | 711 | 0 | 0 | 641 | 0 | 0 |
| Stage 1 | 954 | 954 | - | 857 | 857 | - | - | - | - | - | - | - |
| Stage 2 | 890 | 898 | - | 954 | 954 | - | - | - | - | - | - | - |
| Follow-up Headway | 3.518 | 4.018 | 3.318 | 3.518 | 4.018 | 3.318 | 2.218 | - | - | 2.218 | - | - |
| Pot Capacity-1 Maneuver | 58 | 74 | 432 | 50 | 64 | 484 | 888 | - | - | 943 | - | - |
| Stage 1 | 311 | 337 | - | 320 | 340 | - | - | - | - | - | - | - |
| Stage 2 | 337 | 358 | - | 280 | 303 | - | - | - | - | - | - | - |
| Time blocked-Platoon, % | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | 0 | - | - |
| Mov Capacity-1 Maneuver | 40 | 55 | 431 | # 31 | 48 | 483 | 887 | - | - | 942 | - | - |
| Mov Capacity-2 Maneuver | 40 | 55 | - | # 31 | 48 | - | - | - | - | - | - | - |
| Stage 1 | 265 | 293 | - | 273 | 290 | - | - | - | - | - | - | - |
| Stage 2 | 248 | 305 | - | 190 | 264 | - | - | - | - | - | - | - |

| Approach | EB | WB | NB | SB |
|---|---|---|---|---|
| HCM Control Delay, s | 21.5 | $ 494.1 | 1.6 | 1.3 |
| HCM LOS | C | F | - | - |

| Minor Lane / Major Mvmt | NBL | NBT | NBR | EBLn1 | EBLn2 | WBLn1 | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|
| Cap, veh/h | 887 | - | - | 167 | 431 | 67 | 942 | - | - |
| HCM Control Delay, s | 9.745 | - | - | 32.7 | 14.8 | $ 494.1 | 9.386 | - | - |
| HCM Lane V/C Ratio | 0.14 | - | - | 0.23 | 0.15 | 1.75 | 0.13 | - | - |
| HCM Lane LOS | A | - | - | D | B | F | A | - | - |
| HCM 95th-tile Q, veh | 0.5 | - | - | 0.8 | 0.5 | 10.5 | 0.4 | - | - |

Notes

~ : Volume Exceeds Capacity; $ : Delay Exceeds 300 Seconds; Error : Computation Not Defined

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 12 | 5 | 101 | 59 | 14 | 105 | 29 | 537 | 16 | 31 | 646 | 9 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 302 | 94 | 291 | 187 | 48 | 180 | 50 | 909 | 27 | 54 | 953 | 810 |
| Arrive On Green | 0.18 | 0.18 | 0.00 | 0.18 | 0.18 | 0.18 | 0.03 | 0.51 | 0.51 | 0.03 | 0.51 | 0.00 |
| Sat Flow, veh/h | 867 | 512 | 1583 | 416 | 259 | 979 | 1756 | 1782 | 53 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 18 | 0 | 0 | 191 | 0 | 0 | 31 | 0 | 594 | 33 | 695 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1379 | 0 | 1583 | 1654 | 0 | 0 | 1756 | 0 | 1835 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 3.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 10.2 | 0.8 | 12.6 | 0.0 |
| Cycle Q Clear(g_c), s | 8.0 | 0.0 | 0.0 | 4.6 | 0.0 | 0.0 | 0.8 | 0.0 | 10.2 | 0.8 | 12.6 | 0.0 |
| Prop In Lane | 0.72 | | 1.00 | 0.33 | | 0.59 | 1.00 | | 0.03 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 396 | 0 | 291 | 414 | 0 | 0 | 50 | 0 | 936 | 54 | 953 | 810 |
| V/C Ratio(X) | 0.05 | 0.00 | 0.00 | 0.46 | 0.00 | 0.00 | 0.61 | 0.00 | 0.63 | 0.62 | 0.73 | 0.00 |
| Avail Cap(c_a), veh/h | 396 | 0 | 291 | 414 | 0 | 0 | 162 | 0 | 1265 | 204 | 1327 | 1128 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 14.8 | 0.0 | 0.0 | 16.4 | 0.0 | 0.0 | 20.9 | 0.0 | 7.7 | 20.8 | 8.3 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 11.5 | 0.0 | 0.7 | 10.9 | 1.3 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.2 | 0.0 | 0.0 | 1.8 | 0.0 | 0.0 | 0.5 | 0.0 | 3.3 | 0.5 | 4.2 | 0.0 |
| Lane Grp Delay (d), s/veh | 14.8 | 0.0 | 0.0 | 17.2 | 0.0 | 0.0 | 32.4 | 0.0 | 8.4 | 31.7 | 9.6 | 0.0 |
| Lane Grp LOS | B | | | B | | | C | | A | C | A | |
| Approach Vol, veh/h | | 18 | | | 191 | | | 625 | | | 728 | |
| Approach Delay, s/veh | | 14.8 | | | 17.2 | | | 9.6 | | | 10.6 | |
| Approach LOS | | B | | | B | | | A | | | B | |

| Timer | | | | | | | |
|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | 8 | 5 | 2 | 1 | 6 |
| Phs Duration (G+Y+Rc), s | | 12.0 | | 12.0 | 5.2 | 26.2 | 5.3 | 26.2 |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Max Green Setting (Gmax), s | | 8.0 | | 8.0 | 4.0 | 30.0 | 5.0 | 31.0 |
| Max Q Clear Time (g_c+I1), s | | 10.0 | | 6.6 | 2.8 | 12.2 | 2.8 | 14.6 |
| Green Ext Time (p_c), s | | 0.0 | | 0.2 | 0.0 | 8.0 | 0.0 | 7.6 |

| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 11.0 |
| HCM 2010 LOS | B |

Notes

| Movement | EBL | EBT | EBR | WBL | WBT | WBR | NBL | NBT | NBR | SBL | SBT | SBR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lane Configurations | | | | | | | | | | | | |
| Volume (veh/h) | 6 | 0 | 93 | 49 | 0 | 66 | 126 | 545 | 81 | 119 | 695 | 23 |
| Number | 7 | 4 | 14 | 3 | 8 | 18 | 5 | 2 | 12 | 1 | 6 | 16 |
| Initial Q (Qb), veh | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Ped-Bike Adj(A_pbT) | 0.99 | | 1.00 | 1.00 | | 0.99 | 1.00 | | 1.00 | 1.00 | | 1.00 |
| Parking Bus Adj | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Adj Sat Flow veh/h/ln | 186.3 | 186.3 | 186.3 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 184.4 | 186.3 | 186.3 | 186.3 |
| Lanes | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 |
| Cap, veh/h | 320 | 0 | 155 | 199 | 3 | 103 | 165 | 819 | 122 | 155 | 960 | 816 |
| Arrive On Green | 0.10 | 0.00 | 0.00 | 0.10 | 0.00 | 0.10 | 0.09 | 0.52 | 0.52 | 0.09 | 0.52 | 0.00 |
| Sat Flow, veh/h | 1475 | 0 | 1583 | 751 | 33 | 1051 | 1756 | 1568 | 234 | 1774 | 1863 | 1583 |
| Grp Volume(v), veh/h | 6 | 0 | 0 | 117 | 0 | 0 | 129 | 0 | 639 | 121 | 709 | 0 |
| Grp Sat Flow(s),veh/h/ln | 1475 | 0 | 1583 | 1836 | 0 | 0 | 1756 | 0 | 1803 | 1774 | 1863 | 1583 |
| Q Serve(g_s), s | 1.5 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 2.9 | 0.0 | 10.8 | 2.7 | 12.2 | 0.0 |
| Cycle Q Clear(g_c), s | 4.0 | 0.0 | 0.0 | 2.5 | 0.0 | 0.0 | 2.9 | 0.0 | 10.8 | 2.7 | 12.2 | 0.0 |
| Prop In Lane | 1.00 | | 1.00 | 0.43 | | 0.57 | 1.00 | | 0.13 | 1.00 | | 1.00 |
| Lane Grp Cap(c), veh/h | 320 | 0 | 155 | 305 | 0 | 0 | 165 | 0 | 941 | 155 | 960 | 816 |
| V/C Ratio(X) | 0.02 | 0.00 | 0.00 | 0.38 | 0.00 | 0.00 | 0.78 | 0.00 | 0.68 | 0.78 | 0.74 | 0.00 |
| Avail Cap(c_a), veh/h | 320 | 0 | 155 | 305 | 0 | 0 | 300 | 0 | 1188 | 303 | 1228 | 1044 |
| HCM Platoon Ratio | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 671088.63 | 671088.63 | 0.00 | 671088.63 | 671088.63 |
| Upstream Filter(I) | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 0.00 | 1.00 | 0.00 | 1.00 | 1.00 | 1.00 | 0.00 |
| Uniform Delay (d), s/veh | 16.8 | 0.0 | 0.0 | 17.8 | 0.0 | 0.0 | 18.2 | 0.0 | 7.3 | 18.3 | 7.8 | 0.0 |
| Incr Delay (d2), s/veh | 0.0 | 0.0 | 0.0 | 0.8 | 0.0 | 0.0 | 7.8 | 0.0 | 1.1 | 8.2 | 1.8 | 0.0 |
| Initial Q Delay(d3),s/veh | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| %ile Back of Q (50%), veh/ln | 0.1 | 0.0 | 0.0 | 1.1 | 0.0 | 0.0 | 1.5 | 0.0 | 3.3 | 1.4 | 3.8 | 0.0 |
| Lane Grp Delay (d), s/veh | 16.8 | 0.0 | 0.0 | 18.6 | 0.0 | 0.0 | 26.0 | 0.0 | 8.4 | 26.5 | 9.5 | 0.0 |
| Lane Grp LOS | B | | | B | | | C | | A | C | A | |
| Approach Vol, veh/h | | 6 | | | 117 | | | 768 | | | 830 | |
| Approach Delay, s/veh | | 16.8 | | | 18.6 | | | 11.3 | | | 12.0 | |
| Approach LOS | | B | | | B | | | B | | | B | |

| Timer | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Assigned Phs | | 4 | | 8 | | 5 | 2 | | 1 | 6 | |
| Phs Duration (G+Y+Rc), s | | 8.0 | | 8.0 | | 7.8 | 25.4 | | 7.6 | 25.1 | |
| Change Period (Y+Rc), s | | 4.0 | | 4.0 | | 4.0 | 4.0 | | 4.0 | 4.0 | |
| Max Green Setting (Gmax), s | | 4.0 | | 4.0 | | 7.0 | 27.0 | | 7.0 | 27.0 | |
| Max Q Clear Time (g_c+I1), s | | 6.0 | | 4.5 | | 4.9 | 12.8 | | 4.7 | 14.2 | |
| Green Ext Time (p_c), s | | 0.0 | | 0.0 | | 0.1 | 7.4 | | 0.1 | 6.9 | |

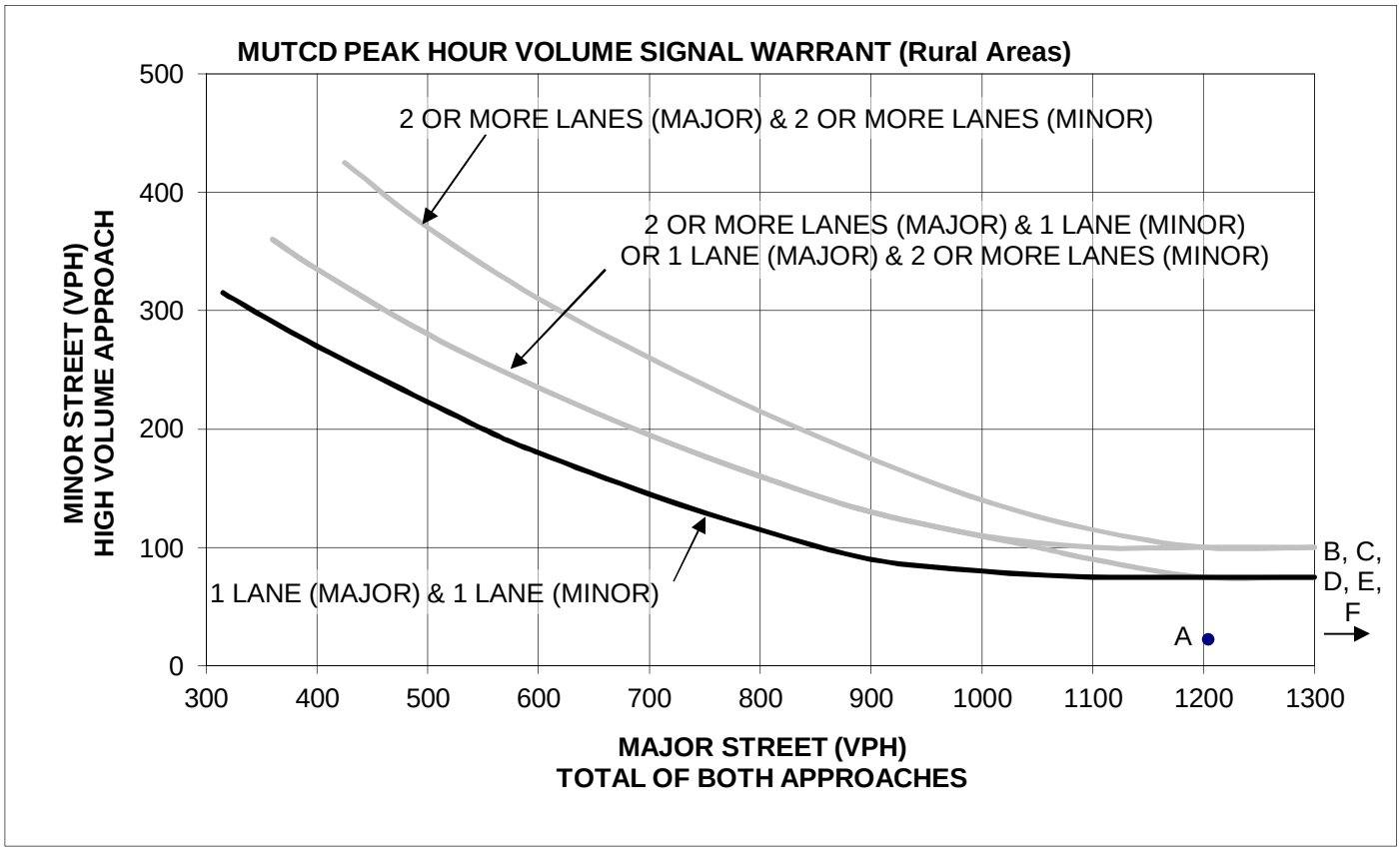
| Intersection Summary | |
|---|---|
| HCM 2010 Ctrl Delay | 12.2 |
| HCM 2010 LOS | B |

Notes

# Appendix G

## Signal Warrant Worksheets

# Warrant 3A - Peak-Hour Warrant




| Scenario | Kaumualii North/South | Halewili East/West | Warrant Met? |
|---|---|---|---|
| A. Existing AM | 1204 | 23 | No |
| B. Existing PM | 1421 | 54 | No |
| C. FutureNoPro AM | 1513 | 30 | No |
| D. FutureNoPro PM | 1787 | 69 | No |
| E. FutureYesPro AM | 1623 | 30 | No |
| F. FutureYesPro PM | 1954 | 69 | No |

Notes:

1. 100 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 75 VPH applies as the lower threshold volume for a minor street approaching with one lane.

2. Bold line applies to intersection geometry.

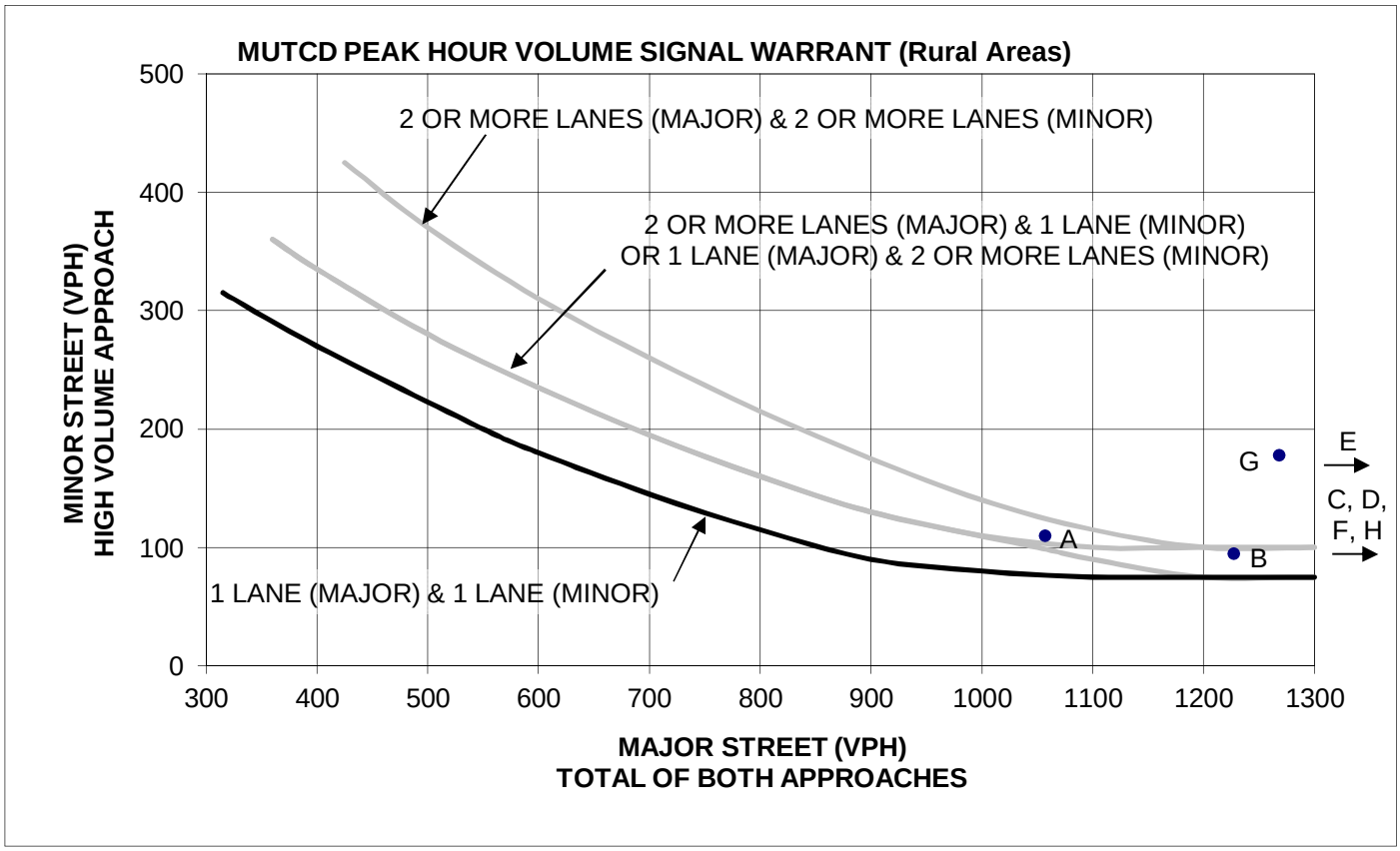
**Warrant 3 (Part B) - Peak Hour Delay**
**Kaumualii Highway (Route 50) / Halewili Road (Route 540)**

| | | | | |
|---|---|---|---|---|
| Number of Approaches to Intersection: | | 3 approaches | **Minimum Entering Vehicles:** | **650** |
| Total Entering Volumes: | Existing AM: | 1227 vehicles | | |
| | Existing PM: | 1475 vehicles | | |
| | FutureNoPro AM: | 1543 vehicles | | |
| | FutureNoPro PM: | 1856 vehicles | | |
| | FutureYesPro AM: | 1653 vehicles | | |
| | FutureYesPro PM: | 2023 vehicles | | |

| Street | Direction | Scenario | Peak Hour | No. of Stopped Vehicles | Average Vehicle Delay (sec) | Total Vehicle Delay (sec) | Total Delay (hours) | Min. 4 Veh-Hrs of Delay? (Approach) | At least 100 Veh? (Approach) | At least 650 Veh? (Intersection) | Warrant Met? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Halewili | WB | Existing | AM | 23 | 24.5 | 564 | 0.16 | NO | NO | Yes | **NO** |
| Halewili | WB | Existing | PM | 55 | 47.5 | 2613 | 0.73 | NO | NO | Yes | **NO** |
| Halewili | WB | FutureNoPro | AM | 30 | 38.6 | 1158 | 0.32 | NO | NO | Yes | **NO** |
| Halewili | WB | FutureNoPro | PM | 69 | 163.2 | 11261 | 3.13 | NO | NO | Yes | **NO** |
| Halewili | WB | FutureYesPro | AM | 30 | 46.9 | 1407 | 0.39 | NO | NO | Yes | **NO** |
| Halewili | WB | FutureYesPro | PM | 69 | 282.1 | 19465 | 5.41 | Yes | NO | Yes | **NO** |

Notes:
1. Warrant based on level of service calculations.
2. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound.

# Warrant 3A - Peak-Hour Warrant




| Scenario | Kaumualii North/South | Laulea-Mahea East/West | Warrant Met? |
|---|---|---|---|
| A. Existing AM | 1057 | 110 | Yes |
| B. Existing PM | 1227 | 95 | Yes |
| C. FutureNoPro AM | 1341 | 117 | Yes |
| D. FutureNoPro PM | 1569 | 101 | Yes |
| E. FutureYesPro AM | 1411 | 156 | Yes |
| F. FutureYesPro PM | 1735 | 103 | Yes |
| G. FutYesProP1-2 AM | 1268 | 178 | Yes |
| H. FutYesProP1-2 PM | 1589 | 115 | Yes |

Notes:

1. 100 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 75 VPH applies as the lower threshold volume for a minor street approaching with one lane.

2. Bold line applies to intersection geometry.

**Warrant 3 (Part B) - Peak Hour Delay**
**Kaumualii Highway (Route 50) / Laulea Street (South) - Mahea Road**

Number of Approaches to Intersection: 4 approaches **Minimum Entering Vehicles: 800**

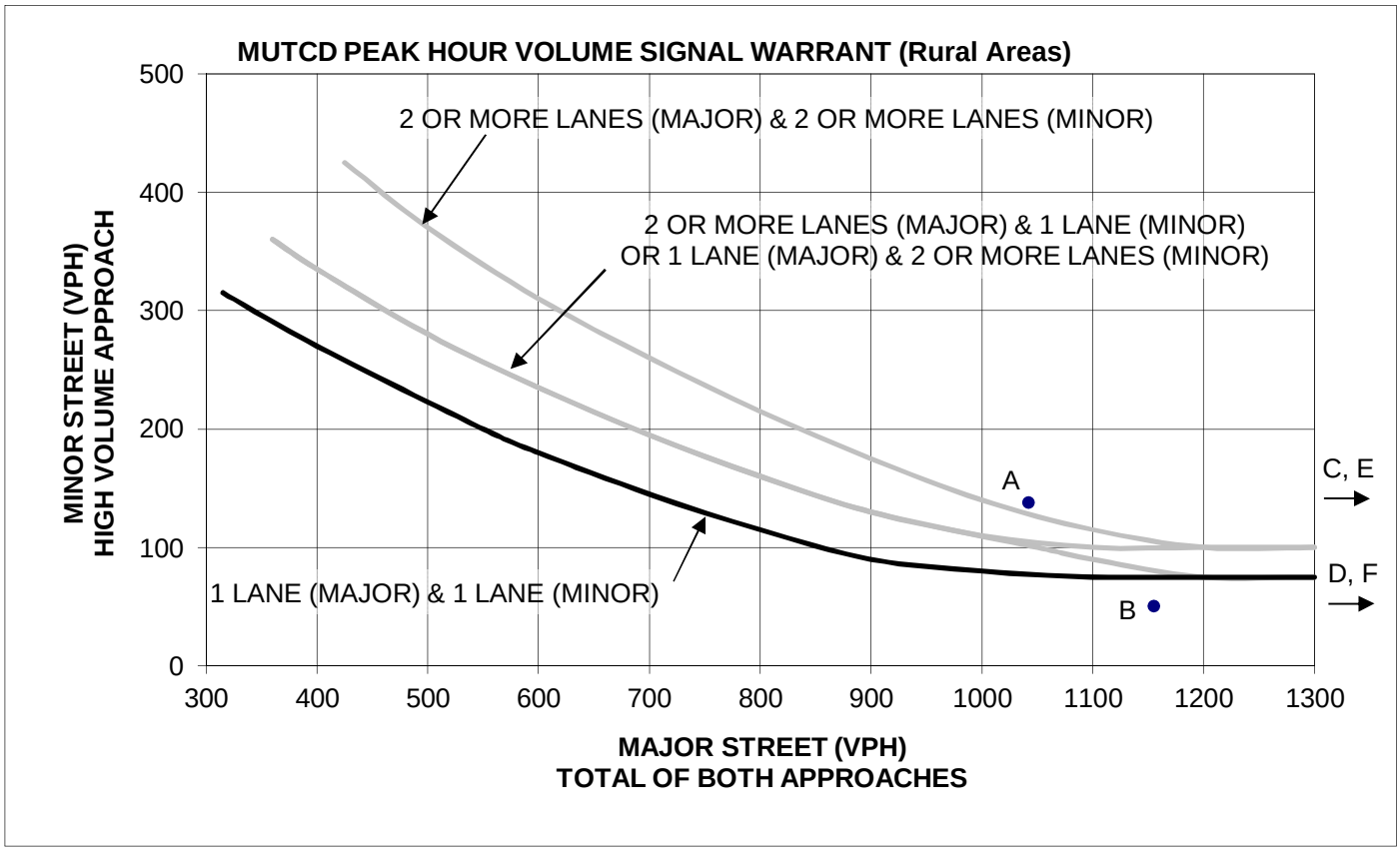
Total Entering Volumes:

| | |
|---|---|
| Existing AM: | 1176 vehicles |
| Existing PM: | 1330 vehicles |
| FutureNoPro AM: | 1507 vehicles |
| FutureNoPro PM: | 1711 vehicles |
| FutureYesPro AM: | 1690 vehicles |
| FutureYesPro PM: | 1939 vehicles |
| FutYesProP1-2 AM: | 1564 vehicles |
| FutYesProP1-2 PM: | 1803 vehicles |

| Street | Direction | Scenario | Peak Hour | No. of Stopped Vehicles | Average Vehicle Delay (sec) | Total Vehicle Delay (sec) | Total Delay (hours) | Min. 4 Veh-Hrs of Delay? (Approach) | At least 100 Veh? (Approach) | At least 800 Veh? (Intersection) | Warrant Met? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laulea (S) | EB | Existing | AM | 110 | 15.4 | 1694 | 0.47 | NO | Yes | Yes | **NO** |
| Mahea | WB | Existing | AM | 9 | 22.0 | 198 | 0.06 | NO | NO | Yes | **NO** |
| Laulea (S) | EB | Existing | PM | 95 | 15.1 | 1435 | 0.40 | NO | NO | Yes | **NO** |
| Mahea | WB | Existing | PM | 8 | 43.8 | 350 | 0.10 | NO | NO | Yes | **NO** |
| Laulea (S) | EB | FutureNoPro | AM | 117 | 21.3 | 2492 | 0.69 | NO | Yes | Yes | **NO** |
| Mahea | WB | FutureNoPro | AM | 49 | 26.7 | 1308 | 0.36 | NO | NO | Yes | **NO** |
| Laulea (S) | EB | FutureNoPro | PM | 101 | 20.6 | 2081 | 0.58 | NO | Yes | Yes | **NO** |
| Mahea | WB | FutureNoPro | PM | 41 | 59.6 | 2444 | 0.68 | NO | NO | Yes | **NO** |
| Laulea (S) | EB | FutureYesPro | AM | 123 | 30.7 | 3776 | 1.05 | NO | Yes | Yes | **NO** |
| Mahea | WB | FutureYesPro | AM | 156 | 442.4 | 69014 | 19.17 | Yes | Yes | Yes | **Yes** |
| Laulea (S) | EB | FutureYesPro | PM | 101 | 24.4 | 2464 | 0.68 | NO | Yes | Yes | **NO** |
| Mahea | WB | FutureYesPro | PM | 103 | 803.1 | 82719 | 22.98 | Yes | Yes | Yes | **Yes** |
| Laulea (S) | EB | FutYesProP1-2 | AM | 118 | 23.2 | 2738 | 0.76 | NO | Yes | Yes | **NO** |
| Mahea | WB | FutYesProP1-2 | AM | 178 | 227.6 | 40513 | 11.25 | Yes | Yes | Yes | **Yes** |
| Laulea (S) | EB | FutYesProP1-2 | PM | 99 | 21.5 | 2129 | 0.59 | NO | NO | Yes | **NO** |
| Mahea | WB | FutYesProP1-2 | PM | 115 | 494.1 | 56822 | 15.78 | Yes | Yes | Yes | **Yes** |

Notes:
1. Warrant based on level of service calculations.
2. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound.

# Warrant 3A - Peak-Hour Warrant




| Scenario | Kaumualii North/South | Laulea (N) East/West | Warrant Met? |
|---|---|---|---|
| A. Existing AM | 1042 | 138 | Yes |
| B. Existing PM | 1155 | 51 | No |
| C. FutureNoPro AM | 1361 | 147 | Yes |
| D. FutureNoPro PM | 1466 | 55 | No |
| E. FutureYesPro AM | 1438 | 147 | Yes |
| F. FutureYesPro PM | 1679 | 63 | No |

Notes:

1. 100 VPH applies as the lower threshold volume for a minor street approach with two or more lanes and 75 VPH applies as the lower threshold volume for a minor street approaching with one lane.

2. Bold line applies to intersection geometry.

**Warrant 3 (Part B) - Peak Hour Delay**
**Kaumualii Highway (Route 50) / Laulea Street (North)**

Number of Approaches to Intersection: 3 approaches **Minimum Entering Vehicles: 650**

Total Entering Volumes:

| | | |
|---|---|---|
| Existing AM: | 1180 | vehicles |
| Existing PM: | 1206 | vehicles |
| FutureNoPro AM: | 1508 | vehicles |
| FutureNoPro PM: | 1521 | vehicles |
| FutureYesPro AM: | 1693 | vehicles |
| FutureYesPro PM: | 1797 | vehicles |

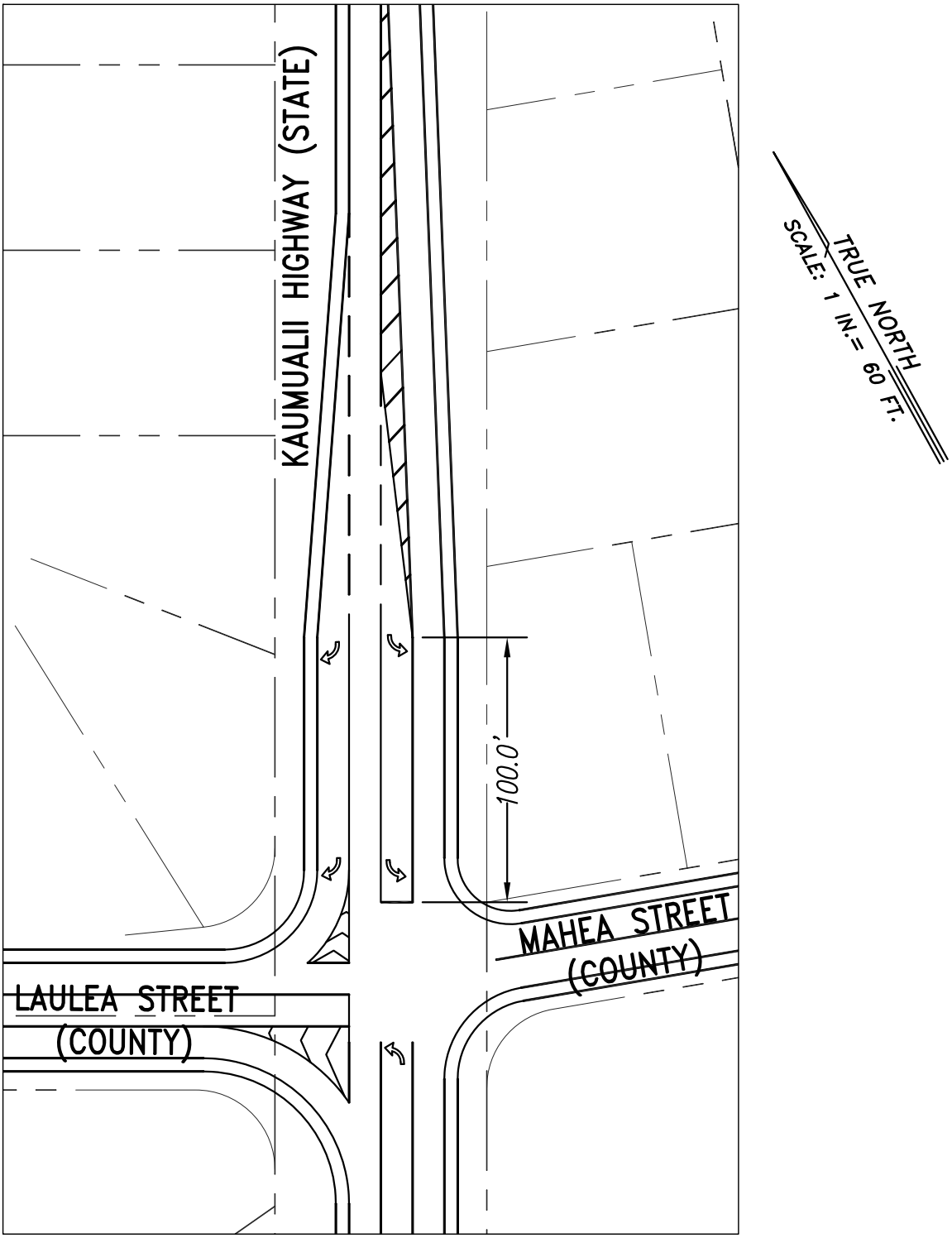
| Street | Direction | Scenario | Peak Hour | No. of Stopped Vehicles | Average Vehicle Delay (sec) | Total Vehicle Delay (sec) | Total Delay (hours) | Min. 4 Veh-Hrs of Delay? (Approach) | At least 100 Veh? (Approach) | At least 650 Veh? (Intersection) | Warrant Met? |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Laulea (N) | EB | Existing | AM | 138 | 18.4 | 2539 | 0.71 | NO | Yes | Yes | **NO** |
| Laulea (N) | EB | Existing | PM | 51 | 16.4 | 836 | 0.23 | NO | NO | Yes | **NO** |
| Laulea (N) | EB | FutureNoPro | AM | 147 | 25.8 | 3793 | 1.05 | NO | Yes | Yes | **NO** |
| Laulea (N) | EB | FutureNoPro | PM | 55 | 21.1 | 1161 | 0.32 | NO | NO | Yes | **NO** |
| Laulea (N) | EB | FutureYesPro | AM | 147 | 491.7 | 72280 | 20.08 | Yes | Yes | Yes | **Yes** |
| Laulea (N) | WB | FutureYesPro | AM | 108 | 53.8 | 5810 | 1.61 | NO | Yes | Yes | **NO** |
| Laulea (N) | EB | FutureYesPro | PM | 55 | 284.3 | 15637 | 4.34 | Yes | NO | Yes | **NO** |
| Laulea (N) | WB | FutureYesPro | PM | 63 | 73.2 | 4612 | 1.28 | NO | NO | Yes | **NO** |

Notes:
1. Warrant based on level of service calculations.
2. NB, SB, EB, WB = Northbound, Southbound, Eastbound, Westbound.

Appendix H

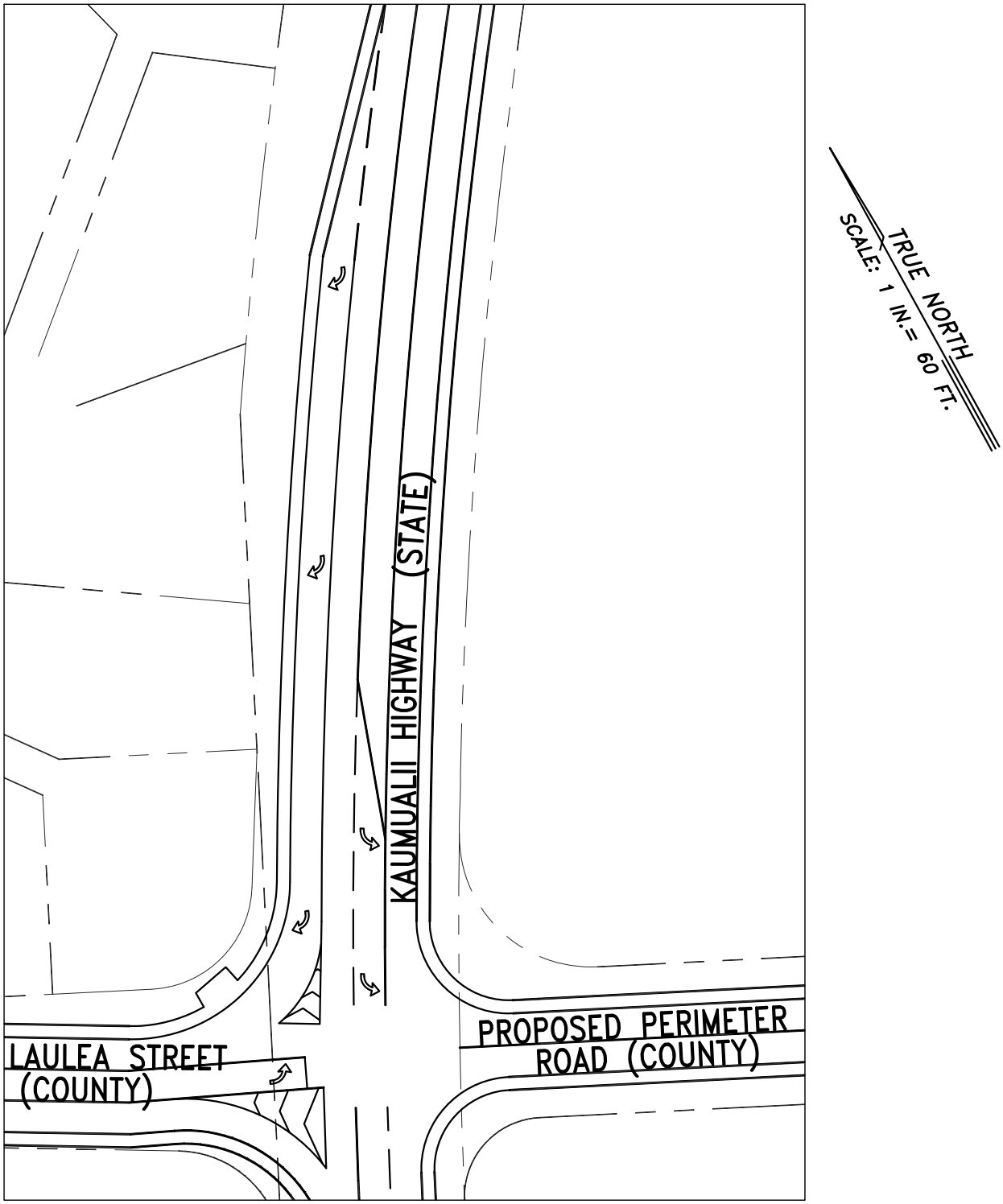
Conceptual Improvement
Drawing

Southbound Kaumualii Highway (Route 50)
Left Turn Lane Extension




**KAUMUALII HIGHWAY (ROUTE 50) / LAULEA STREET (SOUTH) - MAHEA ROAD**

SCALE 1:60




**KAUMUALII HIGHWAY (ROUTE 50) / LAULEA STREET (NORTH)**

SCALE 1:60

Appendix I

*Traffic/Pedestrian Signalization Options for Lima Ola Workforce HousingDevelopment,*
Community Planning and Engineering,
October 2014

# Traffic/Pedestrian Signalization Options

**for**

## Lima Ola

## Workforce Housing Development

**Eleele, Kauai, Hawaii**

*Prepared For:*

*County of Kauai*
*Housing Agency*

*Prepared By:*

Community Planning and Engineering, Inc.

**October 2014**

## INTRODUCTION

The purpose of this report is to address the future issue of pedestrian safety at the Mahea Road and Kaumualii Highway Intersection, adjacent to the Lima Ola subdivision. It has been observed that vehicles coming from the east of the intersection travel above the posted 35 mph speed limit. The following options have been considered with the intent to calm traffic as they approach the intersection and crosswalk.

## I. OPTIONS CONSIDERED

### A. Option 1 - Installation of Traffic Signal Lights

Option 1 provides the safest alternative to both traffic and pedestrian safety. It is expected that traffic along the Mahea Road and Kaumualii Highway Intersection will increase upon completion of the Lima Ola subdivision. Implementation of traffic signal lights is the optimal alternative in providing orderly movement of vehicles and pedestrians for this increase in traffic.

With an estimated construction cost of $1,000,000 and the need to install numerous devices regulating traffic from all directions, Option 1 will be the most expensive and labor intensive alternative.

### B. Option 2 – Installation of Pedestrian Hybrid Beacons (PHB)

Option 2 addresses the need of providing pedestrian protection at the crosswalk. The Pedestrian Hybrid Beacon (PHB) system is actuated only when pedestrians are present. This allows for more free movement of traffic during non-peak pedestrian hours. To prevent vehicles from congesting during pedestrian peak hours, the system can be programmed with a delay in-between crossing sequences.

When actuated, th sequence is performed to give ample time for the pedestrian to cross and also the opportunity for vehicles to proceed when the crosswalk is clear (as seen on Figure 1). This system also benefits from the use of red lights that give drivers a better prompt to “Stop”. The estimated duration from “Dark” to “Dark” is 33 seconds, with 26 seconds allotted for pedestrians to cross.

A 2010 FHWA before-and-after study of PHB systems have shown reductions of pedestrian-related crashes and roadway crashes by 69% and 29%, respectively. The District of Columbia Department of Transportation reported a compliance rate of 97.1%

Lack of knowledge and confusion towards this new system will be a concern. If Option 2 is implemented, funding into public education should be considered by use of media and pamphlets. Estimated construction cost is $750,000.

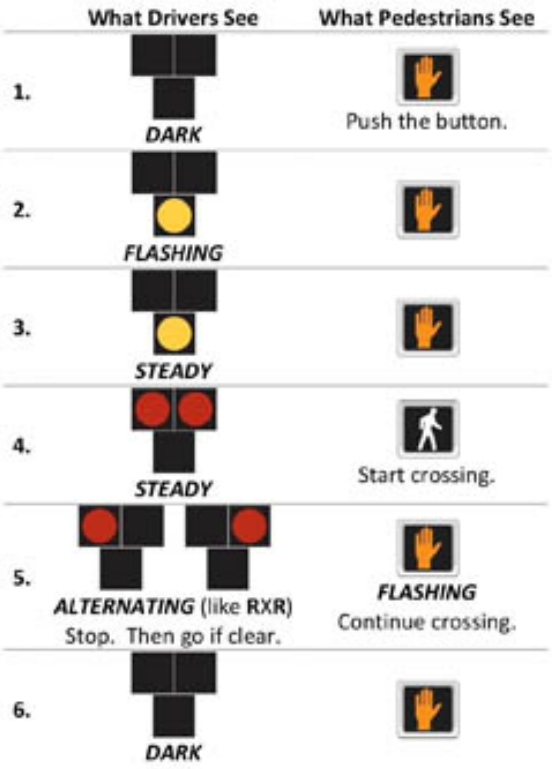



Figure 1: PHB Sequence

Figure 2: PHB Crossing

## C. Option 3 – Installation of Flashing Pedestrian Crossing and Rumble Strips

Option 3 is a combination of two traffic calming methods.

The first is the installation of rumble strips that consist of white Bott's Dots aligned in rows within the traveling lane, as seen on Figure 5. The vibration and sound produced when driving over these strips will prompt vehicles to slow down. Because of consideration to noise affecting the homes, an option is to install these strips before the Kapa Water Tanks, approximately 4000 feet northeast of the intersection. A 35 mph sign is located at this location and would be supplemented by the addition of rumble strips. By reducing vehicle speeds prior to entering the residential area, drivers will have safer approaches when traveling toward the crosswalk and intersection. The construction cost for installing the rumble strips alone is $12,500.

Drawbacks to the use of rumble strips include deterioration and maintenance. Over time the Bott's Dots experience wear and its effectiveness in slowing traffic lessens, as shown in Figure 4.

Installation of flashing beacons at the crosswalk will address the issue of pedestrian safety. This system is pedestrian-activated and consists of flashing in-street LED lights that run parallel to both sides of the crosswalk. Additionally, flashing crosswalk signs on both ends of the crosswalk are installed.

This system of flashing lights warns drivers of the presence of pedestrians. Studies in California and Washington have shown that drivers yield to pedestrians 80% more frequently when the warning lights are flashing.

Option 3 is the least costly alternative of the three. The estimated total construction cost for installing flashing beacons and rumble strips is $250,000.

However, flashing beacons provide the least protection due to the lack of a definite stop signal such, as a red light. And as with PHBs, public education is recommended if Option 3 is considered.

Figure 3: Flashing Beacons

Figure 4: Rumble Strips on Pali Hwy, Oahu

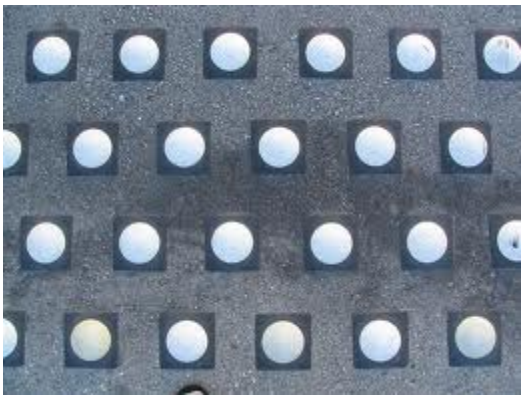


Figure 5: Bott's Dots

# APPENDIX F: ENVIRONMENTAL NOISE ASSESSMENT REPORT

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# Environmental Noise Assessment Report
# Lima Ola Workforce Housing Development
## 'Ele'ele, Island of Kauai, Hawaii

April 2014

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## 1.0 EXECUTIVE SUMMARY

**1.1** The Lima Ola Workforce Housing Development is located in the 'Ele'ele community on the west side of the Island of Kauai. The project site consists of approximately 75 acres and is bordered by Kaumuali'i Highway to the north, a future Habitat for Humanity to the west, and agricultural fields to the south and east. The land is zoned for agricultural uses and is currently being utilized as a coffee farm. The Lima Ola Workforce Housing Development is proposed to be a residential development with various categories of residential lots (i.e., single family, mufti family, etc.) green spaces, parks, as well as a community center. The purpose of this environmental noise assessment is to evaluate potential noise impacts to the proposed development as well as to the surrounding community.

**1.2** The project area is currently exposed to varying daytime ambient noise levels, depending on the proximity to major roadways. The areas adjacent to Kaumuali'i Highway experience high ambient noise levels during peak traffic hours. Ambient noise levels range from 50 to 68 dBA adjacent to Kaumuali'i Highway. The ambient noise environment is relatively low in areas that are far from the major roadways, where ambient noise levels range from 44 to 70 dBA. The dominant noise sources are traffic, wind, birds, occasional distant aircraft flyovers, and farm and construction equipment.

**1.3** Development of project areas will involve excavation, grading, and other typical construction activities. The Lima Ola project is not expected to impact adjacent properties, however, residences from the initial phases may be impacted by construction noise from subsequent phases due to their proximity to the construction site. Noise from construction activities should be short term and must comply with State Department of Health noise regulations.

**1.4** The various phases in the long range development plan will incorporate stationary mechanical equipment that is typical for residential buildings. Expected mechanical equipment may include air handling equipment, condensing units, refrigeration units, etc. Noise from this mechanical equipment and other equipment must meet the State Department of Health *Community Noise Control* rules, which stipulate maximum permissible noise limits at the property line. The design of the new Lima Ola Workforce Housing Development should give consideration to controlling the noise emanating from stationary mechanical equipment so as to comply with these noise rules and to prevent noise impacts to the residences.

**1.5** Future traffic volume increases on Kaumuali'i Highway and the surrounding roadways due to the development of the Lima Ola project are not significant. The greatest increase occurs for the homes adjacent to Mahea Road where a 2 dB increase in noise level is expected. This is less than the threshold of human perception.

**1.6** For homes within the Lima Ola development located more than 75 feet from the center line of Kaumuali'i Highway, the FHWA maximum noise limit of 67 dBA will be satisfied. The projected traffic volumes and speed limits on the future roadways that provide access to the Lima Ola development are expected to be insignificant.

**1.7** To satisfy HUD site acceptability standards and reduce the noise impact to the Lima Ola homes adjacent to Kaumuali'i Highway, a minimum setback distance of 95 feet from the center line must be provided. If the minimum setback distance cannot be provided, additional noise mitigation options (such as a noise barrier wall) can be considered.

## 2.0 PROJECT DESCRIPTION

The Lima Ola Workforce Housing Development is located in the 'Ele'ele community on the west side of the Island of Kauai. The project site consists of approximately 75 acres and is bordered by Kaumuali'i Highway to the north, a future Habitat for Humanity to the west, and agricultural fields to the south and east. The land is zoned for agricultural uses and is currently being utilized as a coffee farm. The Lima Ola Workforce Housing Development is proposed to be a residential development with various categories of residential lots (i.e., single family, mufti family, etc.) green spaces, parks, as well as a community center. The purpose of this environmental noise assessment is to evaluate potential noise impacts to the proposed development as well as to the surrounding community.

## 3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

### 3.1 State of Hawaii, Community Noise Control (HDOH)

The State of Hawaii Community Noise Control Rule [Reference 1] defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to *stationary* noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most *moving* sources, such as vehicular traffic noise, aircraft noise, or rail transit noise. However, the Community Noise Control Rule does regulate noise related to agricultural, construction, and industrial activities, which may not be stationary.

The maximum permissible noise levels for stationary mechanical equipment are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 1. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by DOH.

The criteria for *impulse* or impact noise is separate from stationary noise due to the nature of the sound. DOH defines impulse noise as " any sound with a rapid rise and decay of sound pressure level, lasting less than one second, caused by sudden contact between two or more surfaces…". Noise from pile driving is considered impulse noise and the maximum permissible noise level is 10 dB above the specified noise limits for stationary sources, as shown in Figure 1.

### 3.2 U.S. Federal Highway Administration (FHWA)

The FHWA regulation 23 CFR 772 contains highway traffic noise abatement criteria (NAC) for seven land use activity categories and assigns corresponding maximum hourly equivalent sound levels ($L_{eq(h)}$) for traffic noise exposure [Reference 2, 3]. The Noise Abatement Criteria (NAC) for all seven categories are listed in Figure 2. The Lima Ola Workforce Housing Development would fall under "Category B", defined as residential, and has a corresponding maximum $L_{eq(h)}$ of 67dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards.

### 3.3 State of Hawaii Department of Transportation (HDOT)

The HDOT has implemented the requirements of the FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy,

a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's NAC or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" is defined as 1 dB less than FHWA's NAC and "substantially exceed" is defined as an increase of at least 15 dB.

### 3.4 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels ($L_{dn}$) sufficient to protect public health and welfare from the effects of environmental noise [Reference 5]. The EPA has established a goal to reduce exterior environmental noise to an $L_{dn}$ not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an $L_{dn}$ not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

### 3.5 U.S. Department of Housing and Urban Development (HUD)

HUD's environmental noise criteria and standards in 24 CFR 51 [Reference 6] were established for determining housing project site acceptability. These standards are based on day-night equivalent sound levels, $L_{dn}$, and are not limited to traffic noise exposure. However, for project sites in the vicinity of highways, the $L_{dn}$ may be estimated to be equal to the design hour $L_{eq(h)}$, provided "heavy trucks (vehicles with three or more axles) do not exceed 10 percent of the total traffic flow in vehicles per 24 hours and the traffic flow between 10:00 p.m. and 7:00 a.m. does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours." For these same conditions, $L_{dn}$, may also be estimated as 3 dB less than the design hour $L_{10}$. The HUD Site Acceptability Standards for exterior sound levels are summarized in Table 1. However, HUD also recommends the EPA's $L_{dn}$ 55 dBA goal for outdoors in residential areas.

**Table 1.** HUD Site Acceptability Standards

| Category | Day-Night Sound Level | Comments |
|---|---|---|
| Acceptable | Less than or equal to 65 dBA | No special acoustical design consideration necessary |
| Normally Unacceptable | Greater than 65 dBA, but less than or equal to 70 dBA | 5 dB additional attenuation required through use of barriers or in design to ensure interior noise levels are acceptable |
| | Greater than 70 dBA, but less than or equal to 75 dBA | 10 dB addition attenuation required through the use of barriers or in design to ensure interior noise levels are acceptable |
| Unacceptable | Greater than 75 dBA | Attenuation measures must be submitted on a case-by-case basis |

The intent of the $L_{dn}$ 65 dBA outside criteria is to achieve 45 dBA indoors, however, the standard also applies to locations where quiet outdoor space is required. HUD will sometimes allow upgrades to the building shell to meet an interior $L_{dn}$ of 45 in Normally Unacceptable or Unacceptable areas. This can be accomplished by specifying building facades, windows, and doors with a higher STC rating than normal construction.

### 3.6 Community Response to Change in Noise Level

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, the average ability of an individual to

perceive changes in noise levels is well documented and has been summarized in Table 2 [Reference 7]. These guidelines permit direct estimation of an individual's probable perception of changes in noise levels.

**Table 2.** Average Ability to Perceive Changes in Noise Level

| Sound Level Change (dB) | Human Perception of Sound |
|---|---|
| 0 | Imperceptible |
| 3 | Just barely perceptible |
| 6 | Clearly noticeable |
| 10 | Two times (or 1/2) as loud |
| 20 | Four times (or 1/4) as loud |

A commonly applied criterion for estimating a community's response to changes in noise level is the 'community response scale' proposed by the International Standards Organization (ISO) of the United Nations [Reference 8]. The scale shown in Table 3 relates changes in noise level to the degree of community response and allows for direct estimation of the probable response of a community to a predicted change in noise level.

**Table 3.** Community Response to Increases in Noise Levels

| Sound Level Change (dB) | Category | Response Description |
|---|---|---|
| 0 | None | No observed reaction |
| 5 | Little | Sporadic Complaints |
| 10 | Medium | Widespread Complaints |
| 15 | Strong | Threats of Community Action |
| 20 | Very Strong | Vigorous Community Action |

The values stated in Tables 2 and 3 should not be considered regulatory requirements because they are not associated with a specific governing document for this project. However, these tables are very useful in assessing the human perception to changes in sound levels and they are considered to be supplemental information to the governing State of Hawaii Community Noise Control Rule, which does not discuss community response to changes in noise levels.

## 4.0 EXISTING ACOUSTICAL ENVIRONMENT

Two types of noise measurements were conducted to assess the existing acoustical environment in the vicinity of the project location. The first noise measurement type consisted of continuous long-term ambient noise level measurements. The second type of noise measurement was short-term and included traffic counts. The purpose of the short-term noise measurements and corresponding traffic counts is to calibrate the traffic noise prediction model. The noise measurements were conducted between March 27, 2014 and March 31, 2014.

The methodology, location, and results for each of the measurements are described below and the measurement locations are illustrated in Figure 2. Photographs of the measurements locations are provided in Appendix B.

### 4.1 Long Term Noise Measurements

Continuous long-term ambient noise level measurements were conducted to assess the existing acoustical environment in the vicinity of the project site. Long-term measurements (taken continuously over the course of multiple days) offer a baseline for establishing existing ambient noise levels in the area and are used for estimating future noise levels by adding the ambient levels to other noise levels generated from the proposed project.

### 4.1.1 Long-Term Noise Measurement Procedure

Hourly equivalent sound levels were recorded for approximately 4 days at two locations. The measurements were taken using a Larson-Davis, Model 820, Type 1 Sound Level Meter together with a Gras, Model 40AQ Type 1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended 2-year calibration period. The microphones were mounted on tripods at 6 to 10 feet above grade. Windscreens covered the microphones during the entire measurement period. The sound level meters were secured in weather-resistant cases.

### 4.1.2 Long-Term Noise Measurement Locations

*Location L1:* The sound level meter was located on the north end of the project site adjacent to Kaumuali'i Highway, approximately 65 feet from the center line. The dominant noise source was vehicular traffic from the highway. Secondary noise sources included birds, wind, occasional aircraft flyovers, and construction and agricultural equipment.

*Location L2:* The sound level meter was located at the south end of the project site. Noise sources included birds, insects, wind, occasional aircraft flyovers, and construction and agricultural equipment.

### 4.1.3 Long-Term Noise Measurement Results

The measured $L_{eq(h)}$ and the 90 percent exceedance level ($L_{90}$) in dBA are graphically presented in Figures 3 and 4 for each location. The ambient sound levels at L1 were dynamic and depended significantly on the vehicular traffic patterns of the highway (where higher ambient noise levels occurred during peak traffic hours). The ambient sound levels at L2 were atypical as higher noise levels occurred after sundown and decreased again shortly before sunrise. This phenomenon may have been caused by a natural noise source such as insects but the source of the nighttime noise was not confirmed. The range of $L_{eq(h)}$ during the day (7:00 AM to 10:00 PM) and during the night (10:00 PM to 7:00 AM) and average calculated day-night level are summarized for each location in Table 4 below.

**Table 4.** Summary of Noise Measurement Results (dBA)

| Measurement Location | 7 AM-10 PM $L_{eq(h)}$ Range | 10 PM-7 AM $L_{eq(h)}$ Range | Average $L_{dn}$ |
|---|---|---|---|
| L1 – Project Site North | 61-68 | 50-67 | 67 |
| L2 – Project Site South | 44-70 | 43-70 | 68 |

## 4.2 Short Term Noise Measurements

An approximate 30-minute $L_{eq}$ was measured at one location approximately 40 feet north of the center of Kaumuali'i Highway. Vehicular traffic counts and traffic mix were documented during the measurement period. The noise measurement was taken using a Larson-Davis Laboratories, Model 824, Type-1 Sound Level Meter together with a Larson-Davis, Model 2541 Type-1 Microphone. Calibration will was checked before and after the measurement with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period.

## 5.0 POTENTIAL NOISE IMPACTS

### 5.1 Project Construction Noise and Compliance with State of Hawaii Community Noise Control Rule

The various construction phases of the project will generate significant amounts of noise. Depending on when construction occurs, the Lima Ola development may impact existing adjacent properties, such as the homes adjacent to Kaumuali'i Highway. Future developments such as the Habitat for Humanity site on the adjacent parcel may also be impacted by construction noise if completed before the Lima Ola development. Similarly, residences from the initial phases may be impacted by construction noise from subsequent phases due to their proximity to the construction site.

Development of the project areas will involve excavation, grading, and other typical construction activities during construction. The use of impact equipment is not anticipated. The actual noise levels produced during construction will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 5. Earthmoving equipment, e.g., bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction. In cases where construction noise is expected to exceed the HDOH "maximum permissible" property line noise levels, a permit must be obtained to allow the operation of construction equipment.

### 5.2 Project Generated Stationary Mechanical Noise and Compliance with State of Hawaii Community Noise Control Rule

The Lima Ola Workforce Housing Development is proposed to be a residential development with six categories of residential lots (i.e., single family, mufti family, etc.) green spaces, parks, as well as a community center which may also house a retail outlet. The various phases in the long range development plan will incorporate stationary mechanical equipment that is typical for residential buildings. Expected mechanical equipment may include air handling equipment, condensing units, refrigeration units, etc. Noise from this mechanical equipment and other equipment must meet the State noise rules, which stipulate maximum permissible noise limits at the property line. For multi-family dwellings, business, and commercial areas, the noise limits are 60 dBA during the day and 50 dBA during the night, as shown in Figure 1. For residential areas (i.e., single-family homes), noise limits are 55 dBA during the day and 45 dBA during the night. Mitigation of mechanical noise to meet the State DOH noise rules should be incorporated into the project design.

### 5.3 Vehicular Traffic Noise and Compliance with FHWA/HDOT Noise Limits

A vehicular traffic noise analysis was completed using the DataKustik CadnaA (version 4.4) software program [Reference 9] for the existing conditions, and future year 2040 projections including the "with project" and "without project" conditions. The traffic noise analysis was based on the peak hour AM and PM traffic volumes provided by the Traffic Consultant [Reference 10]. Intersection geometric configurations and speed limits were also provided by the traffic consultant.

Vehicular traffic noise level contours were calculated throughout the project site and surrounding community. The short-term noise measurement and corresponding traffic counts will be used to validate the software at noise measurement locations L1, L2, and S1. The results of the traffic noise analysis for the existing and future year projections are shown graphically in Figures 6 to 8 for the peak AM traffic hour. The calculated traffic noise levels are not significantly different for the peak AM and peak PM hour, less than 1 dB, so only the peak AM traffic contours have been presented.

### 5.3.1 Vehicular Traffic Noise Impacts on the Surrounding Community

Future traffic volume increases on Kaumuali'i Highway and the surrounding roadways due to the development of the proposed project are not significant. Therefore, existing residences located within the 'Ele'ele community will not experience a significant vehicular traffic noise increase due to the Lima Ola development. The change in daytime noise level (future with project vs. future without project) for the community is graphically represented in Figure 9. The yellow contours signify an increase of up to 3 dB which is less than the threshold of human perception. The greatest increase occurs for the homes adjacent to Mahea Road where an insignificant 2 dB increase in noise level is expected.

### 5.3.2 Vehicular Traffic Noise Impacts on the Project

Future year traffic projections show that the FHWA maximum noise limit of 67 dBA will be satisfied for homes that are located more than 75 feet from the center line of Kaumuali'i Highway. The projected traffic volumes and speed limits on the future roadways that provide access to the Lima Ola development are not significant enough to generate noise levels greater than 60 dB at the adjacent homes. This is true for the access roads off of Kaumuali'i Highway and Halewili Road/Mahea Road as well as the potential perimeter road that may be developed in the future as part of a separate project.

Although the FHWA criteria is not a regulatory requirement for this project, as it has no authority to enforce land use, its noise limit criteria is recommended by the FHWA to be used as a guideline for consideration of land use and the impact of traffic noise.

## 5.4 Compliance with EPA and HUD Noise Guidelines

The results from the long-term noise measurements conducted at the Lima Ola Workforce Housing Development site indicate that the day-night level is less than 67 dBA for areas located beyond 40 feet from the center line of Kaumuali'i Highway. Therefore, the noise levels for a majority of the project site are within the HUD site acceptability standards, which state a design goal of $L_{dn} \leq 65$ dBA for the exterior noise level. The EPA has an existing design goal of $L_{dn} \leq 65$ dBA and a future design goal $L_{dn} \leq 55$ dBA for exterior noise levels. Therefore the noise levels at the project site are currently within the EPA existing design goals but exceed the future design goals.

The residences within the Lima Ola Workforce Housing Development that are located along Kaumuali'i Highway and the major perimeter roadways will be exposed to traffic noise. HUD site acceptability standards must be satisfied by providing minimum setback distances or other traffic noise mitigation measures in order to reduce the noise impact to these homes.

It is important to note that the HUD and EPA noise guidelines are design goals and not enforceable regulations, although the HUD site acceptability standards must be satisfied for projects involving HUD or federal financing. However, these guidelines and design goals are useful tools for assessing the noise environment.

# 6.0 NOISE IMPACT MITIGATION

## 6.1 DOH Noise Permit

In cases where construction noise exceeds, or is expected to exceed the State's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for DOH to issue a construction noise permit, the contractor must submit a noise permit application to DOH, which describes the construction activities for the project. Prior to issuing the noise permit, DOH may require action by the contractor to incorporate noise mitigation into the construction plan. DOH may also require the contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engines, using properly tuned and balanced machines, etc. However, DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities [Reference 1] are:

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels ... before 7:00 AM and after 6:00 PM of the same day, Monday through Friday."
>
> “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 AM and after 6:00 PM on Saturday."
>
> “No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

Although not anticipated during construction of the housing development, the use of pile drivers, hoe rams and jack hammers 25 pounds (lbs.) or larger, high pressure sprayers, and chain saws are restricted to 9:00 AM to 5:30 PM, Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds (lbs.), must be equipped with mufflers [Reference 1].

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. However, when considering a noise permit application, consideration is also given to any proposed noise mitigation for the project. Therefore, noise mitigation for construction activities should be addressed using project management and the source and path noise control measures discussed in Section 6.3 below.

## 6.2 DOH Noise Variance

In cases where nighttime construction is expected, a variance must be obtained from the State DOH to allow the operation of a noise source which emits noise levels in excess of the maximum permissible levels and which operation does not conform to the requirements of the noise permit (i.e., nighttime construction activities which occur between 6:00 p.m. and 7:00 a.m., Monday through Friday). However, nighttime construction is not anticipated for this project so a variance will not be required.

## 6.3 Mitigation of Construction Noise

### 6.3.1 Mitigation of Noise Source

Mitigating construction noise at the source is the most effective form of noise control. The source control methods listed in Table 5 below can be applied to most construction equipment.

**Table 5.** Construction Noise Source Control Methods

| | |
|---|---|
| Scheduling | Limit activities that generate the most noise to less sensitive time periods (e.g. daytime hours). |
| Substitution | Use quieter methods/equipment when possible (e.g. low noise generators, smaller excavators, etc.). |
| Exhaust Mufflers | Install quality mufflers on equipment. |
| Reduced Power Options | Use smallest size and/or lowest power as required. |
| Quieter Backup Alarms | Install manual adjustable or ambient sensitive alarms. Do not use backup alarms during night work. |
| Motors | Insulate or enclose motors |
| Equipment Selection | Electric equipment is quieter than pneumatic equipment |
| Equipment Retrofit | Rubber chucks in jackhammers |
| Equipment Maintenance | Sharpen and balance tools, repair silencing equipment, replace worn parts and open airways |
| Staging Area | Maximize the distance between the construction staging areas and nearby receptors to the greatest extent possible |

In general, a majority of the construction noise mitigation is in the form of scheduling, specifically, limiting the construction hours to the time frame specified by the State DOH. The jackhammer is expected to be the most disruptive piece of equipment used during the construction process so the allowable hours of operation are even more restrictive, as described in Section 6.1.

### 6.3.2 Mitigation of Noise Path

When source control measures are not sufficient to avoid a noise impact, path control measures must be considered. Non-permanent noise barriers or curtains and equipment enclosures could be installed at the construction site to reduce construction noise in noise sensitive locations. The general contractor could also conduct noise monitoring of construction during noisy or extensive activities at locations close to residential properties.

## 6.4 Mitigation of the Development Noise

The design of the new Lima Ola Workforce Housing Development should give consideration to controlling the noise emanating from stationary mechanical equipment so as to comply with the State Department of Health *Community Noise Control* rules [Reference 1]. The location of the mechanical equipment should take into account proximity to the nearest noise sensitive receiver to reduce noise impacts. For example, outside condensing units should be located far from the neighboring residence's windows or area of outside use (such as a lanai or yard). If sufficient space is not provided between the noise source and receiver, the equipment may require some form of mitigation. Typical noise mitigation for stationary equipment such as air-conditioning and ventilation equipment, refrigerators, compressors, etc, includes mufflers, silencers, acoustical enclosures, noise barrier walls, etc. In order for any commercial activities at the community center to be compatible with the adjacent residential areas, noise mitigation measures should also be implemented.

## 6.5 Mitigation of Vehicular Traffic Noise

Vehicular traffic noise from Kaumuali'i Highway may impact the proposed development unless noise mitigation is considered.

### 6.5.1 Mitigation Through Setbacks or Buffer Zones

According to the FHWA's Highway Traffic Noise Analysis and Abatement Guidance [Reference 11], "the FHWA encourages State and local governments to practice compatible land use planning and control near highways. Local governments may use their power to regulate land development to prohibit noise-sensitive land uses adjacent to a highway, or require developers to plan, design, and construct projects that minimize highway traffic noise impacts on adjacent developments." Although the FHWA criteria is not a regulatory requirement for this project, as it has no authority to enforce land use, its noise limit criteria is recommended by the FHWA to be used as a guideline for consideration of land use and the impact of traffic noise. Furthermore, HUD site acceptability standards must be satisfied for projects involving HUD or federal financing. The setback distances shown in Table 6 are recommended to minimize traffic noise impact and be in compliance with the FHWA's maximum exterior $L_{eq(h)}$ noise limit of 67 dBA and the HUD site acceptability standard of $L_{dn}$ 65 dBA. The setback should be measured from the roadway center line.

**Table 6.** Minimum Setback Distances to Satisfy HUD Site Acceptability Standards

| Roadway | Setback Distance |
|---|---|
| Kaumuali'i Highway | 95 feet |
| Future Perimeter Road (Mahea Road Extension) | None required |
| Future Perimeter Road (Laulea Street Extension) | None required |
| Future Collector and Minor Streets | None Required |

### 6.5.2 Additional Noise Mitigation Options

A comprehensive traffic noise and barrier analysis using roadway layout data and the FHWA Traffic Noise Model Software was not performed. The guidelines listed below are general in nature and should be applied where residential housing is constructed within the setback limits listed above and noise mitigation becomes necessary. The following are effective noise mitigation measures.

- Construct barrier walls and/or earth berms along roadways.
- Air-condition buildings instead of relying on natural ventilation.
- Acoustically soften interior spaces by the addition of thick carpeting with a padding underlayment, an acoustical tile ceiling, louvered closet doors, etc.
- Use exterior wall constructions which exhibit high noise reductions.

Typical exterior-to-interior noise reductions for naturally ventilated homes, i.e., with open windows, are approximately 9 dB. Adding absorption to interior spaces, (acoustically softening), can further reduce the noise levels 1 to 5 dB, depending upon the absorption initially present, and the amount of absorption added to the space. Air-conditioned or mechanically ventilated homes will also typically exhibit higher exterior-to-interior noise reductions achieved by several types of building constructions. Estimating the noise reduction provided by a barrier, however, is more difficult to generalize. Factors such as distances to roadways and setbacks, intervening ground conditions, barrier construction, barrier height, roadway elevations, etc., will determine the noise reduction afforded by a traffic noise barrier. In general, a 5 to 10 dB reduction can be expected.

**REFERENCES**


1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

2. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973; Revised at 75 FR 32820, July 13, 2010.

3. *Highway Traffic Noise: Analysis and Abatement Guidance*, U.S. Department of Transportation, Federal Highways Administration, December 2011.

4. *Highway Noise Policy and Abatement Guidelines*, Department of Transportation, Highways Division, State of Hawaii, November 29, 2011.

5. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

6. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24, CFR, Part 51, 44 FR 40860, July 12, 1979; Amended by 49 FR 880, January 6, 1984.

7. M. David Egan, *Architectural Acoustics*, McGraw-Hill Book Company, 1998

8. International Standards Organization ISO/TC 43, *Noise Assessment with Respect to Community Responses*, New York: United Nations, November 1969.

9. DataKustik CadnaA software program, Version 4.4; DataKustik GmbH, 2013.

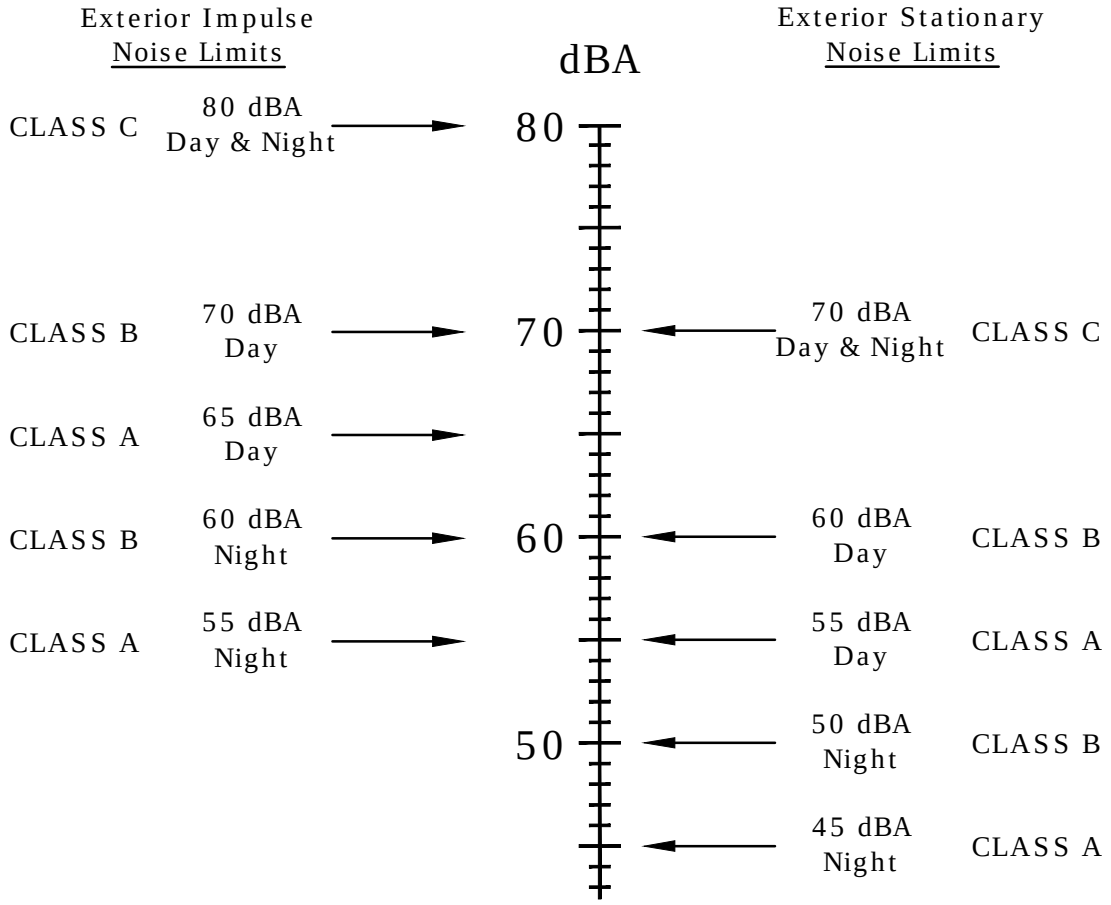
10. *Lina Ola Workforce Housing Project – Traffic Impact Analysis,* Hatch Mott MacDonald, March 24, 2014

## HAWAII DEPARTMENT OF HEALTH MAXIMUM PERMISSIBLE SOUND LEVELS FOR VARIOUS ZONING DISTRICTS

| Zoning District | Day Hours (7 AM to 10 PM) | Night Hours (10 PM to 7 AM) |
|---|---|---|
| CLASS A<br>Residential, Conservation, Preservation, Public Space, Open Space | 55 dBA (Exterior) | 45 dBA (Exterior) |
| CLASS B<br>Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort | 60 dBA (Exterior) | 50 dBA (Exterior) |
| CLASS C<br>Agriculture, Country, Industrial | 70 dBA (Exterior) | 70 dBA (Exterior) |

IMPULSE NOISE:

The maximum permissible noise limit for impulse noise is 10 dBA above the stationary noise limits.

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|---|---|---|
| PROJECT NO: 13-40 | DATE: April 2014 | FIGURE: 1 |

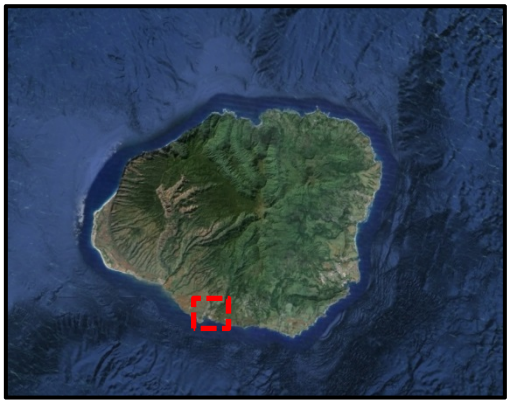
# Property Boundaries and Noise Measurement Locations

## Legend

Noise Measurement Location – Long Term

Noise Measurement Location – Short Term

Property Boundary



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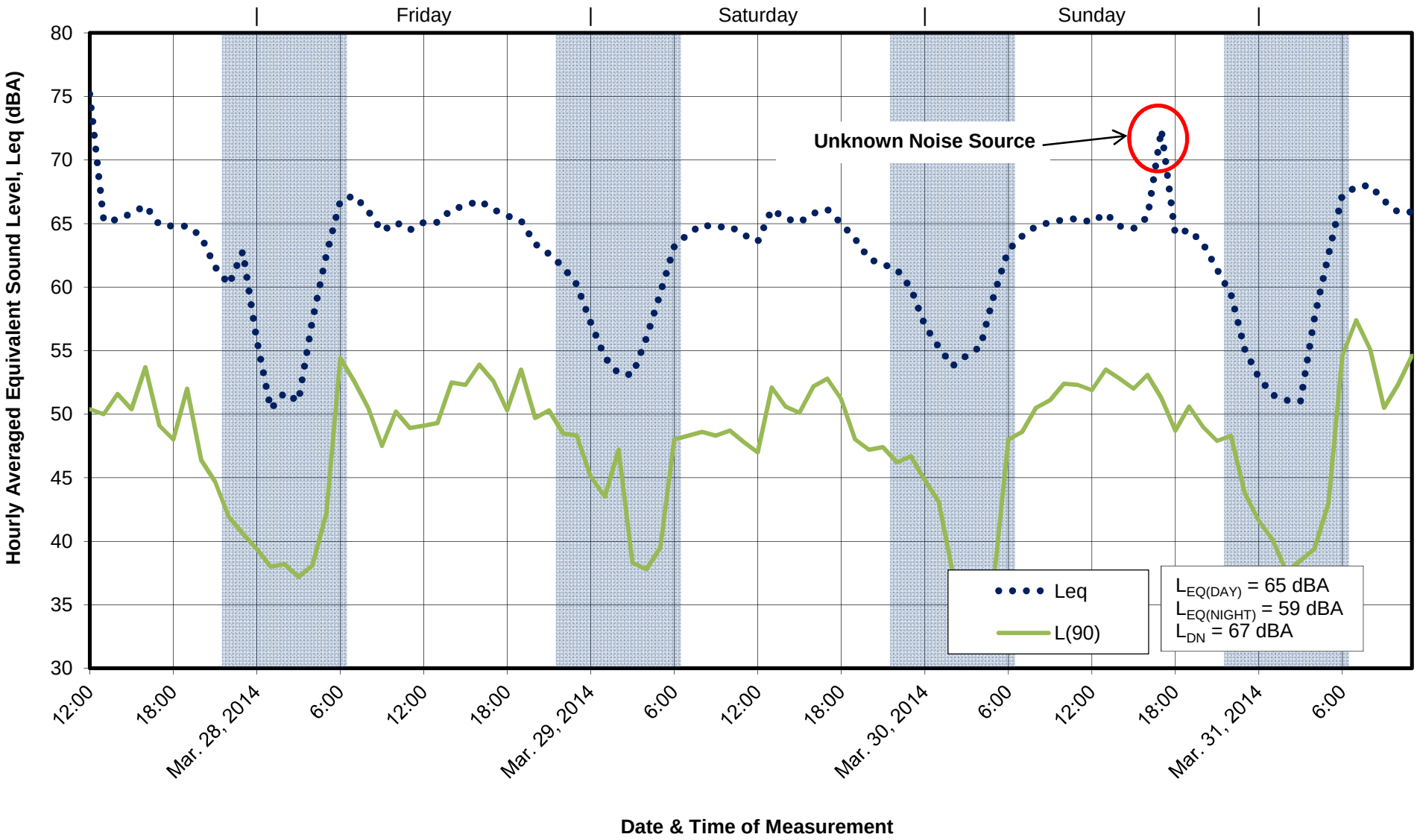
## Long Term Noise Measurement Data - Location L1




| | | | |
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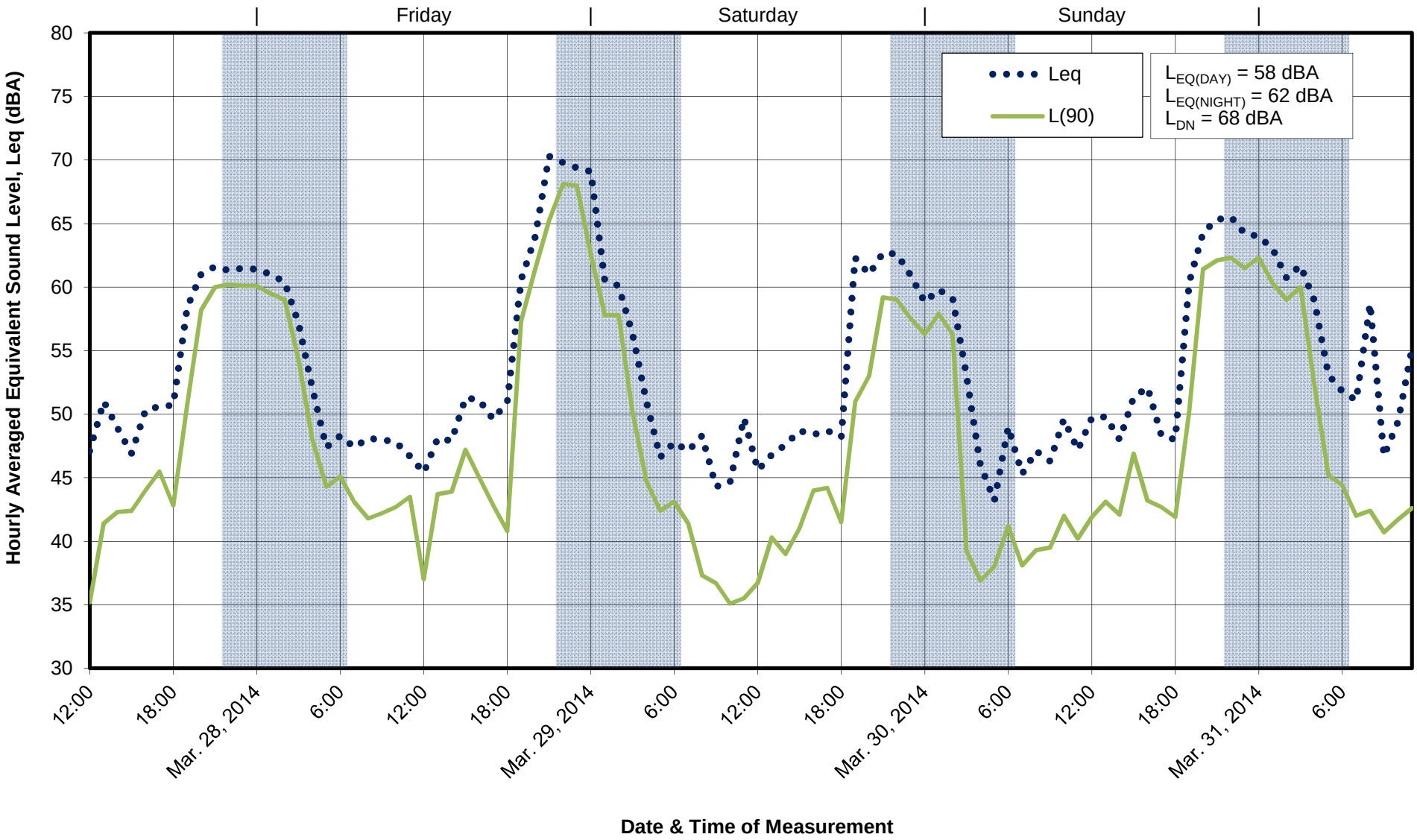
## Long Term Noise Measurement Data - Location L2

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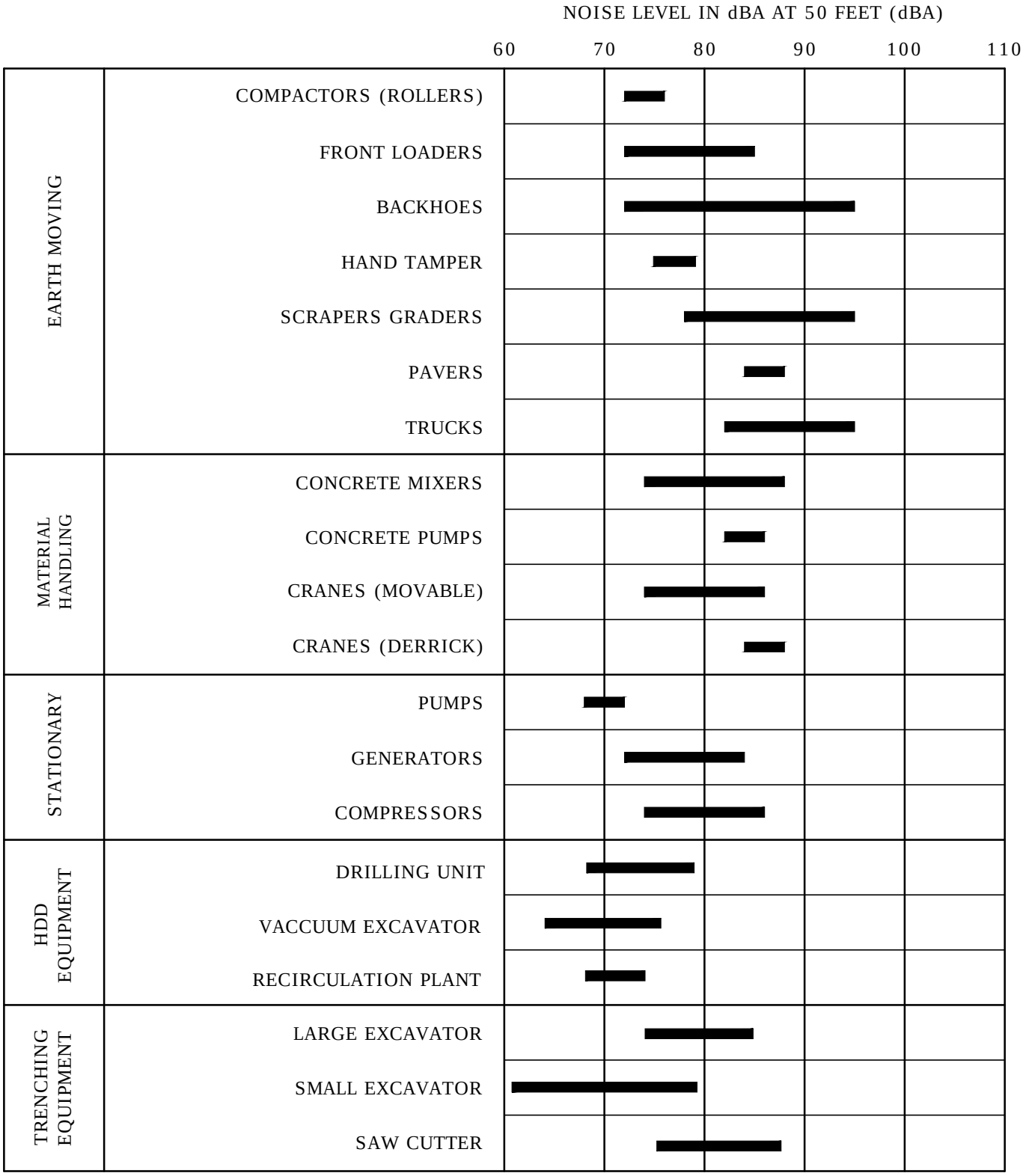
| | PROJECT NO:<br>13-40 | DATE:<br>April 2014 | FIGURE:<br>4 |

# TYPICAL NOISE LEVELS FROM CONSTRUCTION EQUIPMENT




NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

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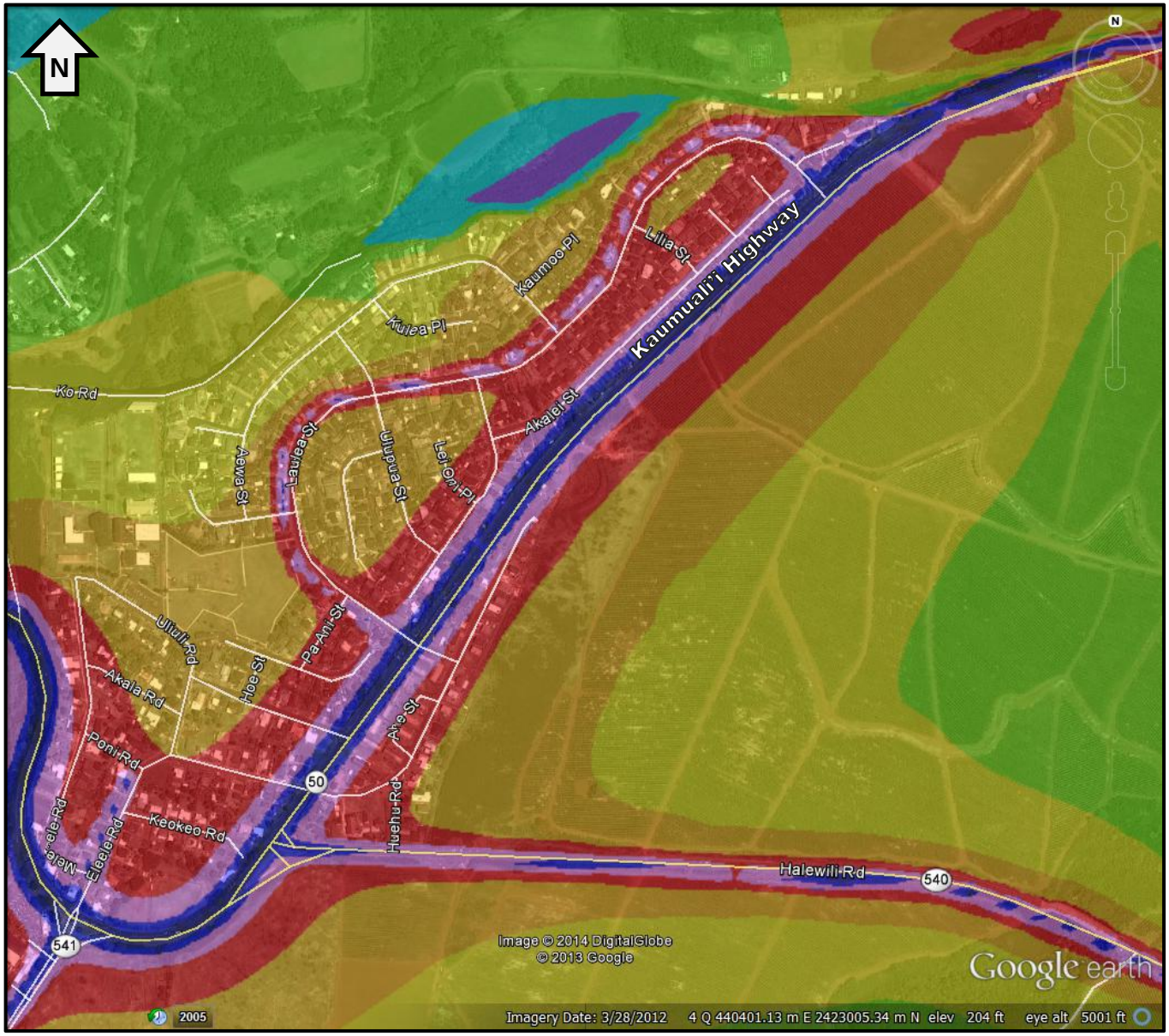
|---|---|---|
| PROJECT NO: 13-40 | DATE: April 2014 | FIGURE: 5 |

# Vehicular Traffic Noise Contours – Existing Condition




**Daytime Traffic Noise Level Contours**

- = 40 dBA
- = 45 dBA
- = 50 dBA
- = 55 dBA
- = 60 dBA
- = 65 dBA
- = 70 dBA

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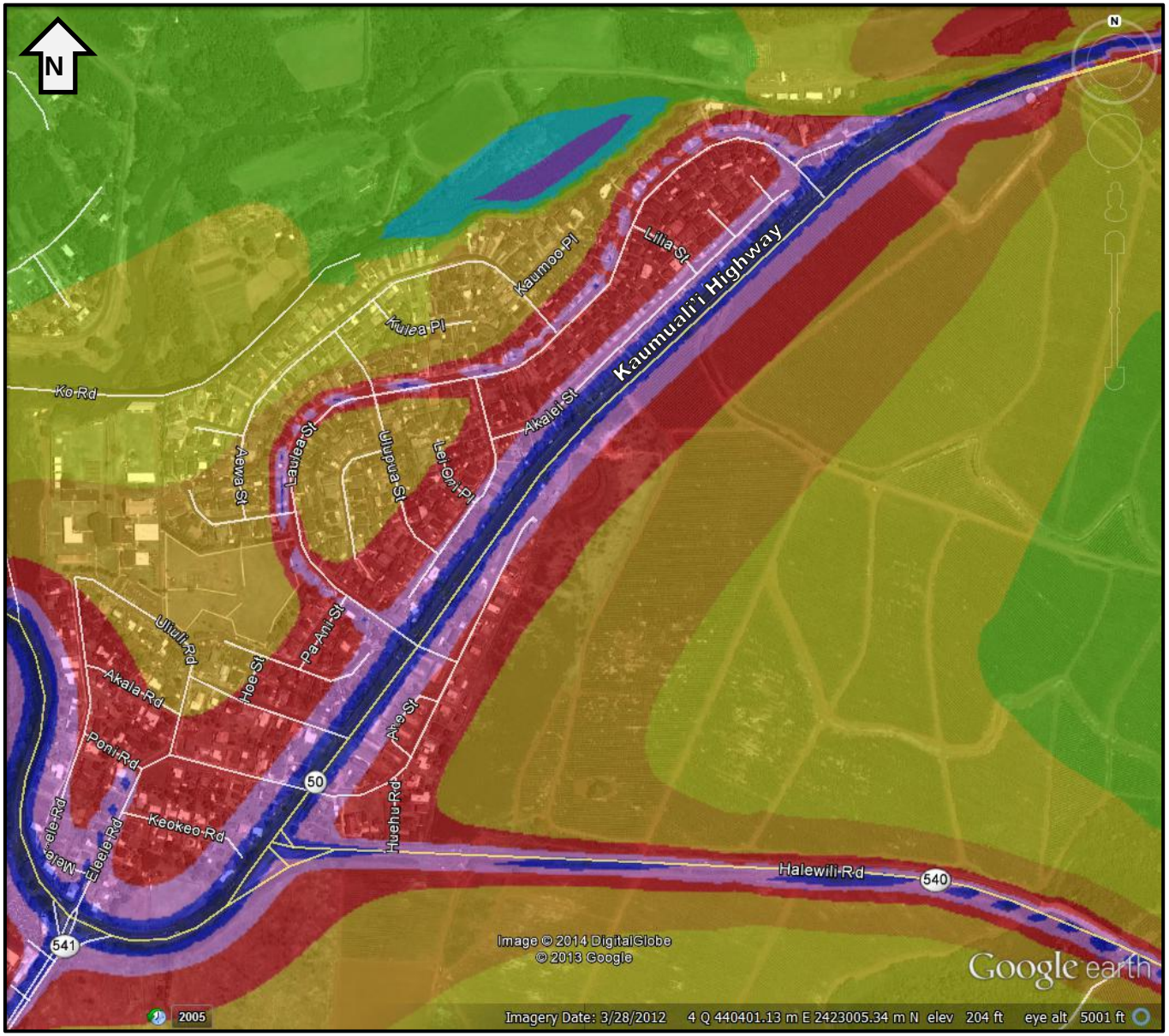
# Vehicular Traffic Noise Contours – Future without Project Condition




**Daytime Traffic Noise Level Contours**

- = 40 dBA
- = 45 dBA
- = 50 dBA
- = 55 dBA
- = 60 dBA
- = 65 dBA
- = 70 dBA

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|---|---|---|
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## Vehicular Traffic Noise Contours – Future with Project Condition

**Daytime Traffic Noise Level Contours**

- = 40 dBA
- = 45 dBA
- = 50 dBA
- = 55 dBA
- = 60 dBA
- = 65 dBA
- = 70 dBA

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## Projected Change in Traffic Noise Levels Due to Project

**Daytime Traffic Noise Delta Contours**

= Δ 1-3 dB
= Δ 3-5 dB
= Δ >5 dB

Δ = "Future with Project" - "Future without Project"

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# APPENDIX A

## Acoustic Terminology

# Acoustic Terminology

Sound Pressure Level

Sound, or noise, is the term given to variations in air pressure that are capable of being detected by the human ear. Small fluctuations in atmospheric pressure (sound pressure) constitute the physical property measured with a sound pressure level meter. Because the human ear can detect variations in atmospheric pressure over such a large range of magnitudes, sound pressure is expressed on a logarithmic scale in units called decibels (dB). Noise is defined as Aunwanted@ sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/P_{ref}) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and $P_{ref}$ is the reference pressure, 20 µPa, which is approximately the lowest sound pressure that can be detected by the human ear. For example:

If P = 20 µPa, then SPL = 0 dB
If P = 200 µPa, then SPL = 20 dB
If P = 2000 µPa, then SPL = 40 dB

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound sources, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined sound level of 53 dB, not 100 dB. Two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 6 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines)[1] at the same level. To address this preferential response to frequency, the A-weighted scale was developed. The A-weighted scale adjusts the sound level in each frequency band in much the same manner that the human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud. The A-weighted noise level is commonly used today in environmental noise analysis and in noise regulations. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

[1] D.W. Robinson and R.S. Dadson, AA Re-Determination of the Equal-Loudness Relations for Pure Tones,@ *British Journal of Applied Physics*, vol. 7, pp. 166 - 181, 1956. (Adopted by the International Standards Organization as Recommendation R-226.

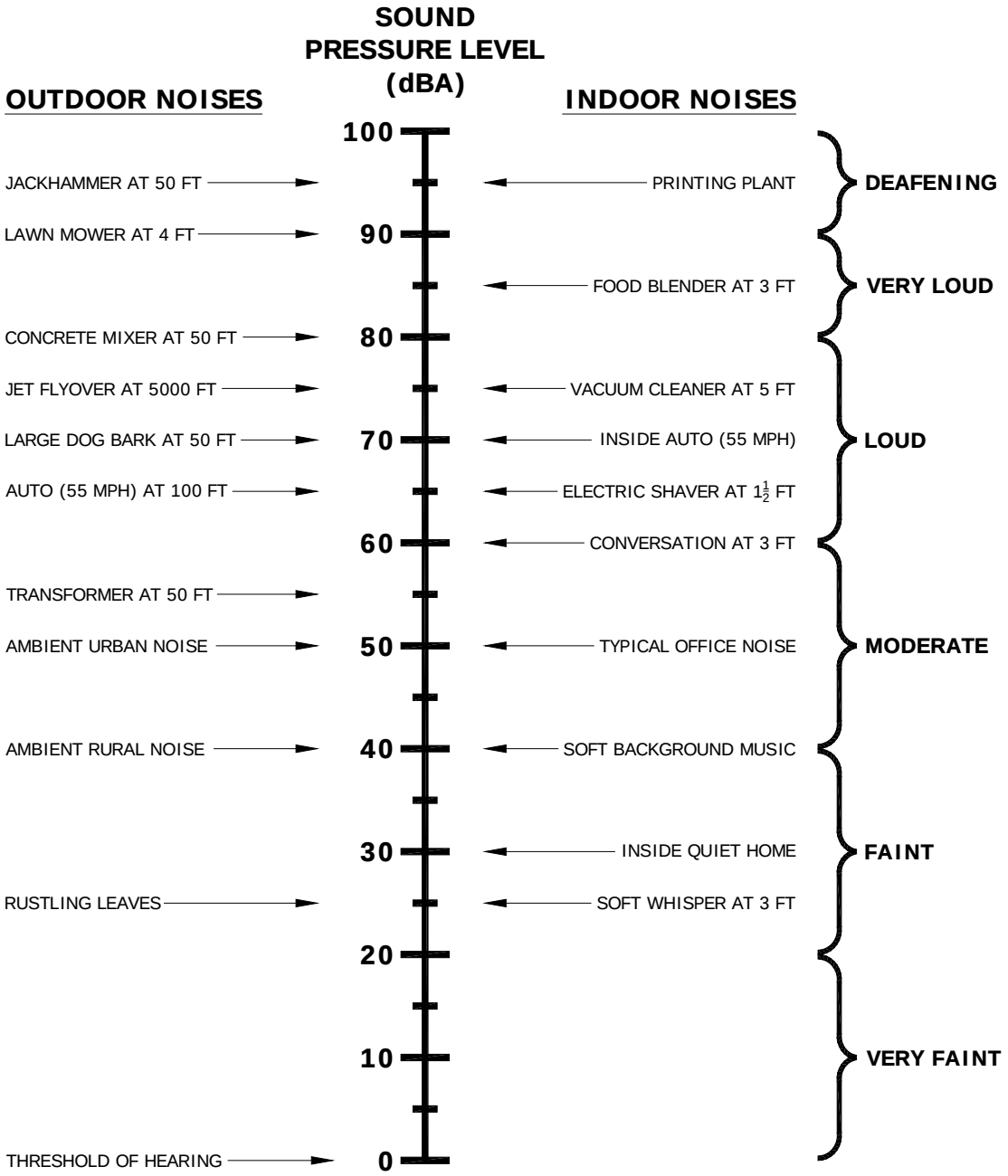



**Figure A-1. Common Outdoor/Indoor Sound Levels**

Equivalent Sound Level

The Equivalent Sound Level ($L_{eq}$) is a type of average which represents the steady level that, integrated over a time period, would produce the same energy as the actual signal. The actual *instantaneous* noise levels typically fluctuate above and below the measured $L_{eq}$ during the measurement period. The A-weighted $L_{eq}$ is a common index for measuring environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

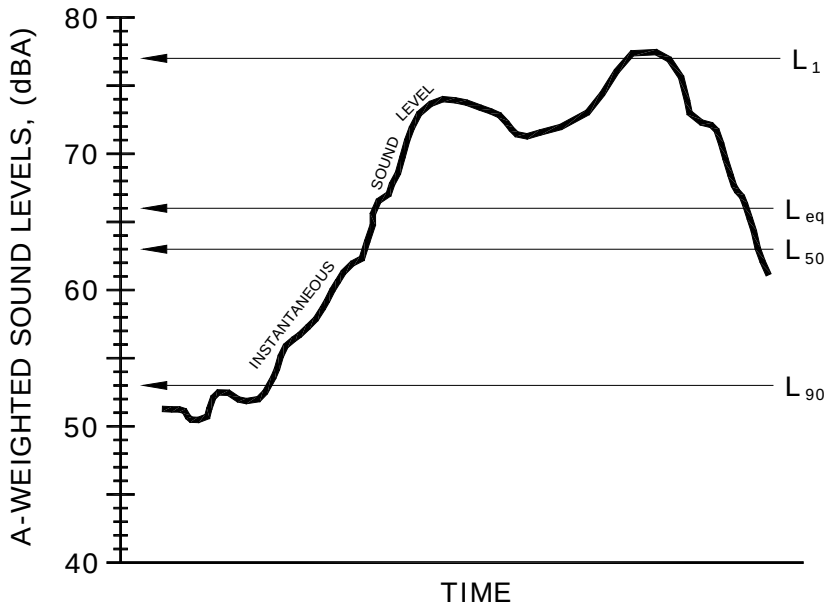



**Figure A-2. Example Graph of Equivalent and Statistical Sound Levels**

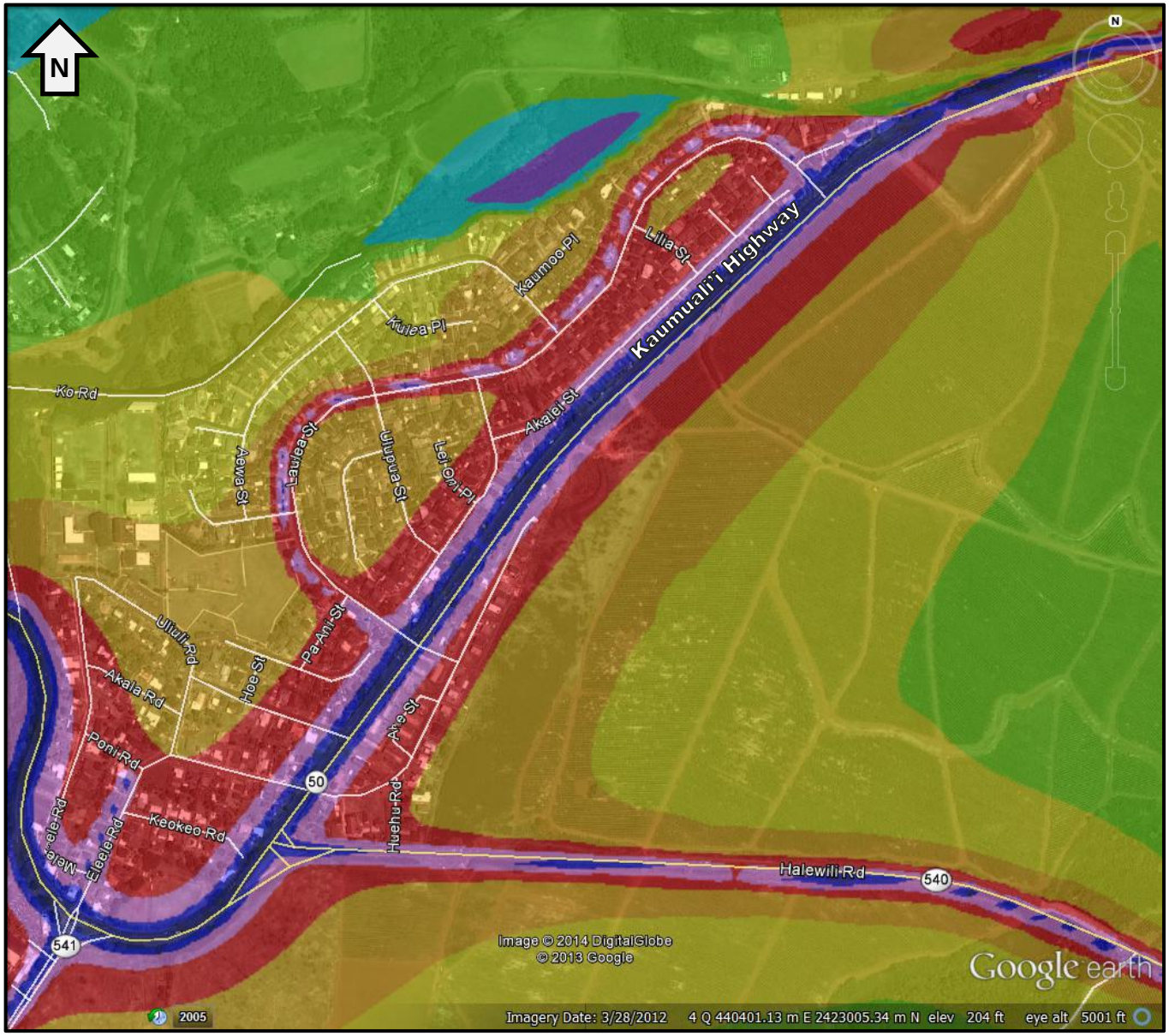
Statistical Sound Level

The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedence Level, $L_n$. The $L_n$ represents the sound level that is exceeded for n% of the measurement time period. For example, $L_{10}$ = 60 dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Typically, in noise regulations and standards, the specified time period is one hour. Commonly used Exceedence Levels include $L_{01}$, $L_{10}$, $L_{50}$, and $L_{90}$, which are widely used to assess community and environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, $L_{dn}$, is the Equivalent Sound Level, $L_{eq}$, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 p.m. and 7 a.m. to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The $L_{dn}$ is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations.

# Vehicular Traffic Noise Contours – Existing Condition




**Daytime Traffic Noise Level Contours**

- = 40 dBA
- = 45 dBA
- = 50 dBA
- = 55 dBA
- = 60 dBA
- = 65 dBA
- = 70 dBA

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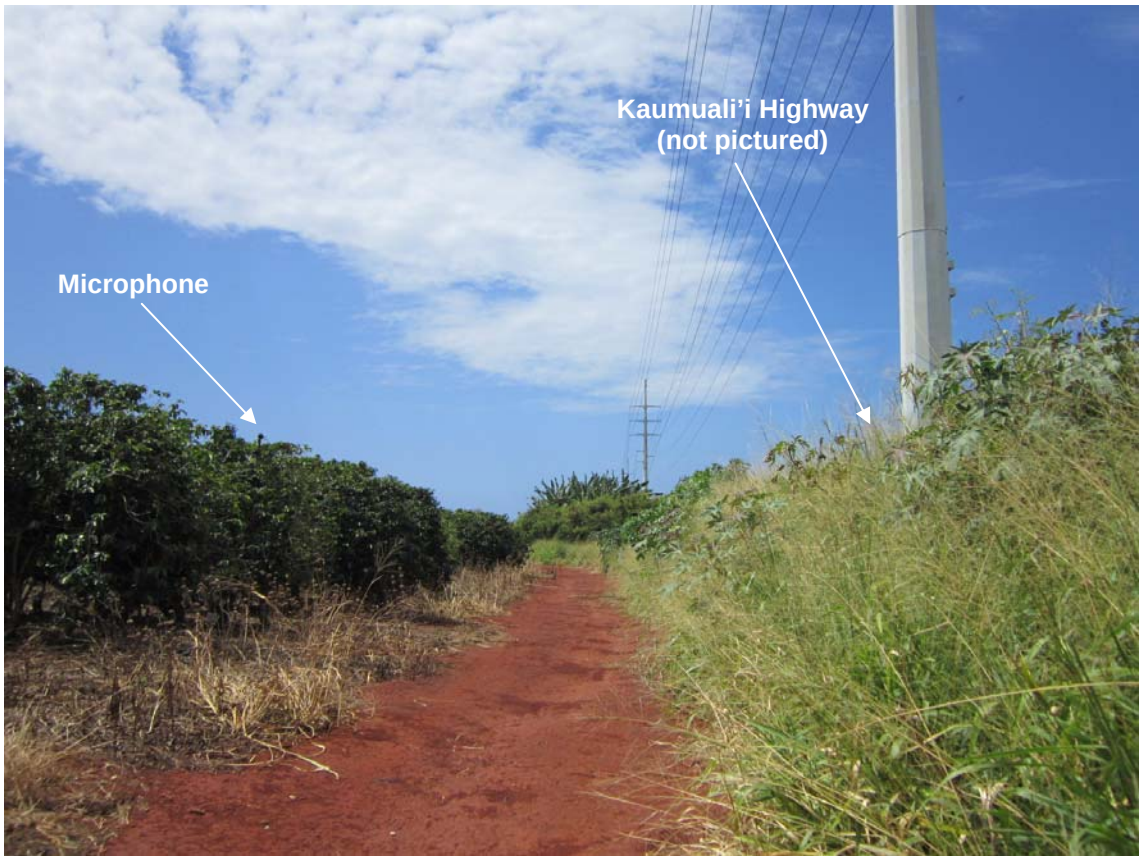
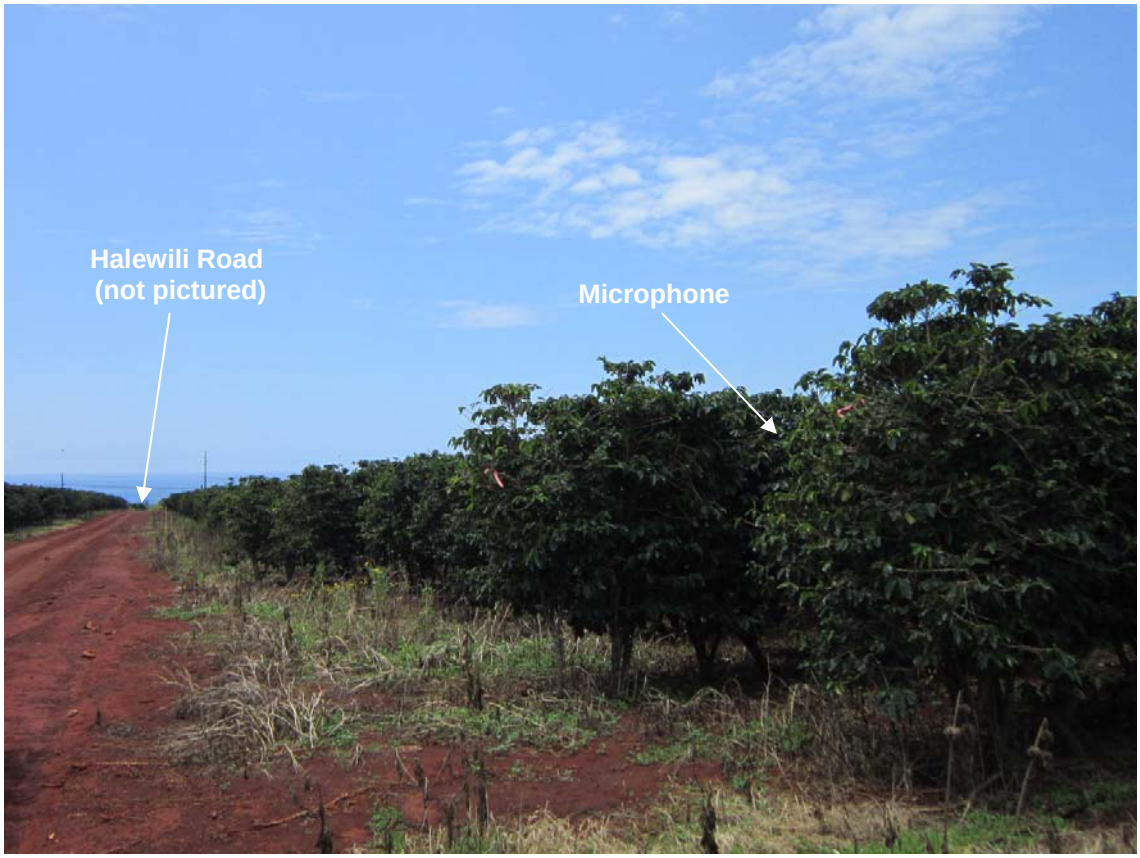



**Location L1**

Microphone mounted on a tripod in coffee tree approximately 10' above grade. Located at the north end of the project site, approximately 65 feet from Kaumuali'i Highway.

The highway runs along the utility poles shown in the photograph.




**Location L2**

Microphone mounted on tripod in a coffee tree approximately 6' above grade. Located near the south end of the project site.

The dirt road in the photograph is a private (Kauai Coffee) access road off of Halewili Road.

# APPENDIX G-1: CULTURAL IMPACT ASSESSMENT

SCS Project Number 1456-CIA-1

# A CULTURAL IMPACT ASSESSMENT FOR A 75-ACRE PARCEL HANAPĒPĒ AHUPUA`A, KONA DISTRICT KAUA`I ISLAND, HAWAI`I [TMK: (4) 2-1-001:054]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and
**Robert L. Spear, Ph.D.**

June 2014

Prepared for:
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# INTRODUCTION

At the request of Colette M. Sakoda, of Community Planning and Engineering, Inc., Scientific Consultant Services, Inc. (SCS), has prepared a Cultural Impact Assessment (CIA) for the proposed development and construction of the Lima Ola Work Force Housing Development Project to be located on approximately 75 acres of undeveloped land of land located in Hanapēpē Ahupua`a, Kona District, Kaua`i Island, Hawai`i [TMK: (4) 2-1-001:054] (Figures 1 through 3). Currently, the property owner and developer is the County of Kaua`i Housing Agency.

The Constitution of the State of Hawai`i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of Native Hawaiians. Article XII, Section 7 (2000) requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by *ahupua`a* tenants who are descendants of Native Hawaiians who inhabited the Hawaiian Islands prior to 1778." In spite of the establishment of the foreign concept of private ownership and western-style government, Kamehameha III (Kauikeaouli) preserved the peoples traditional right to subsistence. As a result in 1850, the Hawaiian Government confirmed the traditional access rights to Native Hawaiian *ahupua`*a tenants to gather specific natural resources for customary uses from undeveloped private property and waterways under the Hawaiian Revised Statutes (HRS) 7-1. In 1992, the State of Hawai`i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights…may extend beyond the *ahupua`a* in which a Native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawai`i (2000) with House Bill (HB) 2895, relating to Environmental Impact Statements, proposes that:

> …there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights… [H.B. NO. 2895].

Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs and practices, and resources of Native Hawaiians as well as other ethnic groups. Act 50 also requires state agencies and other developers to assess the effects of proposed land use or shore line developments on the

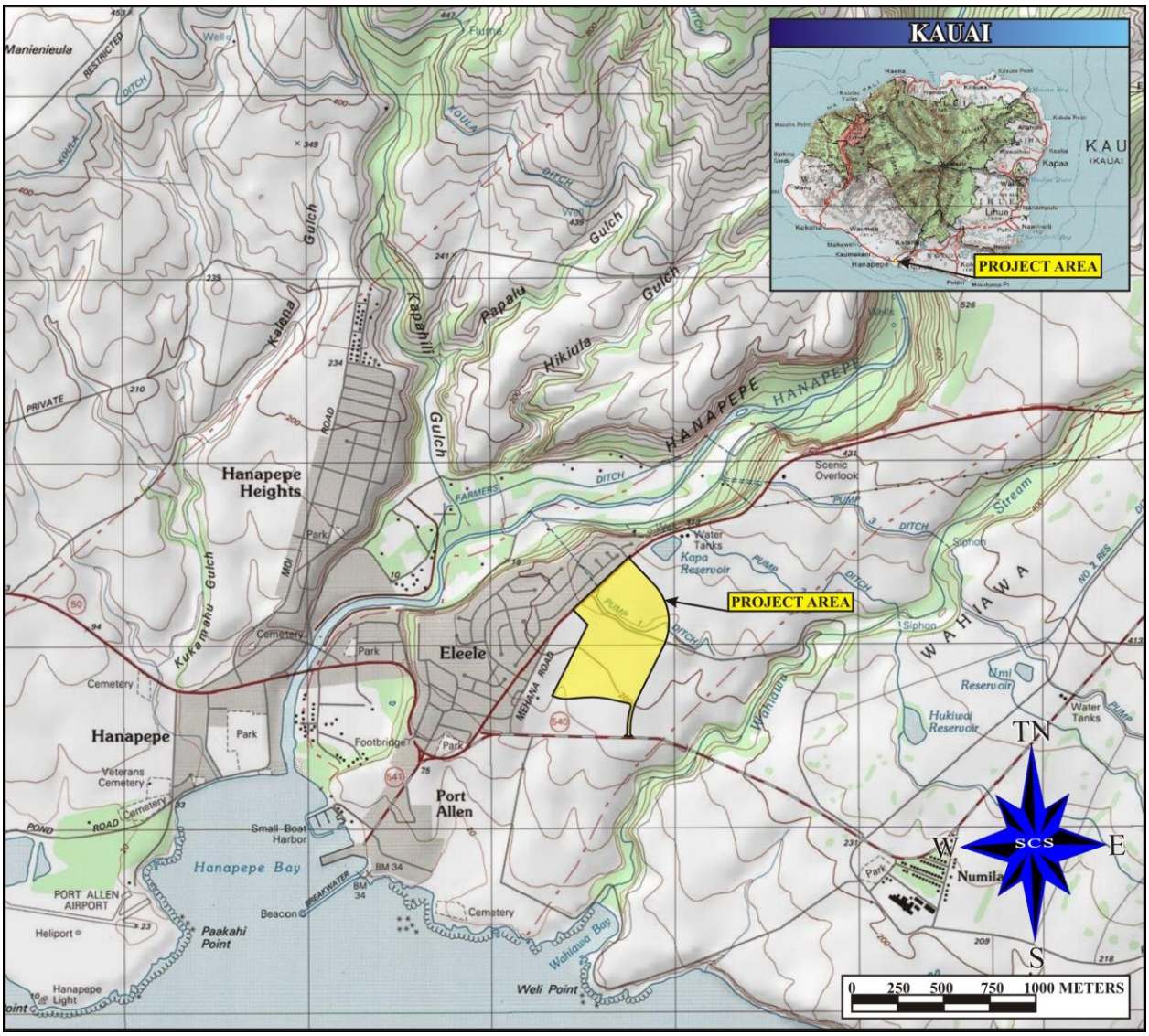


**Figure 1: USGS Quadrangle (Hanapepe 1996) Map Showing Project Area Location.**

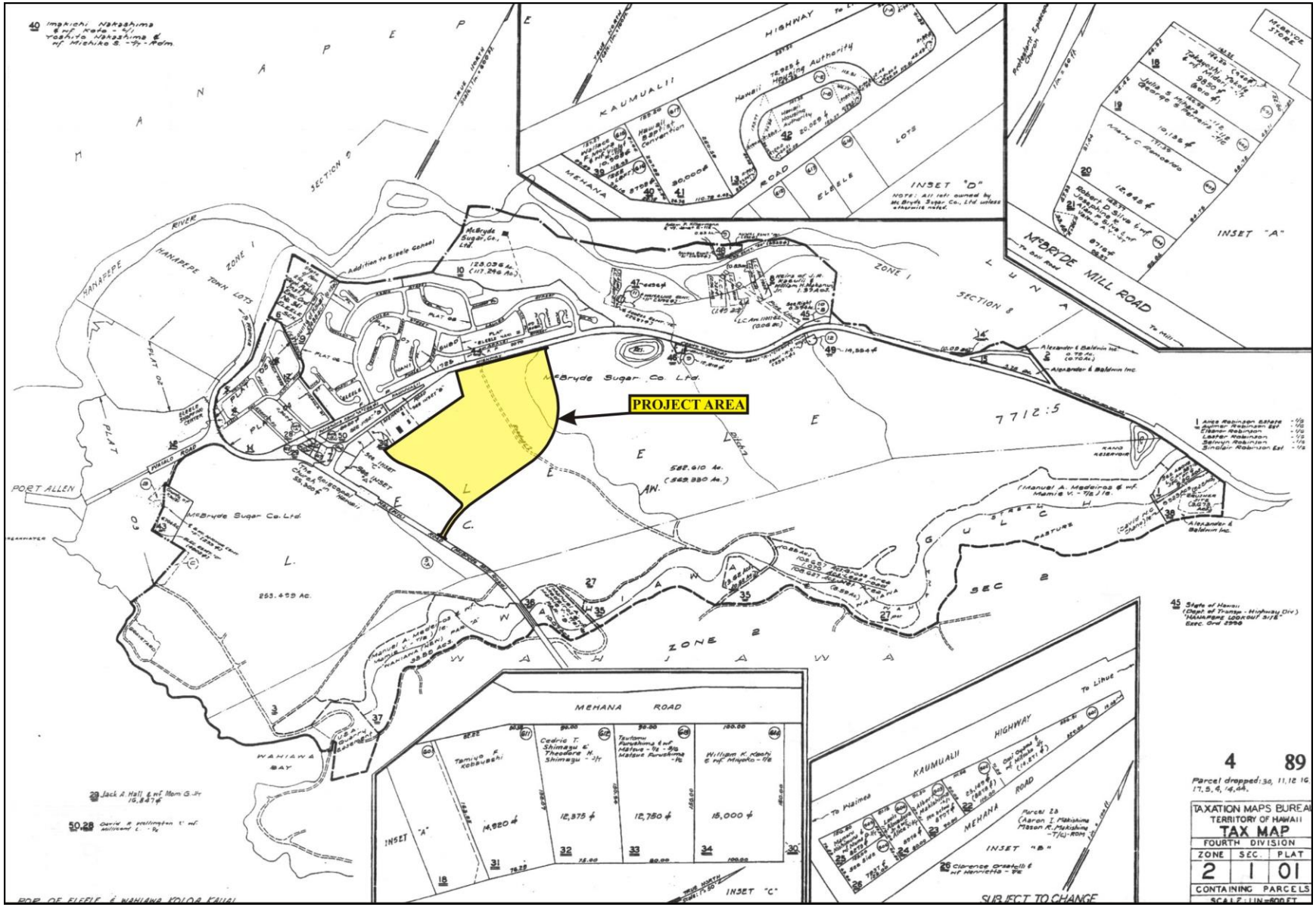


**Figure 2: Tax Map Key [TMK: (4) 2-1-001] Showing Project Area Location.**

**Figure 3: Google Earth Image (2013) Showing Project Area Location.**

"cultural practices of the community and State" as part of the HRS Chapter 343 (2001) environmental review process.

Act 50 re-defined the definition of "significant effect" to include "the sum of effects on the quality of the environment including actions impacting a natural resource, limit the range of beneficial uses of the environment, that are contrary to the State's environmental policies . . . or adversely affect the economic welfare, social welfare or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Cultural resources can include a broad range of often overlapping categories, including places, behaviors, values, beliefs, objects, records, stories, etc. (H.B. 2895, Act 50, 2000).

Thus, Act 50 requires that an assessment of cultural practices and the possible impacts of a proposed action be included in Environmental Assessments and Environmental Impact Statements, and to be taken into consideration during the planning process. As defined by the Hawaii State Office of Environmental Quality Control (OEQC), the concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua`a*" (OEQC 2012:12). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

Therefore, the purpose of a Cultural Impact Assessment is to identify the possibility of on-going cultural activities and resources within a project area, or its vicinity, and then assessing the potential for impacts on these cultural resources. The CIA is not intended to be a document of in depth archival-historical land research, or a record of oral family histories, unless these records contain information about specific cultural resources that might be impacted by a proposed project.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 2012:12):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural, which support such cultural beliefs.

The meaning of "traditional" was explained in *National Register Bulletin*:

> Traditional" in this context refers to those beliefs, customs, and practices of a living community of people that have been passed down through the generations', usually orally or through practice. The traditional cultural significance of a historic property then is significance derived from the role the property plays in a community's historically rooted beliefs, customs, and practices. . . . [Parker and King 1990:1]

## METHODOLOGY

This Cultural Impact Assessment was prepared as much as possible in accordance with the suggested methodology and content protocol in the Guidelines for Assessing Cultural Impacts (OEQC 2012:11-13). In outlining the "Cultural Impact Assessment Methodology", the OEQC (2012:11) states that:

> "…information may be obtained through scoping, community meetings, ethnographic interviews and oral histories…"

This report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. An example letter of inquiry is presented in Appendix A, copies of the posted notice and Affidavit are presented in Appendix B, an example follow-up letter of inquiry is presented in Appendix C, and responses to the inquiries are presented in their entirety in Appendix D. This Cultural Impact Assessment was prepared in accordance with the suggested methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 2012:13), whenever possible. The assessment concerning cultural impacts may include, but not be limited to:

A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.

B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.

C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.

D. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.

E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.

F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.

H. An explanation of confidential information that has been withheld from public disclosure in the assessment.

I. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.

J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.

K. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

If on-going cultural activities and/or resources are identified within the project area, assessments of the potential effects on the cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

## ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps, land records, such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological reports.

## INTERVIEW METHODOLOGY

Interviews are conducted in accordance with Federal and State laws, and guidelines, when knowledgeable individuals are able to identify cultural practices in, or in close proximity to, the project area. If they have knowledge of traditional stories, practices and beliefs associated with a project area or if they know of historical properties within the project area, they are sought out for additional consultation and interviews. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information concerning particular cultural resources. Often people are recommended for their expertise, and indeed, organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs (OHA), historical societies, Island Trail clubs, and Planning Commissions are depended upon for their recommendations of suitable informants. These groups are invited to contribute their input, and suggest further avenues of inquiry, as well as specific individuals to interview. It should be stressed again that this process does not include formal or in-depth ethnographic interviews or oral histories as described in the OEQC's *Guidelines for Assessing Cultural Impacts* (2012). The assessments are intended to identify potential impacts to on-going cultural practices, or resources, within a project area or in its close vicinity.

If knowledgeable individuals are identified, personal interviews are sometimes taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. When information pertaining to traditional cultural practices is provided, a release form is signed by the informant, making the interview available for the study. When telephone interviews occur, a summary of the information is usually sent for correction and approval, or dictated by the informant and then incorporated into the document. If no cultural resource information is forthcoming and no knowledgeable informants are suggested for further inquiry, interviews are not conducted.

## ENVIRONMENTAL SETTING

The Lima Ola project is on the south side of Kaua`i Island, between Hanapēpē and Kalāheo near the southern intersection of Kaumuali`i Highway, State Highway Road 50 and Halewili Road, State Road 540. This area is the beginning of the drier southwestern side of Kaua`i. The project is located on a south-sloping plain between the drainages of the Hanapēpē River and the Wahiawa Gulch. The slope is moderate and falls in a north/south direction from an elevation of 290 feet near Kapa Reservoir to 160 feet at Halewili Road. The 75-acre parcel is bounded by Kaumuali`i Highway to the northwest and west, Halewili Road to the south, and agricultural lands to the east and northeast.

### SOILS

The land between Hanapēpē and Kalāheo including Wahiawa is part of the Koloa Volcanic Series. The base of the formation was formed 1.5 million years after the primary shield-building stage had ceased. The Koloa Volcanic Series, covered two thirds of the eastern side of the island. Numerous vents along with cinder and spatter cones and a small shield volcano exist within Kalāheo and Wahiawa Ahupua`a. Soil formation occurs rapidly upon volcanic ash deposits in the warm humid climates of Kaua`i lowlands. Long periods without volcanic activity allowed the surface to be cut by streams to form gullies and to weather away rock to form ravines (McDonald and Abbott 1970). Numerous intermittent and perennial streams bisect the environs of Kalāheo, Wahiawa and Hanapēpē Ahupua`a.

According to Foote *et al*. (1972:90; Map Sheet Number 14) the project area soil is associated with two soil types of Makaweli silty clay loam: Makaweli silty clay loam, 0 to 6 percent slopes (MgB) and Makaweli silty clay loam, 6 to 12 percent slopes (MgC). The Makaweli soil series consist of well-drained soils on gently sloping to steep uplands, with elevations ranging from nearly sea level to 500 feet. Annual rainfall amounts to 20 to 35 inches, where three-fourths accumulates between October and March. Makaweli silty clay loam (0%-6% slopes) occurs on the tops of broad interfluves, with a surface layer consisting of dusky-red silty clay loam and a subsoil of dusky-red, friable silt loam and silty clay loam that has prismatic and sub angular blocky structure. The substratum is soft, weathered basic igneous rock. Permeability is moderate, runoff is slow and the erosion hazard is slight. Makaweli silty clay loam on 6%-12% slopes is similar to the former soil type but has medium runoff and moderate erosion hazard. Both soils are typically used for irrigated sugarcane, pasture, and woodlands.

**VEGETATION**

The project area has had a history of ranching and agricultural use that began with cattle ranching in the mid 1800's and transitioned to sugar cane cultivation in the late 1800's. Sugar production was prominent for the next one hundred years. Currently, the Lima Ola parcel is being used to grow coffee for Kauai Coffee. The coffee plants are mature and have been yielding coffee beans for a several decades. Aside from coffee, the current vegetation on the parcel consists of invasive weeds, grasses and *koa haole* (*Leucaena leucocephala*).

## TRADITIONAL AND HISTORIC BACKGROUND

Kaua`i, the oldest and fourth largest of the eight main Hawaiian Islands (with land area equaling approximately 1,432 square kilometers), was formed from one great shield volcano (Macdonald *et al.* 1983:458-461). At one time, this vast volcano supported the largest caldera in the islands, horizontally extending 15 to 20 kilometers across. Mt. Wai`ale`ale, forming the central hub of the island, extends 1,598 meters (above mean sea level) amsl. Topographically, Kaua`i is a product of heavy erosion with broad, deep valleys and large alluvial plains.

Kaua`i is justifiably famous as the first landing place of Captain James Cook in January of 1778. Cook estimated a total population of the island of approximately 30,000, but this figure has been questioned by some (*e.g.*, Bennett 1931) as probably too high. Later estimates, based on U.S. Census data, put the early 19th century population of Kaua`i at approximately 10,000. In any case, compared with the other large islands, Kaua`i has witnessed relatively modest growth and development, with a modern population (c. 50,000) not much larger than these original figures.

Until very recently, the island has survived, in large part, on an agricultural economy, with commercial sugarcane, rice, and other crops supplanting the traditional taro in historic times. A concomitant influx of many diverse ethnic groups (including Japanese, Filipino, Chinese, and Euro-American) has also added to the modern character of the island. Much of the knowledge of traditional land use patterns is based on what was recorded at the time of, and shortly after, Western Contact. Early records (such as journals kept by travelers and missionaries), Hawaiian traditions that survived long enough to be written down, as well as, archaeological investigations have assisted in understanding the past.

## PAST POLITICAL BOUNDARIES

Approximately 600 years ago (from the time of Mo`ilikukahi on O`ahu and based on a 25 year per-generation count), the native population had expanded throughout the Hawaiian Islands. Land was considered the property of the king or *ali`i `ai moku* (the *ali`i*, or chief, who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities 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 the individual plots of land.

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili`* ā*ina* were used to delineate various land sections. A district, or *moku*, appeared approximately B.P. 600 years, as the native population had expanded to a point where large political districts could be formed (Lyons 1875:29, Kamakau 1961:54, 55; Moffat and Fitzpatrick 1995:28). Kaua`i consisted of six *moku*; Kona, Puna, Ko`olau, Halele`a, Napali, and Waimea (*ibid*: 23). These districts contained smaller land divisions (*ahupua`a*) which customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore, able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina*, or *`ili*, were smaller land divisions and were next to importance to the *ahupua`a*. They were administered by the chief who controlled the *ahupua`a* in which it was located (*ibid*: 33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61). The proposed project area is located in the *ahupua`a* of Hanapēpē, meaning "crushed bay" (due to landslides) (Pukui *et al*. 1974:40).

## TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture that incorporated pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were cultivated. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985).

Many Hawaiian river valleys were defined by cultivation occurring in lower valley sections and on bends in the stream where alluvial terraces could be modified to take advantage of the stream flow (Kirch and Sahlins Vol. 2 1992:59; Earle 1978:31, 155). Although no longer in use, agricultural terraces were reported in the valley interiors around Hanalei. However, the alluvial plain was extensively cultivated and contained two irrigation systems, still functioning into the present time (Earle 1978:34.) Fishponds of the *loko-i`a-kalo* type were situated inland of Hanalei and Wai`oli Rivers (Kikuchi 1987). This type of fishpond not only supported the growing of *kalo* on small mounds (*pu`epu`e)* but, supported fish, crustacean, shellfish and some aquatic plants (see Kikuchi 1987). Along with the three deep valleys of the Halele`a District (Wainiha, Wai`oli, and Lumaha`i), Hanalei, formed one of the most agriculturally productive regions on Kaua`i (Handy and Handy 1972:419).

Coastal zones were utilized for acquiring marine resources and where habitation sites, burials, and ceremonial structures, often associated with fishing, were identified (Bennett 1931). Slightly inland of Hanalei Bay, was "...the preferred area for house sites," because of the coral sandy soils (Earle 1978:29). Hanalei Bay had no reliable ship anchorage for trading due to the susceptibility of the north coast's variable weather conditions and, therefore, never became a major port (Riznik 1987:2).

**PRE-CONTACT PERIOD**

During the pre-Contact Period, the *ahupua`a* of Hanapepe belonged to the district of Kona, the largest of Kaua`i's five traditional political districts. Hanapēpē Ahupua`a contains within its borders the third longest river on Kaua`i, Hanapēpē River, which originates on the slopes of Kawaikini and flows through a valley bordered on both sides by steep canyon walls. The prehistory of Hanapepe remains relatively enigmatic. From the few archaeological investigations of the Hanapepe area, it appears that the settlement pattern was typical of most Kaua`i locations. The pattern consisted of a well-utilized coastal region and by extension, use of the entire ahupua`a.

Nōmilu Fishpond and its surrounding environs are also associated with numerous legends. This area is "...said to have been made by Pele and guarded by Puhi-`ula (red eel) and Puhi-pakapaka (scaly eel), both supernatural eels" (Pukui *et. al.* 1974:166). Salt gathered from its saltpans was the finest and most desired salt in Kaua`i (Wichman 1998:35). Wichman (1998:35) states that, "[p]eople came in the summer to gather salt when the winds blew the salt across the surface of the pond to the edge of the pond." According to Pukui (*et. al.* 1974:166), when there

is volcanic activity on the Big Island, the smell of sulpher is carried by the wind to this area. So, after gathering salt, people placed the salt on leaves as offerings for Pele.

Handy and Handy (1972: 428) mention that Kukuiolono was a famous place in Kalāheo for sweet potato. Wichman (1998) also mentions that bird catching and feather collecting was practiced in the uplands.

Between Kalāheo and the Lima Ola parcel was the *ahupua`a* of Wahiawa, which is described in greater detail then its neighboring Kalāheo. According to Keahi Luahine, a *kama`aina* (native resident), in 1935 taro terraces extended all the way down the valley to the *muliwai* (inlet) (Handy and Handy 1972:428). Handy and Handy (*ibid*) describe Wahiawa, which was renowned for a particular variety of taro, as having an adequate water resource and wet land taro was planted more extensively in this region. Handy and Handy (*ibid*) also mention several springs, which watered terraces and *wauke* (paper mulberry) plantations. Houses and sweet potato plantations were situated above the terraces.

Handy and Handy (1972:428) observed terraces and houses above and below the present highway and abandoned terraces below the bridge on what is now ranchland. Bennett (1931:115) described upper Wahiawa as well, remarking on the extensive number of terraces for such a small area of land.

As for Hanapēpē, Bingham (1848) describes the valley as appearing, "…like an extensive, well watered plantation, interspersed with *kalo* beds and one hundred and forty cottages, and furnishes employment and sustenance to some seven hundred inhabitants."

Handy and Handy (1972: 4290 paint a similar picture of the valley some one hundred and twenty years later when they explored the length of the valley. They observed mostly abandoned house sites and *lo`i* watered by abandoned *auwai*, and stated that "taro terraces are everywhere that the land is irrigable."

**POST-CONTACT PERIOD**

During the early 1800's the islands of Kaua`i and Ni`ihau were the last islands that remained outside the control of King Kamehameha. In 1810 King Kaumuali`i ceded his kingdom to Kamehameha the Great. This was done after Kamehameha had twice failed in his attempts to invade Kaua`i from Oahu. In 1821 Kaumuali`i was taken prisoner by Kamehameha's son,

Liholiho, Kamehameha II, and placed in exile on O`ahu. The following year *ali`i* from O`ahu and other islands arrived to rule Kaua`i. Kaumuali`i died in Honolulu in 1824 and Kauai's lands were given to these newcomer *ali`i.*

In May of 1824 on the plains of `Ele`ele in the general area of the Lima Ola Project George Humehume, son of King Kaumuali`i, led supporters of King Kaumuali`i, in a revolt to regain control of Kaua`i from Kamehameha II. The attempt failed after a prolonged and lopsided battle on these plains. Liholiho (Kamehameha II) destroyed the Kaua`i army and for the next two weeks attempted kill all Kaua`i *ali`i,* and their family members. This event marked the end of Kaua`i as an independent kingdom uniting all the islands under Kamehameha II and suppressing the idea of Kaua`i as a "separate kingdom".

The *ahupua`a* of Hanapepe, meaning "crushed bay" (due to landslides), contained two underground storage tank (UST) removal project locations. During ancient times, the *ahupua`a* of Hanapepe belonged to the district of Kona, the largest of Kaua`i's five traditional political districts.

**WAHI PANA**

Kalāheo has surviving oral histories and several myths that suggest the importance of the area to its traditional occupants. Wichman (1998:33) writes that Kalāheo literally translates as "proud day" and begins at Kāhili peak and extends across the plains between Wahiawa and Lāwa`i, and has a proportionally higher rainfall then Wahiawa. The a*hupua`a* was renown for the huge cinder cone that dominates the region and could be seen from all points within the Kona District from Māhā`ulepū to Kekaha (*ibid*). This cinder cone, Kukuiolono, the light of Lono, was a regionally recognized beacon for navigators within the near and offshore waters of Kona District. A signal fire was kept alight on top of the cone to act as a guide for canoe voyagers and fisherman (Wichman 1998: 33-34).

A notorious battle between Pele and her sister Nāmakaokaha`i at Nōmilu is credited with the creation of the fishpond. The legend is that while Pele was searching for a home on Kaua`i, Nāmakaokaha`i caught up with her at the spot that became Nōmilu. During the battle Pele kicked up dirt, which became the hill Kāpeku. She then caused this hill to erupt, which covered the plains of Wahiawa with rocks. Nāmakaokaha`i flooded the crater with water causing the pond Nōmilu to be formed (Wichman 1998: 35-36). As Pele departed, she turned two large *he`ehe`e* (eels) - Puhi`ula (red eel) and Puhipakapaka (scaly eel)—into stone to guard the pond (Wichman 1998:36).

## THE MĀHELE

The Māhele, the division of Hawaiian lands, introduced the concept of private property into Hawaiian society. The Māhele was initiated by The Organic Acts of 1845 and 1846. In 1848, commissioners of the Māhele instigated an extreme modification to traditional land tenure on all islands that resulted in a division of lands and a system of private ownership. The Māhele was based upon the principles of Western law. While a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society into that of a market economy (Kuykendall Vol. I 1938:145, footnote 47, *et passim*; Daws 1968:111; Kame`eleihiwa 1992:169–170, 176). The dramatic shift from a redistributive economy to a market economy resulted in drastic changes to land tenure, among other things. As a result, foreigners demanded private ownership of land to ensure their investments (Kuykendall Vol. I, 1938:145, *et passim*; Kame`eleihiwa 1992:178; Kelly 1983:45).

Once lands were made available and private ownership was instituted, native Hawaiians, including the *maka`āinana* (people of the land), were able to claim land plots upon which they had been cultivating and living. Oftentimes, foreigners were simply just given lands by the *ali`i*. However, commoners would often only make claims if they had first been made aware of the foreign procedures (*kuleana* lands, or land commission awards). These claims could not include any previously cultivated or currently fallow land, *okipu*, stream fisheries, or many other natural resources necessary for traditional survival (Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). Awarded parcels were labeled Land Commission Awards (LCAs). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property. Commoners claiming house lots in Honolulu, Hilo, and Lāhainā were required to pay commutation to the government before obtaining a Royal Patent for their awards (Chinen 1961:16).

Based on the map for TMK (4) 2-1-01, the project area composes a portion of a larger acreage that was awarded to M. Kekuanaoa under the LCA 7712, Apana 5 (Appendix E). To summarize the LCA in terms of archaeological resources across this vast LCA (only a small portion which composes the project area), empirical sites include *auwai*, fishpond, rice fields, stone walls or "stone fences", piles of stones, a cave, and cultivation areas. The large LCA extends from the coastline to the mountain tops and incorporates most, if not all, of the *ahupua`a*. The LCA lands were chiefly for grazing purposes as the lands were classified as "very stony," with some rice agricultural occurring in valleys in limited breadth (see Appendix E). Currently, the property owner and developer is the County of Kaua`i Housing Agency.

**MCBRYDE SUGAR COMPANY**

The namesake of the McBryde Sugar Co was Duncan McBryde. In the mid 1800s Duncan McBryde arrived from Dunoon, Argyleshire, Scotland and acquired land in Wahiawa and began to develop an extensive ranch. McBryde leased the Wahiawa lands from Kōloa to `Ele`ele from Kauikeaouli (Kamahameha III) in 1857. In 1874 he purchased the land from the estate of Kamahameha V. He built his home at Brydeswood with his wife Elizabeth Amelia Moxley in the upper end of Wahiawa District. They had six children. Duncan McBryde died at the age of 52 in 1878 leaving Elizabeth a widow with six young children and the ranch. In 1886 Elizabeth acquired the *ahupua`a* of Lāwa`i from the estate of Queen Emma. Elizabeth McBryde managed and operated the ranch that stretched from `Ele`ele to Kōloa until the founding of the McBryde Sugar Co. (Sandison 1956).

Walter McBryde, the second son of Duncan and Elizabeth McBryde, held various positions within the Hawai'i and local Kaua`i business communities, including being a representative to the legislature of the provisional government (Sandison 1956). He was involved in the initial organization of the McBryde Sugar and became the manager of Kaua`i Pineapple Co. in 1906, a subsidiary company of McBryde Sugar.

McBryde Sugar formed in 1889 was promoted by a group headed by B.F. Dillingham, who also created plantations at `Ōla`a and Kīhei. The company was created by the merger of three families, the Smith family of Koloa Agricultural Company, the Dreiers of `Ele`ele Plantation, begun in 1884, and the McBrydes vast Wahiawa Ranch.

Kōloa Agricultural originated in 1870 in the western portion of the *ahupua`a* of Kōloa on land leased from the Knudsens. The Smiths grew cane on this land. The land was later conveyed by Mrs. Knudsen to the heirs of J.W. Smith. In 1896 said heirs conveyed their interests in the land to Koloa Agricultural Company. The Smiths also owned 750 acres of the land of `Ōma`o. `Ele`ele, the Dreiers plantation. In 1884 Bernice Pauahi Bishop sold the *`ili* of `Ele`ele to Elizabeth McBryde and August Dreier. The plantation at `Ele`ele had profited, and a mill was constructed at the village. The area now known as Port Allen was the original landing for the plantation. Dreier bought out Elizabeth McBryde's interest in the land in 1895. In 1899, Dillingham then bought out August Dreier for 500,000 dollars in cash for the `Ele`ele Plantation.

Dillingham then issued 55,000 shares of stock to the McBryde family in consideration of the conveyance of nearly all of their Wahiawa land holdings and all the stock of the Koloa Agricultural, which they had come to acquire. Stocks were offered to the public and were quickly taken up. Once the establishment of the McBryde Sugar was completed, plans quickly moved ahead to develop the lands into a large plantation with the required infrastructure to create a successful and profitable plantation.

Immediate plans to clear the land and create an irrigation system ensued. Development costs were high, as the land needed extensive clearing and water had to be brought from great distances. It was during this early phase of development in 1909, that McBryde Sugar was acquired by Alexander and Baldwin Corp. It was during this initial phase of development and later in 1929 to 1933 during an improvement program that vast changes of the landscape occurred. Changes were made to the natural stream flow due to the creation of a reservoir system and a series of pipelines with associated ditches and dikes to distribute water across the landscape for large-scale commercial agriculture. Tunnels and wells were excavated within the floor of Hanapepe Valley and stream pumping plants were installed. These plants immediately proved inefficient and costly putting the plantation in debt in direct relation to high costs associated with pumping water from underground sources as the salt water lens was higher than predicted and fuel costs were high to operate the pumps.

In 1903, a fifty-year license for hydroelectric power from Wainiha stream was acquired by W.E. Rowell, an associate of McBryde Sugar (Figure 4). At this time Kaua`i Electric Co. was formed as a subsidiary of McBryde Sugar. The Wainiha Plant was built and established with a power line to the plantation in `Ele`ele. Pumps were converted to electricity and fuel related costs dropped immediately. A vast system of reservoirs was created at this time with a combined holding capacity of 800 million gallons (Wilcox 1996). However, expenditure related to creating this infrastructure caused such financial burdens into the late 1920s that the plantation would not be able to operate and be profitable until a complete renovation occurred.

These financial challenges led to the creation of the improvement program carried out from 1929 to 1933. These improvements consisted of the construction of Alexander Reservoir with a storage capability of 810,000,000 gallons, the concrete lining of miles of the principle irrigation ditches on the plantation, replacement of inefficient machinery, and the construction of a hydroelectric plant. Due to the efficiency created by these improvements, the plantation was released of its debt obligations in 1932.

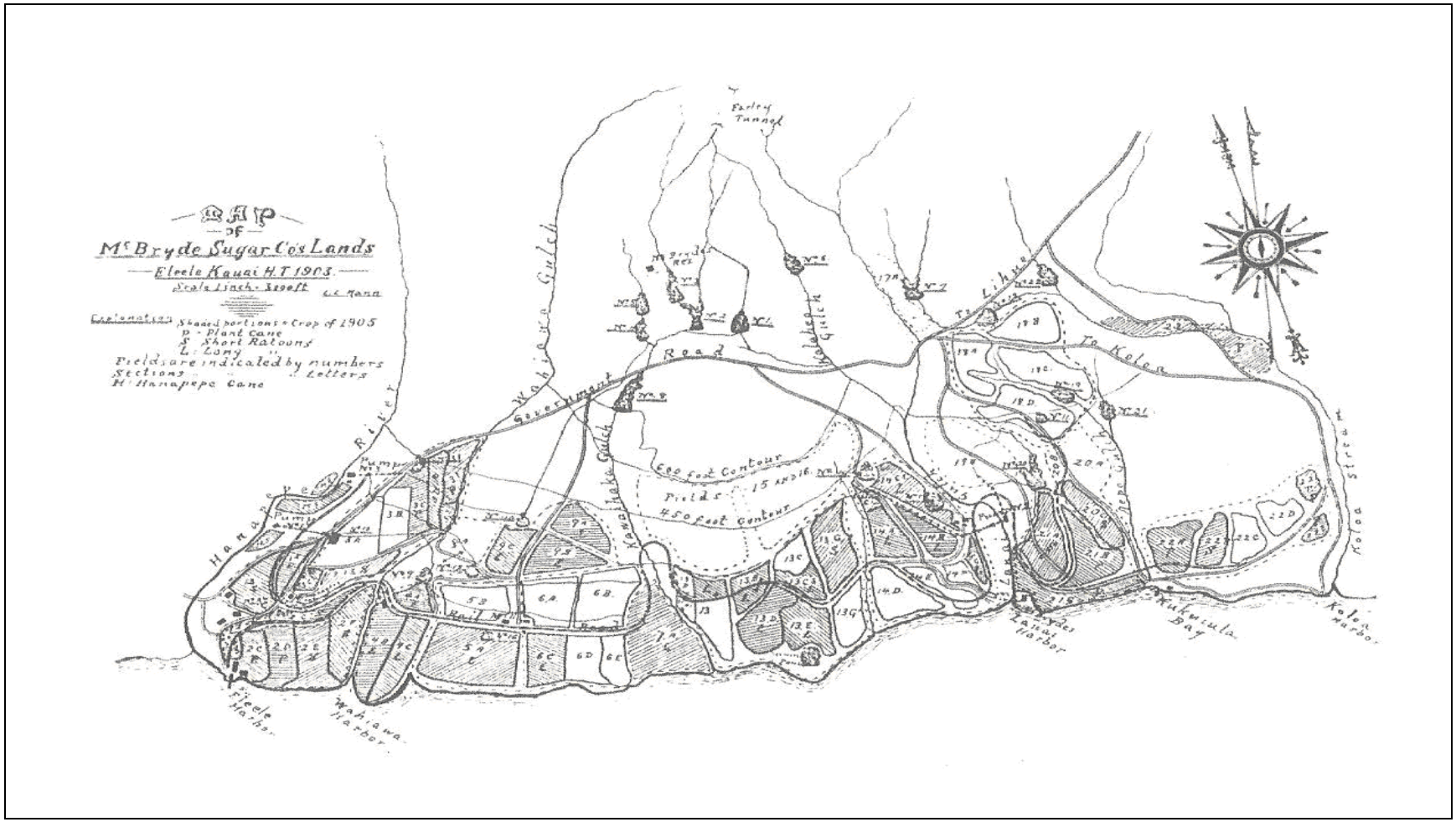


**Figure 4**: **McBryde Plantation 1903 (Kaua`i Historical Society)**

McBryde Sugar obtained additional subsidiary companies such as the Kaua`i Railway Company and Kaua`i Pineapple. The development of these companies brought additional land use changes to the area including the creation of a rail system connecting various points on the plantation to P\ort Allen and the development of truck farming on portions of the land. Infrastructure and remnants related to these modifications exist throughout the landscape. McBryde Sugar was also instrumental in development of Port Allan as a harbor with shipping facilities (Star Bulletin November 2, 1935). McBryde Sugar acquired a large portion of the Grove Farms sugar fields in 1974. During this last twenty years, sugar was supplemented with coffee. McBryde Sugar continued to operate until 1995 when it fell to economic pressures involved in growing sugar in Hawai`i. McBryde stopped producing sugar officially on July 1996 when the Koloa Mill was shut down for good. McBryde Sugar was terminated and replaced by Kaua`i Coffee Company, which continues to grow coffee to the present day.

## ARCHAEOLOGY

The earliest documentation of archaeological sites in Kaua`i was recorded by Wendall C. Bennett (1931; Figure 5). Eleven sites (Bennett Sites 49-60) were identified in the *ahupua`*a of Hanapēpē. They are of various types including sand dune burials, *heiau*, house sites, terraced *lo`i,* and a possible fishing shrine. A table with location and short description follows. The archaeological sites identified during Bennett's (1931) study located in Hanapēpē Ahupua`a are listed in Table 1. Bennett's (1931) work in the area includes the *ahupua`*a of Wahiawa and Kalāheo which borders Wahiawa to the east, listed in Table 2. Bennett's work in Kalāheo Ahupua`a is presented in Table 3.

Bennett Sites 49 through 68 located on both sides of the project area may have influenced activities across the area but lacking any surviving surface features or unique resources SCS is forced to assume that this area was undeveloped during traditional times or the sites have been destroyed during the plantation era.

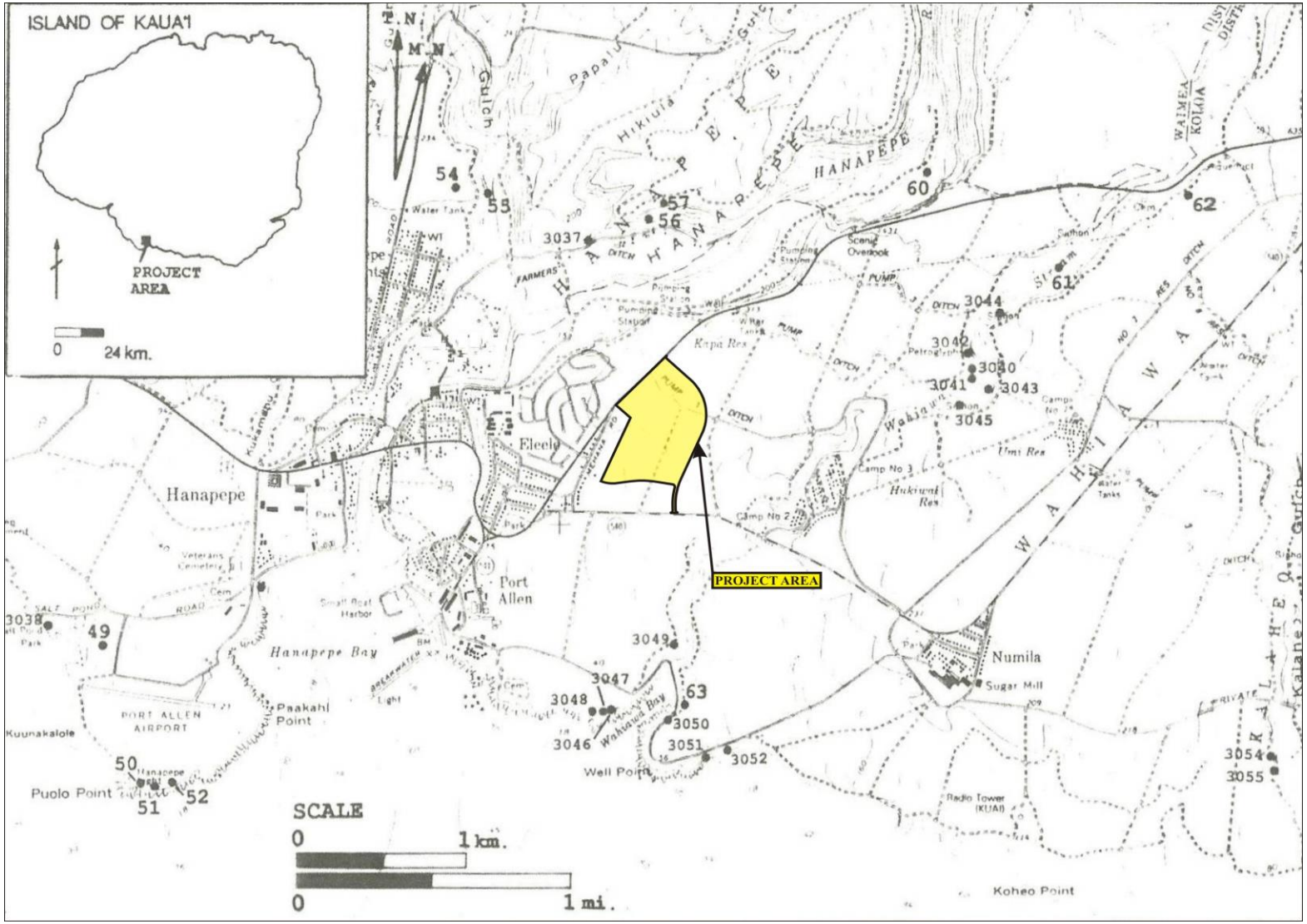


**Figure 5: Previously Identified Archaeological Sites in the Ahupua`a of Hanapēpē, Wahiawa and Kalāheo**

**Table 1: Sites Identified by Bennett (1931) Located in Hanapēpē Ahupua`a**

| Bennett Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 49 | Salt Pan | Near Puolo Point | "…natural flat area on which sea water could evaporate" | NA<br>Still in use |
| 50 | House sites | At Puolo Point | "…many house sites on the flat land near the salt pans, (Site 49)" | NA |
| 51 | Kauakahiunu Heiau | At Puolo Point | "A wall heiau of medium size at the shore, part of the walls still standing." 80 x 60 feet.<br>"Kane and Kanaloa are its deities" | "site is now slightly marked by crumbled stones." |
| 52 | House site or fishing shrine | At Puolo Point<br>Just east of Site 51. | "…front part of this structure rests on beach stones." Composed of three sections two paved with small beach pebbles and one with larger stones. Size approximately 35 by 27 feet irregular shape. | NA<br>He was able to measure it so it must have been in fair condition. |
| 53 | Sand Burials | "In the sand on the northwest side of Hanapepe bay." | Burials in the sand | Today it is the Site of modern cemetery |
| 54 | Makole Heiau | "on Makole bluff" | Thrum describes it as "A small heiau of platform character on the side of the bluff destroyed in the sixties." | Thrum, "None of the walls could be found" |
| 55 | Pualu Heiau | East side of Kapahili Gulch, a quarter mile from the road. | "…a single platform, 142 by 50 feet, built up in the front 6 feet and backed by a wall 3 to 4 feet wide."<br>"… whole structure paved with 3 to 4 inch stones but very much disturbed…" | NA |
| 56 | Akowai Heiau | "…at a place called Akowai on the steeply sloping side of a bluff." | Described by Thrum as, "a small paved heiau of about 50 feet square, in bad condition …. Destroyed about 1865." | "The site today includes a number of well-built house sites (Site 57) and a jumbled mass of walls said to have been the heiau." |
| 57 | House sites at Akowai | Near Site 56 | "… three well paved house sites." | Unknown |
| 58 | Taro terraces | Manuahi Valley | "Like Site 60 this site is completely terraced for taro and contains similar house sites." | Unknown |
| 59 | Moloku Heiau | "… near the peak of Kuopoo ridge at its junction with Kahalau." | Described by Thrum as, "An open platform heiau in fair condition." | Fair |
| 60 | Taro terraces and house sites | "In Hanapepe Valley the taro terraces are everywhere that the land is irrigable." | "House types are of the usual type." | Taro is still being grown in the valley probably using many of the old loi. |

**Table 2: Sites Identified by Bennett (1931) Located in Wahiawa Ahupua`a**

| Bennett Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 61 | Taro Terraces | Wahiawa Valley | "the remains of terraces are remarkable in places for there number.' "There are platform house sites in the valley; burial caves and petroglyphs are also reported." | Unknown |
| 62 | Waipopili Heiau | "… on the bluff on the east side , a short on the distance seaward side of the government road." | Described by Thrum as "An oblong heiau of good size walls still standing." | Thrum continues, "… in clearing the fields of stone the heiau has been obscured so far as any plan is concerned." |
| 63 | Huhuakai Heiau | Wahulua Bay | Described by Thrum as "… [a] medium sized heiau; a portion of its walls may yet be seen. Class unknown." | Thrum, " Nothing that would identify it as a heiau now remains |

**Table 3: Sites Identified by Bennett (1931) Located in Kalāheo Ahupua`a**

| Bennett Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 64 | House sites | "in Kalaheo Gulch at the sea." | Most of the house sites are stone platforms 15 feet square. Some have low walls on three sides. There are fire places on some…" | Unknown. |
| 65 | Kahalekii Heiau | "on the western slope of Kukuiolono hill." | "The heiau is now completely destroyed, but Thrum describes it as "A square three terraced heiau of large size, with several divisions: was highwalled and paved; class unknown." | Unknown |
| 66 | Kukuiolono Heiau | "…on Kukuiolono Hill…" | "…now destroyed." Thrums Description: " A large three terraced heiau, east section being 95 by 112 feet, mid-section 105 by83 feet and west division 105 by 51 feet…" | Unknown |
| 67 | Fishpond salt pans, and taro terraces | Nomilu | "…large, natural, salt water pond with no artificial work done to it." There were salt pans, terraces, walls and perhaps a burial cave. | Most of these structures are probably still in tact as the area is off limits to the general public. |
| 68 | Kapoho Heiau | "…inland of from the fishpond at Nomilu, Kalaheo | "Thrum speaks of this structure as "a large heiau mauka of the fish-pond; destroyed some years ago. Portions of its division walls yet to be seen." | "So much changing has gone on in this region it is hard to say which of the rough stone walls remaining are the ones mentioned by Thrum. |

William K. Kikuchi (1963) conducted an extensive archaeological survey of the Kona District of Kaua`i in 1963. Twenty-three sites were identified in Kalāheo Ahupua`a—many of which were individual components previously recorded as complexes by Bennett. Along the coast, a shelter cave (Site 25) near the western border of the *ahupua`a* at Lokoawa was

identified. Five sites (Sites 26–30) were identified at Kawaihaka Stream valley. These consist of a shelter cave, stone walls, house sites, a spring, and a historic tunnel. Five sites (Sites 31–35) were recorded along the coast between Nōmilu and Kawaihaka and include a fishing shrine, house sites, and shelter caves. Kikuchi recorded seven sites (Sites 36–42) at Nōmilu. These include Nōmilu Fishpond, walls, saltpans, a historic tunnel, and Kapoho Heiau (1963). Three sites (Sites 43–45) were recorded at the eastern *ahupua`a* boundary and include an enclosure, walls, and a fishing shrine. In the uplands, within the present day Kukuiolono park, Kikuchi rerecorded Kukuiolono Heiau (Site 66) and Kahaleki`i Heiau (Site 65), although no physical remnants of the sites exist (Kikuchi 1963).

In 2014, Scientific Consultant Services, Inc. conducted an Archaeological Inventory Survey of the subject property (Powell and Dega 2014, in preparation). During the survey, a single, historic plantation era site, designated as State Site 50-30-09-2219, was identified. The parcel has been active for sugar cane production since the late 1800s and at present, industrial-level coffee cultivation occurs on the parcel.

Other archaeological studies conducted in the area include a study by Folk and Hammatt (1991) who conducted inventory survey and testing of LCA 6647 in Kalāheo. The study produced negative results. The absence of cultural deposits was posited to be a result of modifications related to a proposed reservoir system that included the entire perimeter of LCA 6647. Additionally, Nancy McMahon (1988) conducted a survey within TMK 2-4-01:12. This study revealed the presence of historic earthen terraces related to pineapple cultivation.

Kukuiolono Park to the south and on the *makai* side of Kaumuali`i Highway contains an artifact display of broad diversity collected throughout the region during the plantation era by Walter McBryde, descendant of Duncan McBryde (founder of McBryde Sugar Company). This collection includes a phallic stone, Pohakuhunaahuula Stone, Pohakuawa Stone, and the Kaua`i Iki Stone. The large upright phallic stone was considered to be reverent to the fish god, Pohakuloa. This stone revered by the ancients was collected from its original location, at the junction of trails to the beach above McBryde Mill (Sandison 1956). Pohakuhunaahuula, the feather cloak stone is reputed to be associated with the *ali`i*, Ola. This artifact was relocated to the park from its original location near Brydeswood. During times of war, the *ali`i* hid the cloak under the rock and covered it with *`uala lau* as a form of camouflage (Sandison 1956).

Pohakuawa is a very large boulder with a large carved concave basin depression that holds a substantial volume of water. The density of the basalt slows the percolation process and

allows for the water to remain in the basin for long periods of time. The stone artifact was brought to the park from its original location, reportedly a mile west of Brydeswood on the trail to upper reaches of Wahiawa lands. The legends associated with the stone state that a fisherman stopped for the night at Pohakuawa and stored his catch of live *awa* in the cool waters of the stone draped with *`uala lua* to keep the stone cool and to prevent the fish from jumping out.

Kaua`i Iki is a large, boulder-shaped stone like the island of Kaua`i. This stone was relocated to the park from its original location in Wahiawa. The legend of the stone is that a Hawaiian family was clearing their *loi* of rocks when they came across this rock. Noticing its resemblance to the island of Kaua`i, they decided to leave it in place and gave it its name (Sandson 1956).

## CONSULTATION

Consultation was conducted via telephone, e-mail, personal interviews, and the U.S. Postal Service. Consultation was sought from Dr. Kamana`opono M. Crabbe, Chief Executive Officer, Office of Hawaiian Affairs; Hinano Rodrigues, State Historic Preservation Division, Maui; Kunane Aipolani, Chair, Kaua`i Island Burial Council; William Ho`ohuli, community member; Glenn K. Kapahu, community member; John Kruse, community member; Rhoda L. Libre, community member; Joseph P. Manini, community member; Leah Perreira, community member; Ronson K. Sahut, community member; Beryl Blaich, community member; Kuulei Santos, community member; and Wilma H. Holi, community member.

In addition, a Cultural Impact Assessment Notice was published on October 9, 10, and 13, 2013, in *The Honolulu Star-Advertise*r and in *The Garden Isle News*, which published on the same dates on Kaua`i, and November 2013 issue of the OHA newspaper, *Ka Wai Ola* (see Appendix B). These notices requested information of cultural resources or activities in the area of the proposed project, stated the Tax Map Key (TMK) number, and where to respond with pertinent information. Based on the responses, an assessment of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

## CULTURAL IMPACT ASSESSMENT INQUIRY RESPONSES

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural

practices take place is a requirement of the OEQC (2012:13). As stated earlier, this includes the cultural resources of the different groups comprising the multi-ethnic community of Hawai`i.

One response to SCS's request seeking information pertaining to traditional cultural practices conducted in the vicinity of the proposed development site was received from one individual, Sabra Kauka, Department of Education, Hawaiian Studies Coordinator, Kauai Complex. Mrs. Kauka's comments were received via e-mail dated March 12, 2014, and are summarized below (see Appendix D).

**Sabra Kauka**

Mrs. Kuaka stated that John Kruse gave her the SCS letter requesting information on cultural sites in the 75-acre Lima Ola Work Force Housing Development Project in Hanapēpē. Sabre Kauka, in turn, showed the SCS letter of inquiry to Kupuna Janet Kahalekomo, as she is the oldest link, in the Hawaiian Studies Kupuna program, to the Hanapēpē area, and she is quite knowledgeable. Kupuna Kahalekomo said that the area has been in either sugar cane or coffee production for her whole life. So any cultural sites that may have been there are long gone. Kupuna Kahalekoma, also, stated that Francis Ching surveyed the area in the 1950s and wrote a report.

## SUMMARY

The "level of effort undertaken" to identify potential effect by a project to cultural resources, places or beliefs (OEQC 2012) has not been officially defined and is left up to the investigator. A good faith effort can mean contacting agencies by letter, interviewing people who may be affected by the project or who know its history, research identifying sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. Sending inquiring letters to organizations concerning development of a piece of property that has already been totally impacted by previous activity and is located in an already developed industrial area may be a "good faith effort". However, when many factors need to be considered, such as in coastal or mountain development, a good faith effort might mean an entirely different level of research activity.

In the case of the current undertaking, letters of inquiry were sent to individuals and organizations that may have knowledge or information pertaining to the collection of cultural resources and/or practices currently, or previously conducted in close proximity to the proposed development and construction of the Lima Ola Work Force Housing Development Project to be

located on approximately 75 acres of undeveloped land of land located in Hanapēpē Ahupua`a, Kona District, Kaua`i Island, Hawai`i [TMK: (4) 2-1-001:054].

Historical and cultural source materials were extensively used and can be found listed in the References Cited portion of the report. Such scholars as Samuel Kamakau, Martha Beckwith, Jon J. Chinen, Lilikalā Kame`eleihiwa, R. S. Kuykendall, Marion Kelly, E. S. C. Handy and E.G. Handy, Elspeth P. Sterling, and Mary Kawena Puku`i and Samuel H. Elbert and continue to contribute to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina Database (2012) and the Office of Hawaiian Affairs Papakilo Database (2013).

## CULTURAL ASSESSMENT AND RECOMMENDATIONS

Analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is also a suggested guideline of the OEQC (2012). Based on historical research, and no additional suggestion for contacts, analysis of the potential effect of the project on cultural resources, practices or beliefs, its potential to isolate cultural resources, practices or beliefs from their setting, and the potential of the project to introduce elements which may alter the setting in which cultural practices take place is a requirement of the OEQC (2012). As indicated by the responses received fro the community, the project area has not been, and is not currently, used for traditional cultural purposes.

Based on the above research and the comments received from the community, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to numerous traditional cultural practices including, gathering, access, cultivation, the use of traditional plants, *oli* (chanting) and *ha`a* (dancing), and making traditional tools (i.e., *poi* pounders, *poi* boxes), will not be impacted by the proposed undertaking.

## REFERENCES


Bennett, Wendall C.
1931 *The Archaeology of Kaua`i*, Bishop Museum Bulletin 80, Honolulu.

Bingham, H.
1848 *Residence of Twenty-One Years in the Sandwich Islands*. University of Michigan.

Chinen, J,J.
1961 *Original Land Titles in Hawaii*. Copyright 1961. Jon Jitsuzo Chinen.

Daws, Gavin
1968 *Shoals of Time*. University of Hawaii Press. Honolulu.

Folk, W.H. and H.H. Hammatt
1991 *Archaeological Survey and Subsurface Testing of Land Commission Award 6647 at Kalaheo, Kaua`i, Hawai`i (TMK:4-2-3-02:22*). Cultural Surveys Hawai`i, Kaneohe.

Earle, Timothy
1978 Economic and Social Organization of A Complex Chiefdom: The Halelea District, Kaua`i, Hawaii. *Anthropological Papers, Museum of Anthropology*, University of Michigan, No. 63. Ann Arbor, Michigan.

Foote, D.E., E. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Oahu, Maui, Molokai, and Lanai, State of Hawaii*. U.S. Department of Agriculture Soil Conservation Service, Washington, D.C.

Handy, E.S., and E.G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment.* Bishop Museum, Bulletin 233. Honolulu.

Kamakau, Samuel
1961 *Ruling Chiefs of Hawaii*. The Kamehameha Schools Press: Honolulu.

Kame`eleihiwa, Lilikalā
1992 *Native Land and Foreign Desires*. Bishop Museum Press, Honolulu.

Kelly, Marion
1983 *Nā Māla o Kona: Gardens of Kona*. Dept. of Anthropology Report Series 83-2. Bishop Museum. Honolulu.

Kikuchi, William K
1963 Archaeological Survey and Excavations on the Island Kaua`i, Kona District Hawaiian Islands.

1987 The Fish Ponds of Kaua'i. *Archaeology in Kaua'i 14(1):32. Kaua'i Community College, Lihu'e, Hawai'i.*

Kirch, Patrick Vinton
1985 *Feathered Gods and Fishhooks, An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.

Kirch P.V., and M. Sahlins
1992 *Anahulu: The Anthropology of History in the Kingdom of Hawaii, Volume 1: Historical Ethnography*. University of Chicago Press, Chicago.

Kuykendall, R.S.
1938 *The Hawaiian Kingdom*. Vol. 1. University of Hawai`i Press. Honolulu.
.
Lucas, Paul F. Nahoa
1995 *A Dictionary of Hawaiian Legal Land-terms*. Native Hawaiian Legal Corporation. University of Hawai`i Committee for the Preservation and Study of Hawaiian Language, Art and Culture.. University of Hawai`i Press.

Lyons, C. J.
1875 "Land Matters in Hawaii 2," The Islander, June 9, 1875. Honolulu, Hawai`i.
Macdonald, G.A., A.T. Abbot, and F.L. Peterson
1983 *Volcanoes in the Sea: The Geology of Hawaii*. 2nd ed. University of Hawaii Press: Honolulu.

McBryde Sugar Company
1899 -1949 The Story of McBryde Sugar Company, Ltd.,

McMahon, Nancy
1988 State of Hawai`i, Department of Land and Natural Resources Letter to File from Nancy McMahon Job # 87-9, TMK 2-4-04:5. State Historic Preservation Division. On file at the State Historic Preservation Division, Kapolei.

Moffat, Riley M. And Gary L. Fitzpatrick
1995 *Surveying the Māhele*. An Editions Book. Hong Kong.

Parker, Patricia L., and Thomas F. King
1990 *Guidelines for Evaluating and Documenting Traditional Cultural Properties*. National Register Bulletin 38. Washington, D.C.: National Park Service.

Pukui, M.K., S.H. Elbert, and E.T. Mookini
1974 *Place Names of Hawaii.* Revised and Expanded Edition. University of Hawaii Press, Honolulu.

Powell, Jim and Michael Dega

2014 *An Archaeological Inventory Survey of a 75 Acre Parcel in the Ahupua`a of Hanapēpē, District of Kona, Kaua`i Island, Hawai`i [TMK: (4) – 2-1-01:054]*. Scientific Consultant Services, Inc. Honolulu. (In prep.).

Pukui, M.K., and S.H. Elbert
1992 *Place Names of Hawaii*. University of Hawaii Press, Honolulu.

Riznik, Barnes
1987 *Wai`oli Mission House, Hanalei, Kauai. Grove Farm Homestead and Wai`oli Mission House*. Grove Farm Kaua`i.

Sandison, John
1956 *Walter Duncan McBryde and Kukuiolono Park*. Hamilton Library, Pacific Collections, University of Hawai`i at Mānoa.

Star Bulletin
1935 Hawaiian Sugar Plantation History, No 36—McBryde Island of Kaua`i, November 2, 1935.

State of Hawaii Office of Environmental Quality Control
2012 *Guide to the Implementation and Practice of the Hawaii Environmental Policy Act, 2012 Edition*. State of Hawaii, Office of Environmental Quality Control, Honolulu. (http:// www.hawaii.gov/health/environmental/oeqc/index.html).

The Hawaiian Sugar Planters' Association Plantation Archives
University of Hawaii at Manoa Library, Hawaiian Collection/Special Collections.

Waihona `Aina Database
2014 https://www.waihona.com. Accessed December 2014.

Wichman, Frederick B.
1998 Kaua`i Ancient Place Names and Their Stories, University of Hawai`i Press, Honolulu.

Wilcox, C.
1996 *Sugar Water: Hawai`i's Plantation Ditches*. University of Hawai`i Press, Honolulu.

# APPENDIX A: EXAMPLE LETTER OF INQUIRY

Dear:

In compliance with the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health’s Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i on November 19, 1997, Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to the proposed 75-acre Lima Ola Work Force Housing Development Project in Hanapēpē Ahupua`a, Kona District, Island of Kaua`i, Hawai`i [TMK:(4)–2-1-001:054] (Figures 1 through 3).

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man-made and natural which support such cultural beliefs…

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the project area. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed housing development. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as yourself.

Enclosed are maps showing the proposed project areas. Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 or via e-mail (cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely,

Cathleen Dagher
Senior Archaeologist

Cc:

# APPENDIX B: POSTED NOTICE AND AFFIDAVITS

Information requested by Scientific Consultant Services, Inc. (SCS) on cultural resources and traditional, or on-going, cultural activities on or near the proposed Lima Ola Housing Development Project, `Ele1ele `Ili, Kalaheo Ahupua`a, Kona District, Island of Kaua`i, Hawai`i [TMK: (4) 2-1-001:054]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.

(1456)

**AFFIDAVIT OF PUBLICATION**

**IN THE MATTER OF**
Legal Notice

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**STATE OF HAWAII** }
} **SS.**
**City and County of Honolulu** }

**Doc. Date:** OCT 14 2013 **# Pages:** 1
**Notary Name:** Patricia K. Reese First Judicial **Circuit**
**Doc. Description:** Affidavit of Publication

Patricia K. Reese OCT 14 2013
Notary Signature Date

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Information requested by Scientific Consultant Services, Inc. (SCS) on cultural resources and traditional, or on-going, cultural activities on or near the proposed Lima Ola Housing Development Project, 'Ele'ele 'Ili, Kalaheo Ahupua'a, Kona District, Island of Kaua'i, Hawai'i [TMK: (4) 2-1-001:054]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.

(TGI565236 10/9, 10/10, 10/13/13)

Rose Rosales being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 0 times on:

Midweek Wed. 0 times on:

The Garden Island 3 times on: 10/9, 10/10, 10/13/13

And that affiant is not a party to or in any way interested in the above entitled matter.

Rose Rosales

Subscribed to and sworn before me this 14th day
of Oct A.D. 2013

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Ad # 0000565236

LN:_____

(1456)

**AFFIDAVIT OF PUBLICATION**

**IN THE MATTER OF**
Legal Notice

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**STATE OF HAWAII** }
} **SS.**
**City and County of Honolulu** }

**Doc. Date:** OCT 14 2013 **# Pages:** 1
**Notary Name:** Patricia K. Reese First Judicial **Circuit**
**Doc. Description:** Affidavit of Publication

Patricia K. Reese OCT 14 2013
Notary Signature Date

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Information requested by Scientific Consultant Services, Inc. (SCS) on cultural resources and traditional, or on-going, cultural activities on or near the proposed Lima Ola Housing Development Project, 'Ele'ele 'Ili, Kalaheo Ahupua'a, Kona District, Island of Kaua'i, Hawai'i [TMK: (4) 2-1-001:054]. Please respond within 30 days to Cathleen Dagher at (808) 597-1182.
(SA565233 10/9, 10/10, 10/13/13)

Rose Rosales being duly sworn, deposes and says that she is a clerk, duly authorized to execute this affidavit of Oahu Publications, Inc. publisher of The Honolulu Star-Advertiser and MidWeek, that said newspapers are newspapers of general circulation in the State of Hawaii, and that the attached notice is true notice as was published in the aforementioned newspapers as follows:

Honolulu Star-Advertiser 3 times on:
10/09, 10/10, 10/13/2013

Midweek Wed. 0 times on:

_____ times on:

And that affiant is not a party to or in any way interested in the above entitled matter.

Rose Rosales

Subscribed to and sworn before me this 14th day
of Oct A.D. 2013

Patricia K. Reese, Notary Public of the First Judicial Circuit, State of Hawaii
My commission expires: Oct 07 2014

PATRICIA K. REESE NOTARY PUBLIC Comm. No. 86-467 STATE OF HAWAII

Ad # 0000565233

LN:_____

# APPENDIX C: EXAMPLE FOLLOW-UP LETTER

Dear:

This is our follow-up letter to our March 12, 2014 letter which was in compliance with the statutory requirements of the State of Hawai‘i Revised Statute (HRS) Chapter 343 Environmental Impact Statements Law, and in accordance with the State of Hawai`i Department of Health’s Office of Environmental Quality Control (OEQC) Guidelines for Assessing Cultural Impacts as adopted by the Environmental Council, State of Hawai`i, on November 19, 1997.

Scientific Consultant Services, Inc. (SCS) is in the process of preparing a Cultural Impact Assessment (CIA) pertaining to the proposed 75-acre Lima Ola Work Force Housing Development Project in Hanapēpē Ahupua`a, Kona District, Island of Kaua`i, Hawai`i [TMK:(4)–2-1-001:054].

According to the *Guidelines for Assessing Cultural Impacts* (Office of Environmental Quality Control, Nov. 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs…The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural which support such cultural beliefs…

We are asking you for any information that you or other individuals have which might contribute to the knowledge of traditional cultural activities that were, or are currently, conducted in the vicinity of the project area. We are also asking for any information pertaining to traditional cultural activities or traditional rights which may be impacted by the proposed housing development. The results of the cultural impact assessment are dependent on the response and contributions made by individuals, such as yourself.

Please contact me at the Scientific Consultant Services, Honolulu, office at (808) 597-1182 or via e-mail (cathy@scshawaii.com) with any information or recommendations concerning this Cultural Impact Assessment.

Sincerely,

Cathleen Dagher
Senior Archaeologist

Cc:

# APPENDIX D: RESPONSES TO INQUIRIES

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
737 IWILEI ROAD, SUITE 200
HONOLULU, HAWAI'I 96817

HRD14/7084

May 2, 2014

Cathleen Dagher – Senior Archaeologist
Scientific Consultation Services, Inc.
1347 Kapi'olani Blvd., Suite 408
Honolulu, HI 96814

Re: Cultural Impact Assessment
Proposed 75-Acre Lima Ola Work Force Housing Development Project
Hanapēpē Ahupua'a, Kona District, Kaua'i Island
Tax Map Key: (4) 2-1-001:054

Aloha e Cathleen Dagher,

The Office of Hawaiian Affairs (OHA) is in receipt of your March 12, 2014 letter and most recent April 18, 2014 letter initiating consultation and seeking comments ahead of a cultural impact assessment for the proposed 75-acre Lima Ola Work Force Housing development project in Hanapēpē district. OHA has no comment specific to the above proposed project at this time.

We applaud your efforts to perform a cultural impact assessment. OHA does request assurances that should iwi kūpuna or Native Hawaiian cultural or traditional deposits be identified during ground altering activities related to this project, all work will immediately cease and the appropriate agencies will be contacted pursuant to applicable law. OHA would like to be notified and consulted if burials are found.

Thank you for initiating consultation at this early stage. Should you have any questions, please contact Kathryn Keala at 594-0272 or kathyk@oha.org.

'O wau iho nō me ka 'oia'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer
Office of Hawaiian Affairs

KMC:kk

Print | Close Window

**Subject:** Lima Ola Work Force Housing Development Project
**From:** Sabra Kauka <sabrakauka@aol.com>
**Date:** Thu, Apr 03, 2014 12:05 am
**To:** "cathy@scshawaii.com" <cathy@scshawaii.com>
**Cc:** Janet Kahalekomo <Janet_Kahalekomo/ELEELE/HIDOE@notes.k12.hi.us>, Kunane Aipoalani <kunane.aipoalani@navy.mil>, Ronson Keali'i Sahut <ronsonkealii@hotmail.com>, Beryl Blaich <blaich@aloha.net>

Re. Your letter of March 12, 2014 to John Kruse

Aloha Cathy,
John Kruse gave me your letter today of March 12, 2014 requesting any information on cultural sites in the 75-acre Lima Ola Work Force Housing Development Project in Hanapepe.

I showed the letter to Kupuna Janet Kahalekomo, Ronson Sahut's grandmother, at her school in 'Eleele. I coordinate the Hawaiian Studies Kupuna on Kauai and Kupuna Kahalekomo is the oldest link that the program has to the Hanapepe area. She is quite knowledgeable.

She said that the area has been in either sugar cane or coffee production for her whole life. So any cultural sites that may have been there are long gone. She is familiar with cultural sites lower in the Wahiawa Valley closer to the ocean, as her mother lived there. But that's not the area you are interested in.

She also said that Francis Ching surveyed the area in the 50's and published a report. I think you are probably familiar with it already.

That's all I have to add. I just wanted to let you know I followed up on John's request.

Aloha,
Sabra Kauka
Dept. Of Education Hawaiian Studies
Coordinator, Kauai Complex
652-1978

Sent from my iPad

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# APPENDIX E: LAND COMMISSION AWARD 7712

# Land Patent No. 4751

(Grant.)

On Land Exchange

By this Patent the Governor of the Territory of Hawaii, in conformity with the laws of the United States of America and of the Territory of Hawaii, makes known to all men that he has this day granted and confirmed unto

H. M. Von Holt

for the consideration of One Dollars, $ 1.00 paid into the Treasury.

And for the further consideration of a deed to the Government of the Territory of Hawaii of lands situate in the City of Honolulu, Island of Oahu, required of road purposes from H. M. Von Holt, the receipt of which is hereby acknowledged.

all of the land situate at Luluali

in the District of Waianae Island of Oahu bounded and described as follows: Lot 8.

Beginning at Puu-o-Kulu mauka Trig. Station marked by an iron oo. or native digger, driven into soft rock and ahu on top of hill of same name as shown on Government Survey Registered Map No. 2040 and running as follows by true bearings:—

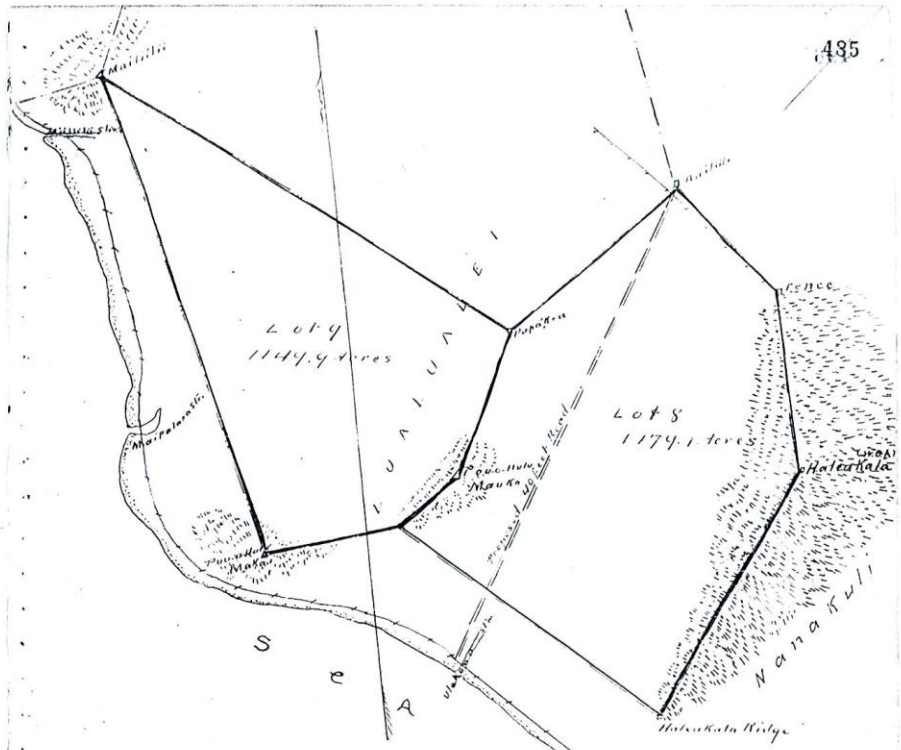
1. N. 26° 20′ 30″ E. 3654 feet along Lot 9 to + on coral stone and ahu;

2. N. 56° 5′ E. 5160 " " Public Lands General Lease No. 535 to + on stone and ahu;

3. S. 38° 17′ E. 3345 " " Government remainder to + on solid rock 5 feet mauka of fence on slope near base of pali

4. S. 2° 3′ E. 4214 " " the same up the Halekakai hill to a point on its summit as located by Prof. W. D. Alexander;

5. S. 87° 30′ 30″ W. 6666 " down the hill along Government




Containing 2629.060 acres Acres, more or less.

To Have and to Hold *the above granted Land unto the said*

H. M. Von Holt

and his *heirs and assigns forever.*

In Witness Whereof, *The Governor of the Territory of Hawaii, has hereto set his hand and caused the Great Seal of the Territory to be hereunto affixed, this* 23rd *day of* June *A. D.* 1903.

(Great Seal)

/s/ Sanford B. Dole

BY THE GOVERNOR:

/s/ Edward S. Boyd
*Commissioner of Public Lands.*

remainder to + on rock and ahu on the Southwest portion of the ridge;

6. N. 47° 16' W. 7486 feet along Government remainder to an unmarked point on Puu-o-Hulu ridge;

7. N. 39° 20' E. 1700 " " the ridge, the same being boundary of Lot 9, to the initial point and containing an area of

1479 1/10 Acres, exclusive of a Government reservation, 110 feet wide for a road,

— Lot 9. —

Beginning at Puu-o-Hulu mauka Trig. Station marked by an iron bar, or native digger, driven into soft rock, and ahu on top of hill of same name, as shown on Government Survey Registered map No. 2040 and running as follows by true bearings:

1. S. 39° 20' W. 1700 feet along ridge, the same being boundary of Lot 8, to an unmarked point;

2. S. 85° 29' W. 3240 " still along the ridge to Puu-o-Hulu makai Trig. Station marked by an iron bar set in ground and ahu, near highest point of hill of same name;

3. N. 12° 27' W. 11756 " along Government remainder to mailili Trig. Station marked by + on stone and ahu on highest point of hill of same name

4. S. 51° 19' E. 11334 " " Public Lands General Lease No. 535 to + on coral stone and ahu;

5. S. 26° 20' 30" W. 3654 " " Lot 8 to the initial point and containing an area of

1149 9/10 Acres.

# APPENDIX G-2: ARCHAEOLOGICAL INVENTORY SURVEY

SCS Project Number 1455-3 AIS

# AN ARCHAEOLOGICAL INVENTORY SURVEY OF A 78-ACRE PARCEL IN HANAPĒPĒ AHUPUA`A, DISTRICT OF KONA, KAUA`I ISLAND, HAWAI`I [TMK: (4)–2-1-001:054]


Prepared by:
**Jim Powell B.A.**
and
**Michael Dega, Ph.D.**


**REVISED**

July 2014

Prepared for:
**Community Planning and Engineering, Inc.**
**1286 Queen Emma Street**
**Honolulu, HI 96813**

## ABSTRACT

At the request of Ms. Collette M. Sakoda of Community Planning and Engineering, Inc., Scientific Consultant Services (SCS), Inc. conducted Archaeological Inventory Survey on 78 acres of land in preparation for the Lima Ola Work Force Housing Development Project in Hanapēpē Ahupua`a, Kona District, Island of Kaua`i, Hawai`i [TMK:(4)–2-1-001:054].

The project consists of two survey locations located within the Ahupua`a of Hanapēpē: a 75-acre site for proposed housing and a 3-acre adjacent area to the south for a proposed detention basin. The proposed detention basin has an existing basin (c. 1-acre), but is being expanded for this project.

A single, historic plantation era site, designated as State Site Number 50-30-09-2219, was identified during the current survey. The parcel has been active for sugar cane production since the late 1800s and at present, industrial-level coffee cultivation occurs on the parcel. No further work is recommended for the study area.

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## INTRODUCTION

At the request of Community Planning and Engineering, Inc., Scientific Consultant Services (SCS), Inc. conducted Archaeological Inventory Survey (AIS) of approximately 78-acres of land in preparation for ground altering activities associated with the proposed Lima Ola Work Force Housing Development project within the *ahupua`a* of Hanapēpē, Kona District, Kaua`i Island, Hawai`i [TMK: (4): 2-1-01:054] (Figures 1 through 4). The land is owned by the County of Kaua`i. Federal funds are not being utilized for this development.

Fieldwork for this project was conducted over a three-day period in September 2013 and during one day in April, 2014 by SCS archaeologists Jim Powell, B.A. and Milton Ching, under the direction of Principal Investigator Michael Dega, Ph.D. The Archaeological Inventory Survey (AIS) consisted primarily of pedestrian survey, site recording, and testing a small, representative portion of the project area. Survey was conducted to determine the presence or absence of significant archaeological sites and features on the surface and cultural deposits in subsurface contexts. Five trenches were placed in the 75-acre area and within the proposed detention basin, all in April, 2014. The overall purpose of the study was to identify and document historical properties, to assess their historical significance for eligibility for listing on the Hawaii and/or National Register of Historic Places, to make project effect recommendations, and to make mitigation recommendations.

The current project area had not previously undergone any formal archaeological investigations. Given archival research and review of the project area, the likelihood of finding traditional-period archaeological sites within the existing coffee fields was considered minimal while the chances of finding historic period sites associated with agriculture, primarily sugar cane, and ranching was higher. One site was identified during the current survey and has been designated as State Site Number (Site 50-30-09-2219, Pump 1 Ditch). Subsurface testing in the project area was kept at a minimum due to the on-going, intensive agricultural activities occurring within the project area (coffee cultivation).

## ENVIRONMENTAL SETTING

The Lima Ola Project occurs on the southern side of Kaua`i between Hanapēpē and Kalāheo, near the southern intersection of Kaumuali`i Highway, State Road 50, and Halewili Road, State Road 540. This area is the beginning of the drier, southwestern side of Kaua`i. The project occurs on the south sloping plain between the drainages of the Hanapēpē River and Wahiawa Stream. The slope is moderate and falls in a north south direction from an elevation of

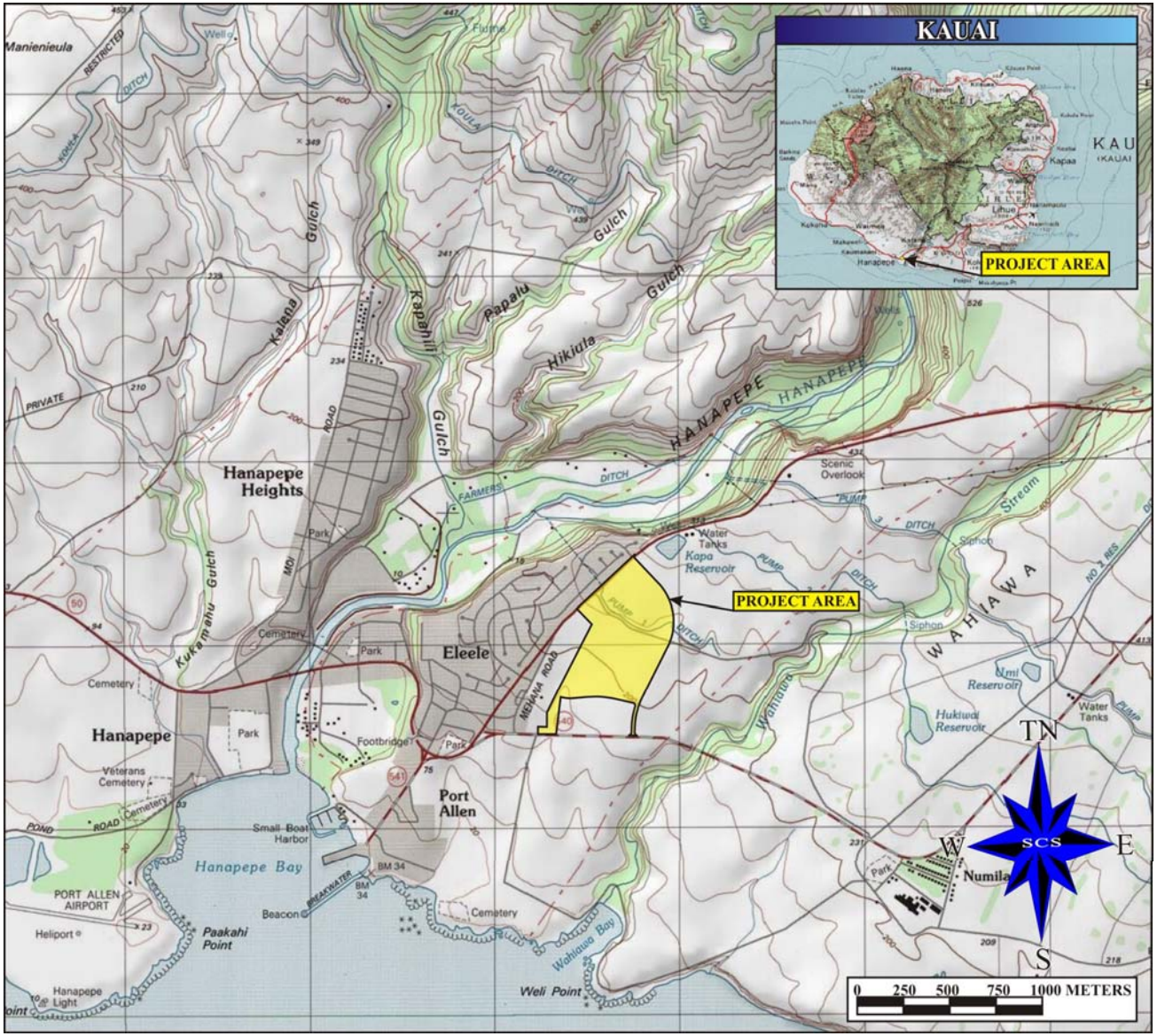


**Figure 1: USGS 1983 Hanapepe Quadrangle Showing Project Area Location.**

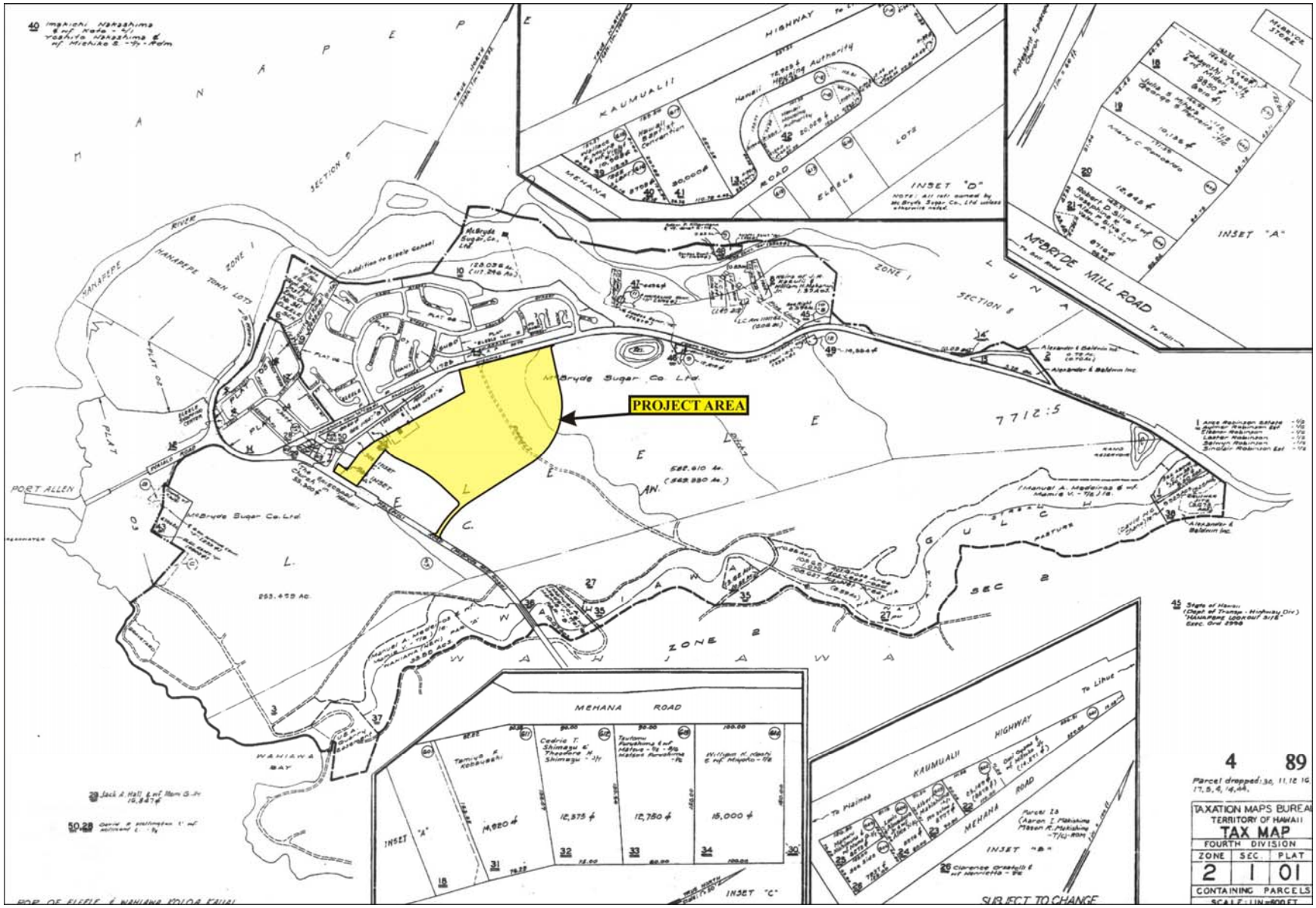


**Figure 2: Tax Map Key (4)-2-1-001:054 Showing Project Area Location.**

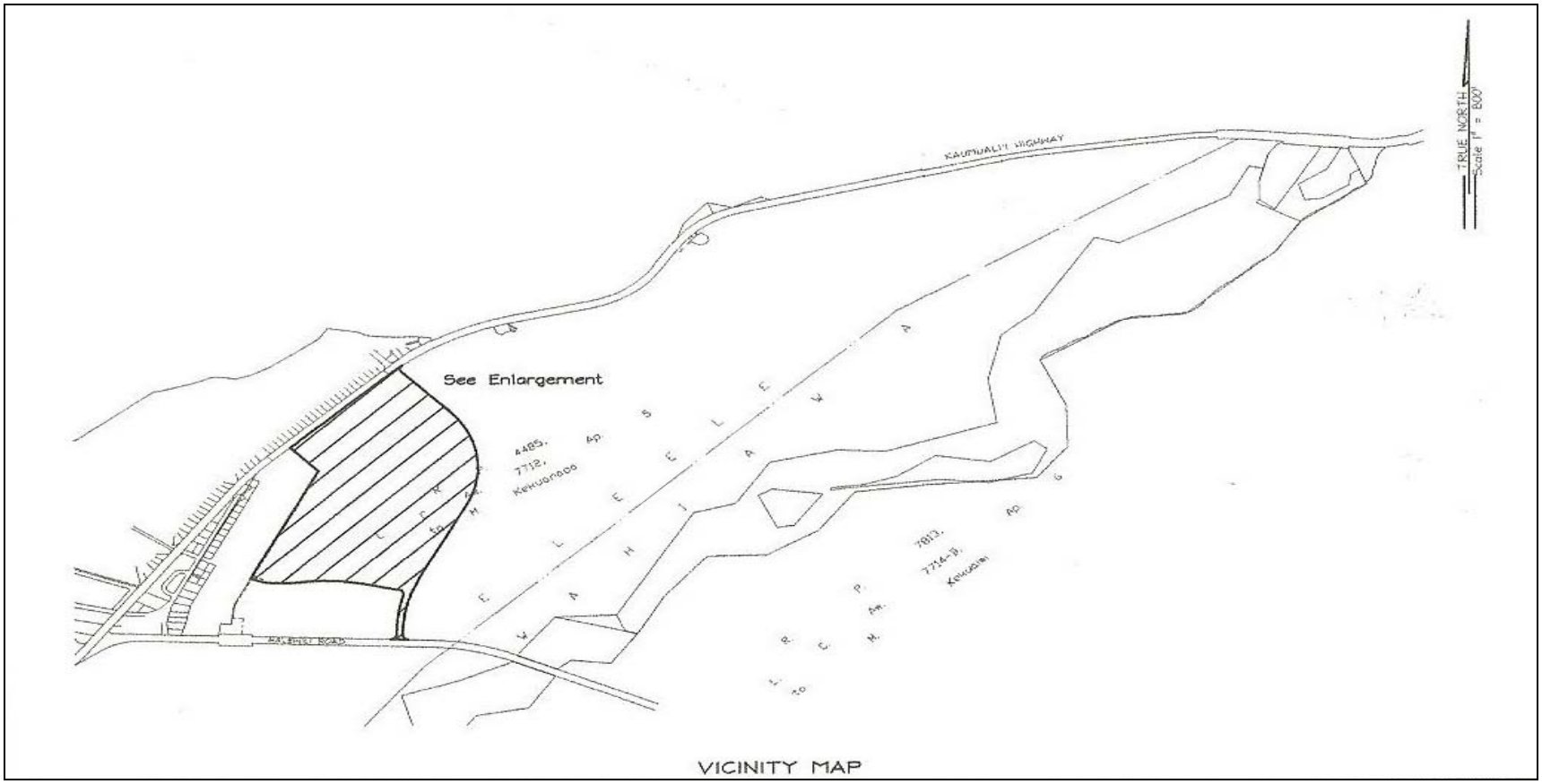


**Figure 3: Lima Ola Vicinity Map with`Ele`ele and Wahiawa Boundary**

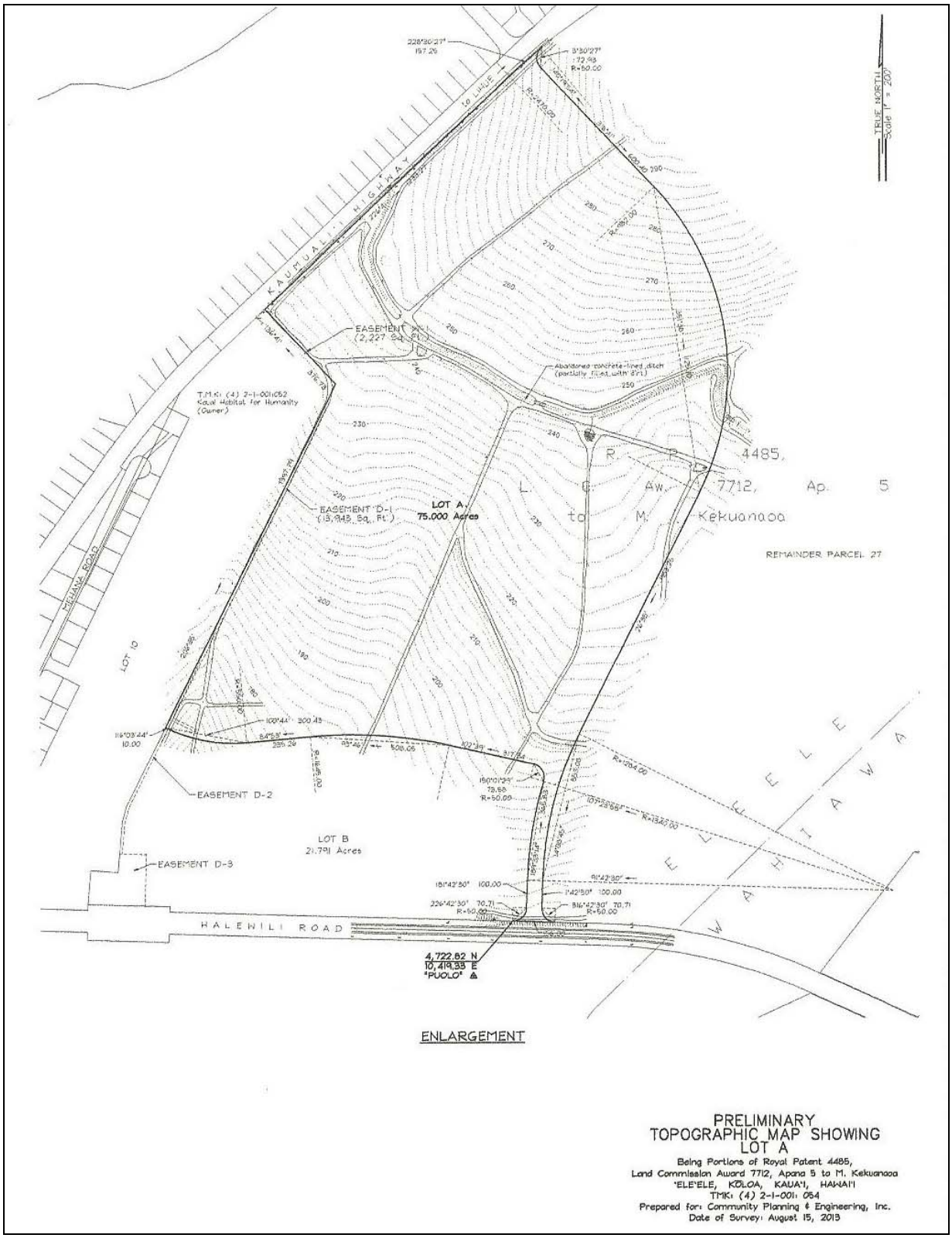


**Figure 4: Lima Ola Topographic Map Showing Project Area in relation to Kaumuali`i Highway and Halewili Road**

290 feet near Kapa Reservoir to 160 feet at Halewili Road (Figures 5 and 6). The 78-acre parcel is bounded by Kaumuali`i Highway to the northwest and west, Halewili Road to the south, and agricultural lands to the east and northeast.

**SOILS**

The land between Hanapēpē and Kalāheo, including Wahiawa, is part of the Kōloa Volcanic Series (McDonald and Abbott 1970). The base of the formation was formed 1.5 million years after the primary shield-building stage had ceased. The Kōloa Volcanic Series covered two thirds of the eastern side of the island. Numerous vents, along with cinder and spatter cones and a small shield volcano, exist within Kalāheo and Wahiawa Ahupua`a. Soil formation occurs rapidly upon volcanic ash deposits in the warm humid climates of the Kaua`i lowlands. Long periods without volcanic activity allowed streams on the surface to form gullies and to weather away rock to form ravines (McDonald and Abbott 1970). Numerous intermittent and perennial streams bisect the environs of Kalāheo, Wahiawa, and Hanapēpē Ahupua`a.

According to Foote *et al*. (1972:90; Map Sheet Number 14), project area soil is associated with two soil types of Makaweli silty clay loam: Makaweli silty clay loam, 0 to 6 percent slopes (MgB) and Makaweli silty clay loam, 6 to 12 percent slopes (MgC). The Makaweli soil series consist of well-drained soils on gently sloping to steep uplands, with elevations ranging from nearly sea level to 500 feet. Annual rainfall amounts to 20-35 inches, where three-fourths accumulates between October and March. Makaweli silty clay loam (0%-6% slopes) is found on the tops of broad interfluves, with a surface layer consisting of dusky-red silty clay loam and a subsoil of dusky-red, friable silt loam and silty clay loam that has prismatic and sub angular blocky structure. The substratum is soft, weathered basic igneous rock. Permeability is moderate, runoff is slow and the erosion hazard is slight. Makaweli silty clay loam on 6%-12% slopes is similar to the former soil type but has medium runoff and moderate erosion hazard. Both soils are typically used for irrigated sugarcane, pasture, and woodlands.

**VEGETATION**

The project area has had a history of ranching and agricultural use that began with cattle ranching in the mid 1800's and transitioned to sugar cane cultivation in the late 1800's. Sugar production was prominent for the next one hundred years. Currently, the Lima Ola parcel is being used to grow coffee for Kauai Coffee. The coffee plants are mature and have been yielding coffee beans for a several decades. During the time of survey for this project, the coffee harvest

**Figure 5: Overview Photograph Showing the Project Area from Kapa Reservoir (Trees are mature coffee). View to the South.**

**Figure 6: Photograph of Western Edge of the Project Area. View to the South.**

had just commenced, thus negating impacting the lands vis backhoe test trenches. Aside from coffee, the current vegetation on the parcel consists of invasive weeds, grasses and *koa haole* (*Leucaena leucocephala*).

## HISTORICAL BACKGROUND

### PRE-CONTACT HISTORY

While the project area is not specifically noted in common historical texts for the area (Handy and Handy 1972; Wichman 1998), in the two *ahupua`a* to the east, Kalāheo and Wahiawa, and Hanapēpē to the west, traditional stories and histories abound in the afore mentioned titles. This is to be somewhat expected as these three *ahupua`a* contained drainages, freshwater streams, and landforms which more readily supported the traditional population, their culture, and thus, their *mo`olelo*.

Kalāheo has surviving oral histories and several myths that suggest the importance of the area to its traditional occupants. Wichman (1998) writes that Kalāheo literally translates as "proud day" and begins at Kāhili Peak and extends across the plains between Wahiawa and Lāwa`i, and has a proportionally higher rainfall then Wahiawa. The *ahupua`a* was renown for the huge cinder cone that dominates the region and could be seen from all points within Kona District, from Māhā`ulepū to Kekaha (Wichman 1998). This cinder cone, named Kukuiolono or the light of Lono, was a regionally recognized beacon for navigators within the near and offshore waters of Kona District (*Ibid*.). A signal fire was kept alight on top of the cone to act as a guide for canoe voyagers and fisherman (Wichman 1998). Three *heiau* are reported at this location, including Kukuiolono Heiau, which contained an *`anu`u* (terrace) that was reported to be three stories tall and covered with white *kapa* (*Ibid*.). This particular *heiau* is reported to be one of the largest on Kaua`i and was traditionally used as a navigational landmark for the local occupants, if not possibly part of a larger system of known navigational points throughout Polynesia.

Nōmilu fishpond and its surrounding environs are also associated with numerous legends. Salt gathered from its saltpans was the finest and most desired salt on Kaua`i (Wichman 1998). A notorious battle between Pele and her sister Nāmakaokaha`i at Nōmilu is credited with the creation of the fishpond. The legend is that while Pele was searching for a home on Kaua`i, Nāmakaokaha`i caught up with her at the spot that became Nōmilu. During the battle, Pele kicked up dirt, which became the hill Kāpeku. She then caused this hill to erupt, which covered the plains of Wahiawa with rocks. Nāmakaokaha`i flooded the crater with water causing the

pond Nōmilu to be formed (Wichman 1998). As Pele departed, she turned two large *he`ehe`e* (eels)—Puhi`ula (red eel) and Puhipakapaka (scaly eel)—into stone to guard the pond (Wichman 1998).

Handy and Handy mention that Kukuiolono was a famous place in Kalāheo for sweet potato (1972). Wichman (1998) also mentions that bird catching and feather collecting was practiced in the uplands.

Between Kalāheo and the Lima Ola 75-acre parcel is the Ahupua`a of Wahiawa. It is described in greater detail then neighboring Kalāheo. In 1935, according to *kama`aina* Keahi Luahine, who grew up in the valley, taro terraces extended all the way down the valley to the *muliwai* [(inlet) Handy and Handy 1972:428]. They describe Wahiawa as having adequate fresh water resources and wet land taro was planted more extensively in this region. Further description in Handy and Handy (1972) speaks of several springs which watered terraces and *wauke* (paper mulberry) plantations. Houses and sweet potato plantations were found above the terraces. Wahiawa was renowned for a particular variety of taro.

Handy and Handy (1972) observed terraces and houses above and below the present highway and abandoned terraces below the bridge, on what is now ranchland. Bennett (1931) described upper Wahiawa as well, remarking on the extensive number of terraces for such a small area of land. See the table below for Bennett's site numbers and descriptions.

As for Hanapēpē, Bingham in 1824 (Bingham 1848) describes the valley as appearing , "…like an extensive, well watered plantation, interspersed with *kalo* beds and one hundred and forty cottages, and furnishes employment and sustenance to some seven hundred inhabitants."

Handy and Handy (1972) paint a similar picture of the valley some one hundred and twenty years later when they explored the length of the valley. They observed mostly abandoned house sites and *lo`i* watered by abandoned *auwai*, and stated that "taro terraces are everywhere that the land is irrigable."

**POST-CONTACT HISTORY**

During the early 1800's, the islands of Kaua`i and Ni`ihau were the last islands that remained outside the control of King Kamehameha. In 1810, King Kaumuali`i ceded his

kingdom to Kamehameha the Great. This was done after Kamehameha had twice failed in his attempts to invade Kaua`i from Oahu. In 1821 Kaumuali`i was taken prisoner by Kamehameha's son, Liholiho (Kamehameha II), and placed in exile on O`ahu. The following year *ali'i* from O`ahu and other islands arrived to rule Kaua`i. Kaumuali`i died in Honolulu in 1824 and Kauai's lands were given to these newcomer *ali'i.*

In May of 1824, on the plains of `Ele`ele in the general area of the Lima Ola Project, George Humehume, son of King Kaumuali`i, led supporters of King Kaumuali`i, in a revolt to regain control of Kaua`i from Kamehameha II. The attempt failed after a prolonged and lopsided battle on these plains. Kamehameha II destroyed the Kaua`i army. Then for two weeks they attempted kill all Kaua`i *ali`i*, and their family members: men, women and children.
This event marked the end of Kaua`i as an independent kingdom uniting all the islands under Kamehameha II, effectively suppressing the idea of Kaua`i as a "separate kingdom".

**THE *MĀHELE***

The Great Māhele, the division of Hawaiian lands, introduced the concept of private property into Hawaiian society. The Māhele was initiated by The Organic Acts of 1845 and 1846. In 1848, commissioners of the Great Māhele instigated an extreme modification to traditional land tenure on all islands that resulted in a division of lands and a system of private ownership. The Māhele was based upon the principles of Western law. While a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society into that of a market economy (Kuykendall Vol. I 1938:145, footnote 47, *et passim*; Daws 1968:111; Kame`eleihiwa 1992:169–170, 176). The dramatic shift from a redistributive economy to a market economy resulted in drastic changes to land tenure, among other things. As a result, foreigners demanded private ownership of land to ensure their investments (Kuykendall Vol. I, 1938:145, *et passim*; Kame`eleihiwa 1992:178; Kelly 1998:4).

Once lands were made available and private ownership was instituted, native Hawaiians, including the *maka`ainana* (people of the land), were able to claim land plots upon which they had been cultivating and living. Oftentimes, foreigners were simply just given lands by the *ali`i*. However, commoners would often only make claims if they had first been made aware of the foreign procedures (*kuleana* lands, or land commission awards). These claims could not include any previously cultivated or currently fallow land, *okipu*, stream fisheries, or many other natural resources necessary for traditional survival (Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). Awarded parcels were labeled Land Commission Awards (LCAs). If occupation could be

established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property. Commoners claiming house lots in Honolulu, Hilo, and Lāhaina were required to pay commutation to the government before obtaining a Royal Patent for their awards (Chinen 1961:16).

Based on the map for TMK (4) 2-1-01, the project area composes a portion of a larger acreage that was awarded to M. Kekuanaoa under the LCA 7712, Apana 5. To summarize the LCA (see Appendix A for the full award record) in terms of archaeological resources across this vast LCA (only a small portion which composes the project area), empirical sites include *auwai*, fishpond, rice fields, stone walls or "stone fences", piles of stones, a cave, and cultivation areas. The large LCA extends from the coastline to the mountain tops and incorporates most, if not all, of the *ahupua`a*. The LCA lands were chiefly for grazing purposes as the lands were classified as "very stony,", with some rice agricultural occurring in valleys in limited breadth (see Appendix A). Currently, the property owner and developer is the County of Kaua`i Housing Agency.

**MCBRYDE SUGAR COMPANY**

The namesake of the McBryde Sugar Co. was Duncan McBryde. In the mid 1800s, Duncan McBryde arrived from Dunoon, Argyleshire, Scotland and acquired land in Wahiawa and began to develop an extensive ranch. McBryde leased the Wahiawa lands that extended from Kōloa to Ele`ele, from Kauikeaouli (Kamahameha III) in 1857. In 1874 he purchased the land from the estate of Kamahameha V. He built his home at Brydeswood with his wife Elizabeth Amelia Moxley, in the upper end of Wahiawa District, and had six children. Duncan McBryde died at the age of 52 (1878) leaving Elizabeth a widow with six young children and the ranch. In 1886 Elizabeth acquired the Ahupua`a of Lawai from the estate of Queen Emma. Elizabeth McBryde managed and operated the ranch that stretched from Ele`ele to Kōloa, until the founding of the McBryde Sugar Co. (Sandison 1956).

Walter McBryde, the second son of Duncan and Elizabeth McBryde, held various positions within the Hawai'i kingdom and local Kaua`i business communities, including being a representative to the legislature of the provisional government (Sandison 1956). He was involved in the initial organization of the McBryde Sugar and became the manager of Kaua`i Pineapple Co. in 1906, a subsidiary company of McBryde Sugar.

McBryde Sugar formed in 1889 and was promoted by a group headed by B.F. Dillingham, who also created plantations at Olaa and Kīhei. The company was created by the merger of three families: the Smith family of Kōloa Agricultural Co., the Dreiers of Ele`ele Plantation (begun in 1884), and the McBrydes, who owned the vast Wahiawa Ranch.

Kōloa Agricultural originated in c. 1870 in the western portion of the *ahupua`a* of Kōloa, on land leased from the Knudsens. The Smiths grew cane on this land. The land was later conveyed by Mrs. Knudsen to the heirs of J.W. Smith. In 1896, said heirs conveyed their interests in the land to Kōloa Agricultural Co. The Smiths also owned 750 acres of land in Omao, Ele`ele, the Dreier's plantation,. In 1884 Bernice Pauahi Bishop sold the *`ili* of Ele`ele to Elizabeth McBryde and August Dreier. The plantation at Ele`ele had profited, and a mill was constructed at the village. The area now known as Port Allen was the original landing for the plantation. Dreier bought out Elizabeth McBryde's interest in the land in 1895. In 1899, Dillingham then bought out August Dreier for 500,000 dollars in cash for the Ele`ele plantation. Dillingham then issued 55,000 shares of stock to the McBryde family in consideration of the conveyance of nearly all of their Wahiawa land holdings and all the stock of Kōloa Agricultural, which they had come to acquire. Stocks were offered to the public and were quickly taken up. Once the establishment of McBryde Sugar was completed, plans quickly moved ahead to develop the lands into a large plantation, with the required infrastructure to create a successful and profitable plantation.

Immediate plans to clear the land and create an irrigation system ensued. Development costs were high as the land needed extensive clearing and water had to be brought from great distances. It was during this early phase of development in 1909, that McBryde Sugar was acquired by Alexander and Baldwin Corp. During this initial phase of development, and later, between 1929 and 1933, an improvement program was implemented and vast changes occurred on the landscape. Changes were made to the natural stream flow, due to the creation of a reservoir system and a series of pipelines with associated ditches and dikes to distribute water across the landscape, for large-scale commercial agriculture. Tunnels and wells were excavated within the floor of Hanapepe Valley and stream pumping plants were installed. These plants immediately proved inefficient and costly, putting the plantation in debt in direct relation to high costs associated with pumping water from underground sources as the salt water lens was higher than predicted and fuel costs were high to operate the pumps.

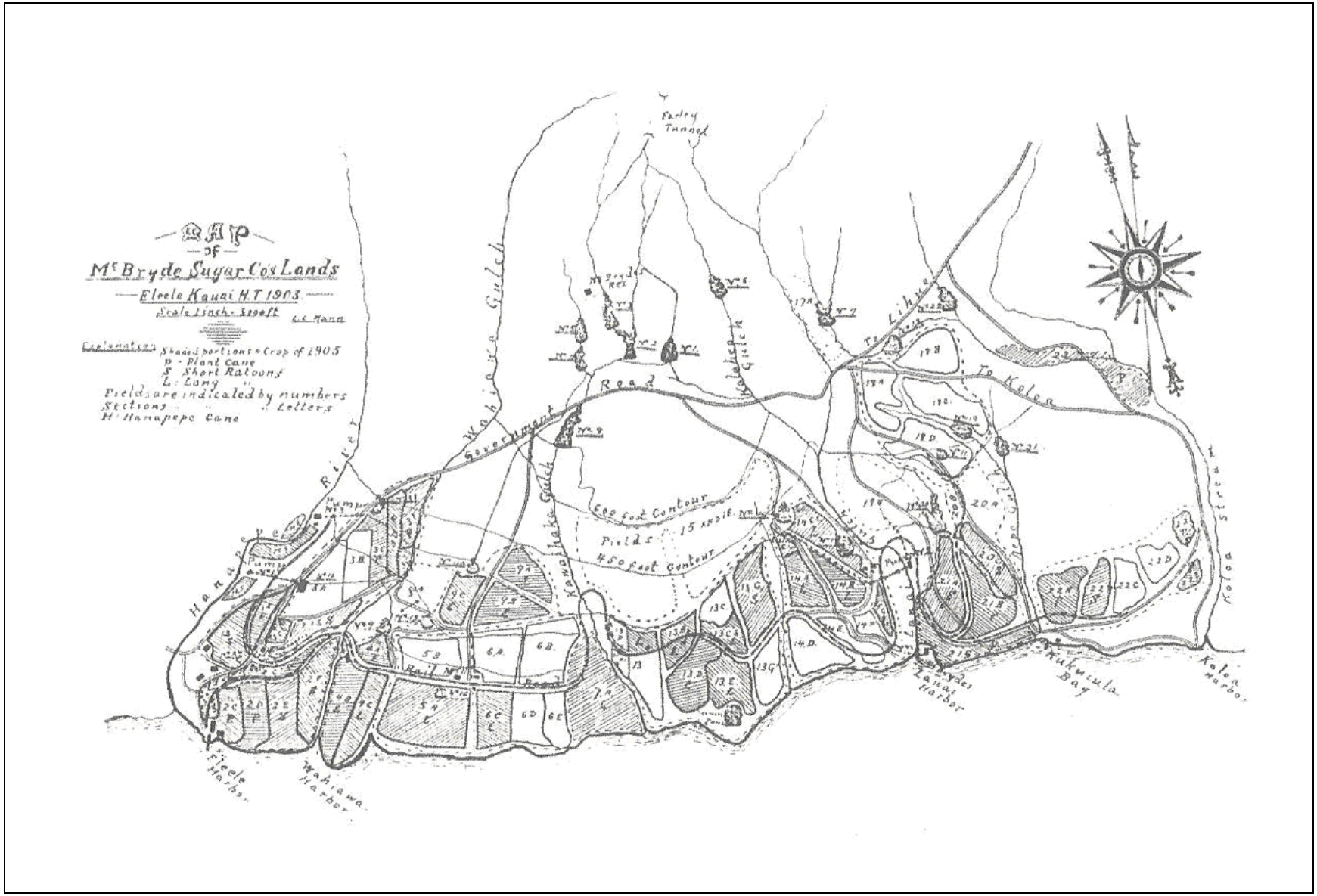


**Figure 7: McBryde Plantation 1903 (Kaua`i Historical Society)**

In 1903, a fifty-year license for hydroelectric power from Wainiha Stream was acquired by W.E. Rowell, an associate of McBryde Sugar (Figure 7). At this time Kaua`i Electric Co. was formed as a subsidiary of McBryde Sugar. The Wainiha Plant was built and established with a power line to the plantation in Eleele. Pumps were converted to electricity and fuel related costs dropped immediately. A vast system of reservoirs was created at this time with a combined holding capacity of 800 million gallons (Wilcox 1996). However, expenditure related to creating this infrastructure caused such financial burdens into the late 1920s that the plantation would not be able to operate and be profitable until a complete renovation occurred.

These financial challenges led to the creation of the improvement program carried out from 1929 to 1933. These improvements consisted of the construction of Alexander Reservoir with a storage capability of 810,000,000 gallons, the concrete lining of miles of the principle irrigation ditches on the plantation, replacement of inefficient machinery, and the construction of a hydroelectric plant. Due to the efficiency created by these improvements, the plantation was released of its debt obligations in 1932.

McBryde Sugar obtained additional subsidiary companies such as the Kaua`i Railway Co. and Kaua`i Pineapple. The development of these companies brought additional land use changes to the area including the creation of a rail system connecting various points on the plantation to Port Allen and the development of truck farming on portions of the land. Infrastructure and remnants related to these modifications exist throughout the landscape. McBryde Sugar was also instrumental in development of Port Allan as a harbor with shipping facilities (Star Bulletin November 2, 1935). McBryde Sugar acquired a large portion of the Grove Farms sugar fields in 1974. During this last twenty years, sugar was supplemented with coffee. McBryde Sugar continued to operate until 1995 when it fell to economic pressures involved in growing sugar in Hawai`i. McBryde stopped producing sugar officially on July 1996 when the Kōloa Mill was shut down for good. McBryde Sugar was terminated and replaced by Kaua`i Coffee Co., which continues to grow coffee to the present day.

## PREVIOUS ARCHAEOLOGY

No formal or recent archaeological work has been conducted in the project area. Besides the Hammatt (1990) study, the environs of the project area have also not been studied recently, but for the Hanapepe Valley area to the northwest. Given the dearth of previous work in the project area, a general regional view is presented below.

Early, formal documentation of archaeological sites on Kaua`i was conducted by Wendall C. Bennett in his "Archaeology of Kaua`i" (1931) (Figure 8). Eleven sites (pp. 49 – 60) were found in the *ahupua`*a of Hanapēpē, slightly to the west of the project area. The sites are of various types and include sand dune burials, *heiau*, house sites, terraced *lo`i*, and a fishing shrine. Table 1 below provides some descriptive information for these sites.

William K. Kikuchi (1963) conducted an extensive archaeological survey of the Kona District of Kaua`i in 1963. Twenty-three sites were identified in the Ahupua`a of Kalāheo, many of which were individual components previously recorded as complexes by Bennett (1931). Along the coast, a shelter cave (Site 25) near the western border of the *ahupua'a* at Lokoawa was identified. Five sites (Sites 26–30) were identified at Kawaihaka Stream Valley. These consisted of a shelter cave, stone walls, house sites, a spring, and an historic tunnel. Five sites (Sites 31–35) were recorded along the coast between Nōmilu and Kawaihaka and included a fishing shrine, house sites, and shelter caves. Kikuchi recorded seven sites (Sites 36–42) at Nōmilu, which included Nōmilu Fishpond, walls, saltpans, a historic tunnel, and Kapoho Heiau. Three sites (Sites 43–45) were recorded at the eastern *ahupua`a* boundary and included an enclosure, walls, and a fishing shrine. In the uplands, within the present day Kukuiolono Park, Kikuchi (1963) recorded the locations of Kukuiolono Heiau (Site 66) and Kahaleki`i Heiau (Site 65), although no physical remnants of the sites exist.

Other archaeological studies conducted in the area include a study by Folk and Hammatt (1991), who conducted Inventory Survey and testing of LCA 6647 in Kalāheo. The study produced negative results. The absence of cultural deposits was posited to be the result of modifications related to a proposed reservoir system that included the entire perimeter of LCA 6647. Additionally, Nancy McMahon conducted a survey within TMK 2-4-01:12. This study revealed the presence of historic earthen terraces related to pineapple cultivation (1991).

Bennett's (1931) work in the area includes the *ahupua`*a of Wahiawa, immediately east of the project area, and Kalāheo, which borders Wahiawa Ahupua`a to the east. Those sites are listed below.

**Table 1: Bennett (1931:49-60) Sites in the Hanapēpē Area, Kaua`i**

| Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 49 | Salt Pan | Near Puolo Point | "…natural flat area on which sea water could evaporate" | NA<br>Still in use |
| 50 | House sites | At Puolo Point | "…many house sites on the flat land near the salt pans, (Site 49)" | NA |
| 51 | Kauakahiunu Heiau | At Puolo Point | "A wall heiau of medium size at the shore, part of thewalls still standing." 80 x 60 feet.<br>"Kane and Kanaloa are its deities" | " site is now slightly marked by crumbled stones." |
| 52 | House site or fishing shrine | At Puolo Point<br>Just east of Site 51. | "…front part of this structure rests on beach stones." Composed of three sections two paved with small beach pebbles and one with larger stones. Size approximately 35 by 27 feet irregular shape. | NA<br>He was able to measure it so it must have been in fair condition. |
| 53 | Sand Burials | " In the sand on the northwest side of Hanapepe bay." | Burials in the sand | Today it is the Site of modern cemetery |
| 54 | Makole Heiau | "on Makole bluff" | Thrum describes it as "A small heiau of platform character on the side of the bluff destroyed in the sixties." | Thrum, "None of the walls could be found" |
| 55 | Pualu Heiau | East side of Kapahili Gulch, a quarter mile from the road. | "…a single platform, 142 by 50 feet built up in the front 6 feet and backed by a wall 3 to 4 feet wide."<br>"… whole structure paved with 3 to 4 inch stones but very much disturbed…" | NA |
| 56 | Akowai Heiau | "…at a place called Akowai on the steeply sloping side of a bluff." | Described by Thrum as, "a small paved heiau of about 50 feet square, in bad condition …. Destroyed about 1865." | "The site today includes a number of well-built house sites (Site 57) and a jumbled mass of walls said to have been the heiau." |
| 57 | House sites at Akowai | Near Site 56 | "… three well paved house sites." | Unknown |
| 58 | Taro terraces | Manuahi Valley | "Like Site 60 this site is completely terraced for taro and contains similar house sites." | Unknown |
| 59 | Moloku Heiau | "… near the peak of Kuopoo ridge at its junction with Kahalau." | Described by Thrum as, "An open platform heiau in fair condition." | Fair |
| 60 | Taro terraces and house sites | "In Hanapepe Valley the taro terraces are everywhere that the land is irrigable." | "House types are of the usual type." | Taro is still being grown in the valley probably using many of the old lo`i. |

## Wahiawa Ahupua`a

| Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 61 | Taro Terraces | Wahiawa Valley | "the remains of terraces are remarkable in places for there number.' "There are platform house sites in the valley; burial caves and petroglyphs are also reported." | Unknown |
| 62 | Waipopili Heiau | "… on the bluff on the east side , a short on the distance seaward side of the government road." | Described by Thrum as "An oblong heiau of good size walls still standing." | Thrum continues, "… in clearing the fields of stone the heiau has been obscured so far as any plan is concerned." |
| 63 | Huhuakai Heiau | Wahulua Bay | Described by Thrum " A medium sized heiau; a portion of its walls may yet be seen. Class unknown." | Thrum, " Nothing that would identify it as a heiau now remains |
| 64 | House sites | "in Kalaheo Gulch at the sea." | Most of the house sites are stone platforms 15 feet square. Some hae low walls on three sides. There are fire places on some…" | Unknown. |
| 65 | Kahalekii Heiau | "on the western slope of Kukuiolono hill." | "The heiau is now completely destroyed, but Thrum describes it as "A square three terraced heiau of large size, with several divisions: was high walled and paved; class unknown." | Unknown |
| 66 | Kukuiolono Heiau | "…on Kukuiolono Hill…" | "…now destroyed." Thrums Description: " A large three terraced heiau, east section being 95 by 112 feet, mid-section 105 by83 feet and west division 105 by 51 feet…" | Unknown |
| 67 | Fishpond salt pans, and taro terraces | Nomilu | "…large, natural, salt water pond with no artificial work done to it." There were salt pans, terraces, walls and perhaps a burial cave. | Most of these structures are probably still in tact as the area is off limits to the general public. |
| 68 | Kapoho Heiau | "…inland of from the fishpond at Nomilu, Kalaheo | "Thrum speaks of this structure as "a large heiau mauka of the fish-pond; destroyed some years ago. Portions of its division walls yet to be seen." | "So much changing has gone on in this region it is hard to say which of the rough stone walls remaining are the ones mentioned by Thrum. |

## Kalaheo Ahupua`a

| Site # | Name / Type | Location | Bennett's Description | Condition |
|---|---|---|---|---|
| 64 | House sites | "in Kalaheo Gulch at the sea." | Most of the house sites are stone platforms 15 feet square. Some hae low walls on three sides. There are fire places on some…" | Unknown. |
| 65 | Kahalekii Heiau | "on the western slope of Kukuiolono hill." | "The heiau is now completely destroyed, but Thrum describes it as "A square three terraced heiau of large size, with several divisions: was high walled and paved; class unknown." | Unknown |
| 66 | Kukuiolono Heiau | "…on Kukuiolono Hill…" | "…now destroyed." Thrums Description: " A large three terraced heiau, east section being 95 by 112 feet, mid-section 105 by83 feet and west division 105 by 51 feet…" | Unknown |
| 67 | Fishpond salt pans, and taro terraces | Nomilu | "…large, natural, salt water pond with no artificial work done to it." There were salt pans, terraces, walls and perhaps a burial cave. | Most of these structures are probably still in tact as the area is off limits to the general public. |
| 68 | Kapoho Heiau | "…inland of from the fishpond at Nomilu, Kalaheo | "Thrum speaks of this structure as "a large heiau mauka of the fish-pond; destroyed some years ago. Portions of its division walls yet to be seen." | "So much changing has gone on in this region it is hard to say which of the rough stone walls remaining are the ones mentioned by Thrum. |

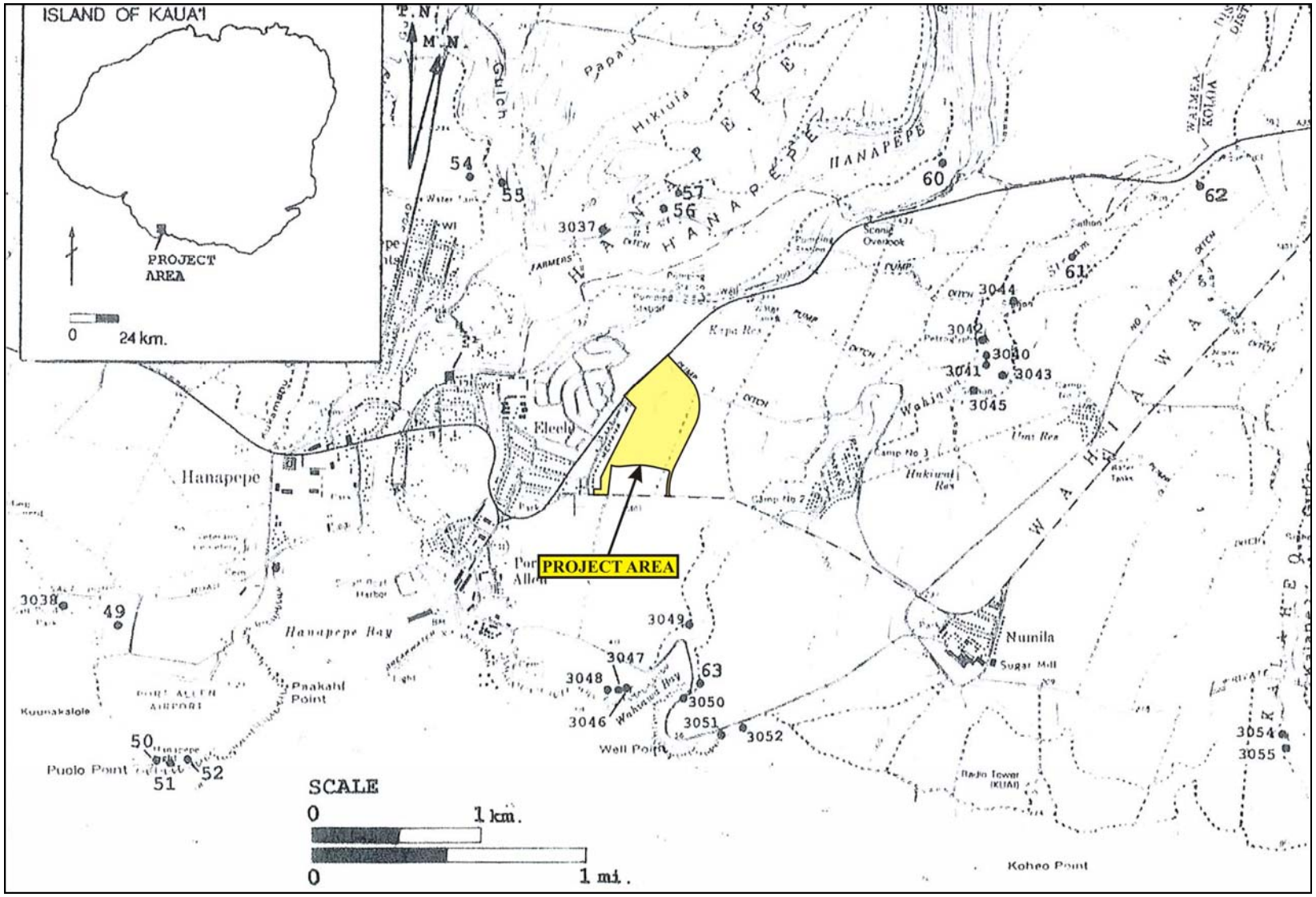


**Figure 8: Previously Identified Archaeological Sites in the Ahupua`a of Hanapēpē, Wahiawa and Kalāheo**

Kukuiolono Park, to the south and on the *makai* side of Kamuali`i Highway, contains an artifact display of broad diversity, collected throughout the region during the plantation era by Walter McBryde, descendant of Duncan McBryde (founder of McBryde Sugar Co.). This collection includes a phallic stone, Pohakuhunaahuula Stone, Pohakuawa Stone, and the Kaua`i Iki Stone. The large upright phallic stone was considered to be reverent to the fish god, Pohakuloa. This stone, revered by the ancients, was collected from its original location, at the junction of trails to the beach above McBryde Mill (Sandison 1956). Pohakuhunaahuula, the feather cloak stone, is reputed to be associated with the *ali`i*, Ola. This artifact was relocated to the park from its original location near Brydeswood. During times of war, the *ali`i* hid the cloak under the rock and covered it with *`uala lau* as a form of camouflage (Sandison 1956).

Pohakuawa is a very large boulder with a large carved concave basin depression that holds a substantial volume of water. The density of the basalt slows the percolation process and allows for the water to remain in the basin for long periods of time. The stone artifact was brought to the park from its original location, reportedly a mile west of Brydeswood, on the trail to upper reaches of Wahiawa lands. The legend associated with the stone state that a fisherman stopped for the night at Pohakuawa and stored his catch of live *awa* in the cool waters of the stone draped with *`uala lua* to keep the stone cool and to prevent the fish from jumping out. The following day, the *awa* was supposed to be transported *mauka* and released in large, freshwater fish ponds in the spring-fed Wahiawa Stream.

Kaua`i Iki is a large, boulder-shaped stone like the island of Kaua`i. This stone was relocated to the park from its original location in Wahiawa. The legend of the stone is that a Hawaiian family was clearing their *loi* of rocks when they came across this rock. Noticing its resemblance to the island of Kaua`i, they decided to leave it in place and gave it its name (Sandison 1956). Additional artifacts in this collection include Lono's Spoon, a basalt boulder exhibiting a carved depression in the center and a carved notch on the rim of the depression as well. Currently there is no information as to how the stone received its name or its importance to the traditional occupants of the area. A saltpan, a stone bowl, a lamp, a game stone, and several unnamed stones exist in this collection as well.

To the west of the project area lies Hanapēpē, as mentioned, a well-watered valley and population center for this area. While a few burials have been documented in the valley and along the shore, it is assumed from Bennett's (1931) and Handy and Handy's (1972) historic reports that the upper valleys contained numerous undocumented sites including agricultural, domestic and religious sites.

Finally, Hammatt (1990) conducted Archeological Reconnaissance of 72-acres in Hanapepe (TMK: 2-1-001, 003, and 027), the project area slightly overlapping with lands along the current southwestern boundary. No archaeological sites were identified during the reconnaissance; Hammatt (1990:10) stating that 50-75 years of cultivation would have destroyed traces of former cultural sites in the area. No further work was recommended, given the landscape use over time.

## EXPECTED FINDINGS WITHIN THE PROJECT AREA

Prior to the current survey, only the Hammatt (1990) reconnaissance survey, with negative results, came close to the project area. Based on archival work, a review of previous archaeology in the area, and current use of the property, it was expected prior to survey that the ground surface of the parcel would have been massively impacted from sugar cane and now coffee production. As such, the potential for surface sites was limited to perhaps historic-era signatures associated with plantation days, as well as possible cattle ranching, interceding the time between former sugar cane and current coffee production. It is likely that subsurface contexts were also modified, but testing was not completed herein to confirm this notion.

## METHODOLOGY

### FIELD METHODOLOGY

Multiple field tasks were completed during the current Archaeological Inventory Survey. Fieldwork consisted of 100% systematic survey of the entire 78 acre parcel. This survey was conducted by two persons walking 3-5 m transects, with visibility determining spacing. Vehicle survey was also conducted along the access roads of the fields. Low growing coffee trees separated by high growing weeds generally prevented access between the individual rows of coffee trees. This somewhat restricted the view plane. During the survey, digital photographs were taken of the project area. One historic property was identified in the field and designated as State Site No. -2219. The site was subject to GPS and recordation, and plotted on a field map provided by Kauai Coffee Company, as well as Google Earth map.

In April, 2014, a total of five trenches were excavated on the parcel, four placed in the 75-acre area and one trench having been placed in the proposed detention basin location. The limited number of trenches completed was due to the active nature of the coffee plantation. Managers of Kauai Coffee stated that any trenching on the parcel would create hazards for the

large machinery used during the harvest season. Also, given the industrial nature of use on the parcel for over the last 100 years, and the location of the parcel, subsurface deposits appeared to have a low probability of occurring.

Historic and archival research was conducted at various repositories including both The Pacific Collections and the Map Collections at University of Hawai`i Hamilton Library, The Hawaiian Sugar Planters' Association Plantation Archives, University of Hawaii at Manoa Library and the Hawai`i State Library. Research was also conducted at the SHPD library in Kapolei. All materials relating to the McBryde Sugar Co., and its involvement in the sugar industry along the southeast shore of Kaua`i were reviewed at the Kaua`i Historical Society in Lihue.

**LABORATORY METHODOLOGY**

Laboratory work involved cataloguing and curating all field notes and photographs during the project. Reporting was also conducted during this phase of work, as well as drafting maps for the project. All materials curated during this project (notes, photos only) are being stored at the SCS laboratory in Honolulu.

## RESULTS

Archaeological Inventory Survey was conducted on approximately 78-acres of land in Hanapēpē Ahupua`a, Kona District, Island of Kaua`i, Hawai`i [TMK:(4)–2-1-001:054]. One newly identified historic property was identified and documented on the parcel. The newly identified site, a single historic feature (irrigation ditch), has been designated as State Site No. 50-30-09-2219. The location of the ditch is plotted on a modern map from the McBryde Sugar Co. called Drip Irrigation Design, Field No. 106, dated 6/14/90. The location is also visible on Google Earth (Figures 9 and 10).

**STATE SITE 50-30-09-2219: PUMP #1 DITCH**
**Feature Count:** 1
**Feature Type:** Irrigation Ditch
**Feature Function:** Water Diversion
**Feature Structural Integrity:** Fair
**Feature Age Association:** Historic, 1908
**Mitigation Recommendations:** Intermittent Monitoring
**Site Description:** State Site 50-30-09-2219 consists of an irrigation ditch, known as the Pump 1

**Figure 9: Google Earth Map showing the location of State Site 50-30-09-2219 (Pump 1 Ditch).**

**Figure 10: Site - 2219 Pump 1 Ditch. View to Northeast.**

Ditch. Located in the northern portion of the project area, Pump 1 Ditch was created in 1908 as part of the McBryde's irrigation system that provided water for cane land between `Ele-`ele and Lāwa`i (McBryde Sugar Company). Water for Pump 1 and 2 Ditches came from wells along the banks of the Hanapēpē River. Pumps moved water up to the Kapa Reservoir at the 300 foot elevation line, approximately 280 feet above the river. From the reservoir, the water was moved easterly across the fields, in the open ditches. These ditches are no longer used for irrigation. The current coffee fields are irrigated by a system of underground pipes and drip irrigation tape. These modern irrigation methods conserve water formerly lost through evaporation in the open ditches. Only Pump 1 Ditch, which lies across the northern quarter of the project area, is within the project area. It has been left in place as a means to control surface runoff in times of heavy rains but is not functionally utilized, as has not for some time. Some of its concrete linings, thought to have been installed in the late 1920's, are still intact. However, most of the ditch is earthen. The irrigation ditch measures approximately 3,300 feet long, 9 feet wide, by 2 feet deep.

As shown in the Figure 9 image, the site is demarcated by an irregular line of vegetation running from the top of the photo to the bottom. The wider brown lines are access roads used to access the fields, while the smaller lines represent the cultigens. Kapa Reservoir is outside the project area. The Pump 1 Ditch continues outside the project area, into another set of cultivated fields.

**TEST EXCAVATIONS AND STRATIGRAPHY**

Five trenches were mechanically excavated in the project area (Figure 11). Table 2 provides descriptive data for the trenches.

As shown in Figures 12 through 19, only one predominant layer was present in subsurface contexts. Layer I, excavated to a maximum depth of 0.90 m below surface (mbs), consisted of red (10R 4/8) silty clay to silty clay loam. Roots were present in upper levels and clastics were few throughout. The soil series is the same identified previously by Foote *et al.* (1972) and has been utilized for intensive sugar cane cultivation and more recently, as a coffee plantation.

**Figure 11: Location of Stratigraphic Trenches. Note: Trench 5 was placed in the proposed detention basin location.**

**Table 2: Trench Descriptive Data**

| Trench # | Length and Depth (in meters) | Azimuth Magnetic | GPS at trench ends | Comments |
|---|---|---|---|---|
| 1 | L - 9<br>D - .82 | A 150 x<br>B 330° | A – 0440678<br>2442932<br><br>B - 0440678<br>2422936 | NCMO |
| 2 | L - 13<br>D - .90 | A 120 x<br>B 300° | A – 0440609<br>2442190<br><br>B - 0440600<br>2423199 | NCMO |
| 3 | L – 16<br>D - .85 | A 75 x<br>B 255° | A – 0440517<br>2423134<br><br>B - 0440529<br>2423314 | NCMO |
| 4 | L - 11<br>D - .80 | A 165 x<br>B 345° | A – 0440391<br>2442754<br><br>B - 0440391<br>2442760 | NCMO |
| | **Detention** | **Basin** | **Trench** | |
| 5 | L - 11<br>D - .54 | A 80 x<br>B 260° | A – 0440341<br>2442586<br><br>B - 0440334<br>2442584 | NCMO |

*NCMO=No Cultural Materials Observed

**Figure 12: Photograph of Trench #1 Stratigraphy. View to East.**

**Figure 13: Photograph of Trench #2 Stratigraphy. View to Northwest.**

**Figure 14: Photograph of Trench #3 Stratigraphy. View to Northeast.**

**Figure 15: Photograph of Trench #4 Stratigraphy. View to West.**

**Figure 16: Photograph showing Location of Trench #3, Pre-Excavation. View to North.**

**Figure 17: Photograph of Trench #4, Pre-Excavation Location, Western Side of Coffee Fields. View to South.**

**Figure 18: Photography of Trench # 5, Pre-Excavation, near Existing Detention Basin. Note: Existing coffee trees are on the right side of the machine, in the proposed basin area.**

**Figure 19: Photograph of Trench #5 Stratigraphy. View to North.**

## DISCUSSION AND CONCLUSION

SCS conducted Archaeological Inventory Survey of approximately 78-acres of land in advance of the proposed Lima Ola Work Force Housing Development Project. A single archaeological site was identified during the current work and designated as State Site No. 50-30-09-2219. The site is formally known as the "Pump 1 Ditch" and runs east-west through the project area. The ditch is an early 20th century historic site, constructed in 1908, to feed the sugar cane fields (see Figures 9 and 10).

This identification of this historic-era, plantation-related site conforms to project area expectations, which predicted historic sites related to the long history of plantation and ranching activities in these environs. The absence of pre-Contact archaeological sites in the project area was somewhat expected, given the location of the project area on table lands (not in a valley near water resources, etc.) and also due to historic-era landscape modifications. The advent of mechanized farming in the late 1890's required relatively smooth fields with little obstruction for wheel, track, and plough machines. The plantations thus heavily modified the surface (and near surface) of these areas. The records of the McBryde Sugar Co. at The Hawaiian Sugar Planters' Association Plantation Archives at the University of Hawaii at Manoa Library provide this insight:

> "…but the terrain was extremely rocky and, as common for the leeward side of the island, there was a clear lack of water. As evidenced by early financial records, "Rock Removal" was a rather large expenditure and many extra laborers were needed to clear the fields."

The result of this rock removal is still in evidence today across former McBryde Sugar Company lands from`Ele`ele to Lawa`i. There are large mounds of rock collected from the fields and, in at least one instance, a mound east of Lawa`i Valley on the Kukuilua Golf Course obscures a substantial traditional Hawaiian site, complete with multi level terraces (J. Powell-pers. comm 2013). SCS has also viewed the large amounts of field stone used by the plantation to fill two side gulches in Lawa`i Valley that allowed a rail system to be built from Port Allan to Kōloa. It is assumed these rocks came from the "rock removal" efforts of McBryde Sugar Co. It is also possible that the rocks were also acquired from traditional sites near the project area.

## SIGNIFICANCE ASSESSMENTS AND RECOMMENDATIONS

A total of one newly identified site, State Site 50-30-09-2219, was documented during the current Archaeological Inventory Survey. The site has been assessed for significance as outlined in Hawai‘i Administrative Rules §13-275-6, per the five criteria below:

(A) Associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.

(B) Associated with the lives of persons significant in the past.

(C) Embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.

(D) Has yielded or may be likely to yield, information important in prehistory or history.

(E) Have important value to native Hawaiian people or other ethnicities in the state, due to associations with cultural practices and traditional beliefs that were, or still are, carried out.

The single site identified within the project area, State Site State Site 50-30-09-2219, is significant under Criteria d, and represents historic-era, plantation use of the landscape. To date, the site has herein been documented, plotted on maps, photographed, and traced via photograph from Google Earth. The site has also been described in historic pamphlets and books (McBryde Sugar Co, etc.). Additionally, Pump 2 Ditch, which occurs less then a mile to the north of the current project area, may serve as an example of Plantation-era architecture. This second site, occurring outside the project area, also no longer serves its original purpose and is now maintained solely to control runoff from the coffee fields during heavy rains.

Given the fact that this landscape has been so extensively modified over the past 100+ years, and there appears limited possibility that historic properties exist in subsurface contexts, no further work is recommended.

## REFERENCES


Bennett, Wendell C.
1931 *The Archaeology of Kaua`i*, Bishop Museum Bulletin 80, Honolulu.

Bingham, H.
1848 *Residence of Twenty-One Years in the Sandwich Islands*. Univ of Michigan.

Chinen, J.J.
1961 *Original Land Titles in Hawaii*. Copyright 1961 Jon Jitsuzo Chinen.

Conde, Jesse C. and Gerald M. Best
*1973* *Sugar Trains, Narrow Gauge Rails of Hawai`i*. Glenwood Publishers, Felton, CA.

Cook, Christopher Leland
2000 *Kaua`i in History*, *A Guide to the Resources*, The History and Humanities Program of The State Foundation on Culture and the Arts in cooperation with The Kaua‘i Historical Society, Honolulu.

Daws, G.
1968 *Shoal of Time: A History of the Hawaiian Islands*. University of Hawaii Press, Honolulu.

Dorrance, W.H., and F.S. Morgan
2000 *Sugar Islands: The 165-Year Story of Sugar in Hawaii*, Mutual Publishing Co., Honolulu.

Folk, W.H. and H.H. Hammatt
1991 *Archaeological Survey and Subsurface Testing of Land Commission Award 6647 at Kalaheo, Kaua`i, Hawai`i (TMK:4-2-3-02:22*). Cultural Surveys Hawaii, Kaneohe.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens
1972 *Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii*. U.S. Dept. of Agriculture, Soil Conservation Science and University of Hawai`i Agricultural Experimentation Station. Washington D.C., U.S. Govt. Printing Office.

Hammatt, H.H.
1990 *Archaeological Reconnaissance of 72 Acres, Hanapepe, Kauai (TMK:2-1- 001, 003, and 027*). Cultural Surveys Hawaii, Kaneohe.

Handy, E.S. and E.G. Handy
1972 *Native Planters in Old Hawaii: Their Life, Lore, and Environment*. Bishop Museum, Bulletin 233. Honolulu.

Kamakau, S.
1992 *Ruling Chiefs of Hawaii*, Revised Edition, Kamehameha Schools Press, Honolulu.

Kame`eleihiwa, L.
1992 *Native Lands and Foreign Desires: Pahea La E Pono Ai?* Bishop Museum Press. Honolulu.

Kikuchi, William K
1963 Archaeological Survey and Excavations on the Island Kaua`i, Kona District Hawaiian Islands.

Kirch, P.V.
1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. University of Hawaii Press, Honolulu.

Kirch, P.V., and M. Sahlins
1992 *Anahulu: The Anthropology of History in the Kingdom of Hawaii,Volume 1*. University of Chicago Press, Chicago.

Kuykendall, R.S.
1938 *The Hawaiian Kingdom.*. Vol.I. University of Hawai`i Press. Honolulu.

McBryde Sugar Company
1899-1949 *The Story of McBryde Sugar Co. Ltd* 1899-1949.

Macdonald, G.A. and Abbott, A.T.
1970 Volcanoes in the Sea. University of Hawai`i Press, Honolulu.

McMahon, Nancy
1988 State of Hawai`i, Department of Land and Natural Resources Letter to File from Nancy McMahon Job # 87-9, TMK 2-4-04:5.

Price, S.
1983 Climate. In *Atlas of Hawaii*, ed. By Warwick Armstrong. The University Press of Hawaii, Honolulu.

Pukui, M.K., and S.H. Elbert
1992 *Place Names of Hawaii*. University of Hawaii Press, Honolulu.

Sandison, John
1956 *Walter Duncan McBryde and Kukuiolono Park*. Hamilton Library, Pacific Collections, University of Hawai`i at Mānoa.

Star Bulletin
1935 Hawaiian Sugar Plantation History, No 36—McBryde Island of Kaua`i, November 2, 1935

The Hawaiian Sugar Planters' Association Plantation Archives
University of Hawaii at Manoa Library, Hawaiian Collection / Special Collections

Waihona `Aina Corporation
2013 Māhele Database, www.waihona.com. Kaneohe, HI.

Wichman, Frederick B.
1998 Kaua`i Ancient Place Names and Their Stories, University of Hawai`i Press, Honolulu, HI.

Wilcox, C.
1996 *Sugar Water: Hawai`i's Plantation Ditches*. University of Hawai`i Press, Honolulu.

# APPENDIX A: LCA DATA

*Eleele ili, Hanapepe Ahupua`a, District of Kona, Island of Kauai,
Boundary Commission, Kauai, Volume 1, Pages 76-80*

No. 16

1873, Boundary of the Ili of Eleele
July 14, Received the following petition, Honolulu July 8th 1873 (No. 16)

Honorable Duncan McBryde, Commissioner of Boundaries for the Island of Kauai

Sir:
In accordance with an act passed and approved on the 22 June 1868
relating to the settlement of boundaries I now make application to you
to define and settle the boundaries of the Ili of Eleele belonging to
the Estate of his late Majesty Kamehameha V situated in the Ahupuaa of
Hanapepe on the Island of Kauai.
I am. Sincerely, your Obedient Servant
Jn O. Dominis, Administrator of Estate of his late Majesty, Kamehameha V.

Thereupon appointed the 23 day of November A D 1873 for the hearing of
said petition, and notified the leasee [sic] together with the leasee
[sic] of Hanapepe and James Gay acting for the Crown of the time and
plan of hearing.

Opai, sworn, The boundary commences at a rocky point on the sea shore at
the junction of the Kuiloa boundary and called Kupuhili and thence mauka
along the river & boundary of Kuiloa to a place on river bank called Palemo
thence to an auwai leading to a fishpond, Kualoau
thence through rice fields to a hole in pali, Nihoawa
thence up ridge to top and along top to Kanehoia
thence along top of pali and down face to hole, Heana
thence to old Heau juncture with Kuiloa at its mauka Northeast. corner,
at a Pride of India tree, Kaluea
thence across river to Kailiili
thence up along old bed of river to Puuhau
thence to Kuhumu
thence to ridge stones crossing river, Waipa [page 77]
Thence to head of auwai of Eleele at Akeahi
thence up face of cliff to top of high rock and thence along pali to
Rowell's stone wall and along stone wall to junction with the boundary
of Wahiawa, thence along the Wahiawa boundary to the sea and round to
place of commencement.

The following natives were also sworn and gave similar testimony:
Helela, Kaia, Kalepa

Decision
Commences at a rocky point on the sea shore at the junction of the Kuiloa boundary and called Kupuhili and thence mauka along the Hanapepe river and boundary of Kuiloa to a place on river bank called Palemo, thence turning East to an old Auwai, that formerly led to a fishpond, Kualoau. Thence through rice fields to a hole in the side of the pali called Nihouawa. Thence up in a straight line to top of ridge and Mauka along ridge to Kaneohia. Thence continuing along top of ridge and pali to opposite and down to a large hole in side of cliff called Heana. Thence to an old Heau [heiau] when the boundaries again joins the Mauka or Northeast corner of Kuiloa at a place called Kaluea where there is a large Pride of India tree. Thence across the Hanapepe river to Kailiili. Thence up along the old bed of river to loi Puuhau. Thence to Kuhumu. Thence to ridge of stones across river called Waipa. Thence to head of auwai of Eleele at a place called Akeahi. Thence up face of high cliff to top of ridge and along ridge and pali to Rowell's stone wall, and following said stone wall to junction with the boundary of Wahiawa. Thence Makai along the Wahiawa boundary in all its windings and turnings to a rocky point on the sea shore called Kenakua and thence West along sea shore to Kupuhili the place of commencement.
Duncan McBryde, Commissioner of Boundaries, Island of Kauai
[page 78]

Boundary of the Ili of Eleele

Notes of Survey of the Land of Eleele on the Southeast Corner of the Ahupuaa of Hanapepe.

The Southeast corner of this land commences at the Southwest corner of Wahiawa at a placed called Kenakua on the sea shore where the rock forms an arch through which the sea rushes. The boundary runs thence North 27? 48' East 2375 links to the centre of a pile of stones under which there is a kind of cave or tunnelat 95 links on this line from the top of the cliff there is a flat and a long stone let into the ground, and from whence the following places bear North 4? 43' East Ahuaeliku Peak [triangle] on the boundary of Hanapepe and Makawele

North 32? 25' West on Puuhapele
North 16? 12' West on Puualau's Peak [triangle]
North 27? 52' East on Pohakea peak [triangle] on the boundary of Wahiawa and Hanapepe. The boundary continued from 2375
North 16? 39' East 1847 links to centre of large pile of stones, at 890 links on this line close to Makai side of road there are three stones let into the ground thus [3 dashes] on the line,
North 30? 36' East 1410 links to place about 1650 links from the top of the pali (3) stones let into the ground thus [point of triangle marked]

North 36? 53' East 9035 links to three stones let into the ground thus [point of triangle marked] outside of old stone wall forming a kind of circle and an area about 1/4 acre, there is to the East a clump of Cactus or Papipi bushes, thence
North 47? 23' East 5676 links to mauka side of Government road adjoining Mr. Rowell's land at stone fence which forms the Northeast corner of this land. Thence following along stone wall
South 87? 34' West 470 links. Thence
South 77? 32' West 323 links. Thence
South 74? 32' West 567 links
South 73? 40' West 1232 links.
[margin note "repetition] Thence (South 74? 32' West 567 links South 72? 40' West 1232 links.) Thence
North 77? 32' West 1118 links to the top of pali or terrace which is the Northwest corner of this land and Southwest corner of Mr Rowell's and from whence the following places bear
Ahuailehu Peak [triangle]
North 26? 56' West Puualani Peak [triangle] North 52? 27' West Pohaka peak [triangle] North 27? 42' E. The boundary runs thence South 50? 0' West 628 links along top of terrace South 22? 57' West 368 links. thence
South 57? 49' West 1085 links. Thence
South 70? 33' West 1946 links
North 33? 25' West 620 links over on to the top of Keahi point. The last five courses are along the top of the pali or terrace which is the boundary.

Returning to the place of commencement the boundary runs along the sea shore in a Northwest direction to a point on the [page 79] East side of the Hanapepe stream, at south corner of a land called Kuiloa, the property of her Majesty Queen Kapiolani, from thence the boundary runs along the land of Kuiloa
North 65? 41' West 826 links along Kuiloa. Thence
North 25? 52' West 800 links along Kuiloa to side of Kuleana owned by Keawe and called Kualoau, stones let into the ground here. Thence
North 48? 21' East 288 links along to corner of Keawe Kuleana, Thence
North 81? 20' East 2500 links crossing through rice plantation and up the face of pali and passing through cave called Nihouawa to the top of the terrace thence along top of terrace
North 9? 47' East 700 links. Thence
North 16? 52' East 776 links. Thence
North 0? 3' West 690 links at 427 links on this line passes close to two (2) tall stones. Thence
[North?] 21? 30' West 791 links to the top of Kaneohia pali. Thence
North 82? 12' East 1115 links. Thence
North 58? East 563 links. Thence
[North?] 42? 30' East 1300 links along the top of pali. Thence
North 2? 14' West 1050 links passing down the face of pali and through

cave called Heana and across flat to the North corner of Kuiloa. Thence
North 29? 29' West 462 links crossing Hanapepe stream to its western bank and mauka side of Government road (where three stones thus [points of triangle])Thence
North 57? East 407 links crossing an auwai thence
North 70? 24' East 636 links crossing Hanapepe stream to its eastern bank. Thence
North 60? 53' East 439 links. Thence
South 84? 46' East 485 links
North 62? 86' East 870 links crossing Hanapepe stream to a point where a small stream joins the main one. Thence
North 61? 19' East 369 links crossing small stream and on to bank. Thence
North 59? 14' East 418 links along bank and past place called Puuhau where a Tamarind and Mango tree are growing. Thence
North 32? 21' East 62 links Along Kuaauna [?]. Thence
North 51? 8' East 161 links along Kuauna.
North 56? 2' East 210 links along Kuaauna. Thence
South 77? 33' East 24 links along Kuaauna. Thence
North 41? 38' East 412 links along Kuauna. Thence
North 16? 23' East 175 links to bank of Auwai and called Kuhumu. Thence
North 60? 37' East 538 links along bank of Auwai. Thence
North 49? 25' East 447 links. Thence
North 40? 58' East 269 links along bank of auwai to Hanapepe stream and called Waipaa. Thence
North 49? 10' East 706 links crossing stream to its east bank. Thence
North 65? 50' East 384 links along bank of stream. Thence
North 82? 55' East 156 links along old bank of stream. [page 80] Thence
South 85? 12' East 835 links along old water course to foot of Keahi Pali and containing an area of Ten Hundred and Seventy one acres more or less.

This land is chiefly adapted for grazing purposes. It is very stony. There are in the valley a few acres here and there adapted and suitable for raising rice but to no great extent.

There is somewhere in this land in this land [sic] a block owned by a native, but as the boundary has never been defined it is not possible to say to what extent.
I hereby certify that this is a correct survey of Eleele as shown by the Crown Commissioner of Boundaries.
James Gay, Surveyor
Duncan McBryde, Commissioner of Boundaries, Island of Kauai

[No. 16, Eleele ili, Hanapepe Ahupua`a, District of Kona, Island of Kauai, Boundary Commission, 1071 acres, 1873]

# APPENDIX H: ENVIRONMENTAL ASSESSMENT FOR HUD-FUNDED PROPOSALS (RECOMMENDED FORMAT PER 24 CFR 58.36, REVISED MARCH 2005)

# Environmental Assessment

**for HUD-funded Proposals**

*Recommended format per 24 CFR 58.36, revised March 2005*
*[Previously recommended EA formats are obsolete].*

Project Identification: Lima Ola Workforce Housing Development

Preparer: Community Planning and Engineering, Inc.

Responsible Entity: Kaua‘i County Housing Agency

Month/Year: April 2016

# Environmental Assessment

**Responsible Entity:** Kaua‘i County Housing Agency
[24 CFR 58.2(a)(7)]

**Certifying Officer:** Kanani Fu **-** Housing Director
[24 CFR 58.2(a)(2)]

**Project Name:** Lima Ola Workforce Housing Development

**Project Location:** ‘Ele‘ele, Island of Kaua‘i, State of Hawai‘i

**Estimated Total Project Cost:** To be determined

**Grant Recipient:** Kauai County Housing Agency
[24 CFR 58.2(a)(5)]

**Recipient Address:** Pi‘ikoi Building, 4444 Rice Street, Suite 330, Lihue, Hawaii 96766

**Project Representative:** Mr. Gary Mackler, Kaua‘i County Housing Agency

**Telephone Number:** 808-241-4444

**Conditions for Approval:** (List all mitigation measures adopted by the responsible entity to eliminate or minimize adverse environmental impacts. These conditions must be included in project contracts and other relevant documents as requirements). [24 CFR 58.40(d), 40 CFR 1505.2(c)]

Control measures are anticipated during the construction and operation phase which would include County of Kauai construction best management practices (BMPs), adherence to County drainage, utility and infrastructure standards, along with recommendations to reduce/eliminate potential impacts to special status biological species. Improvements to traffic intersections accessing the project site are recommended to avoid impacts to traffic within the surrounding roadway network.

**Hazards, Nuisances including Site Safety**
Project construction will increase the possibility of safety issues, hazards and nuisances. The developer(s)/contractor(s) are responsible for controlling these issues through the incorporation of County of Kauai BMPs. With the control measures in place, the proposed development is not expected to generate hazards or nuisances.

**Energy Consumption**
Kauai Island Utility Cooperative (KIUC) is expected to supply the necessary power to the housing development. The proposed project will increase the electrical load demand of the local substation. The proposed development may require an electrical line extension and other upgrades to service the proposed development. However, these effects are expected to be insignificant as a result of the proposed project. Any electrical issues shall be resolved prior to development. Once the electrical improvements are conducted, the energy supply should meet the demand of the project site with respect to the surrounding area. Additional energy demand for the proposed project shall be accommodated by the KIUC; therefore, no significant impacts to energy consumption are expected to result from the project.

**Noise**
Construction BMPs to reduce short-term noise impacts would include; insulation/muffling, equipment

substitution, selection, retrofit, and maintenance, utilization of staging areas and non-permanent noise barriers would be implemented to reduce construction noise. Further, buffer zones between construction activities and residential areas would be created, and construction work would be limited to the hours between 7:30 am and 3:30 pm on weekdays.

**Air Quality**
BMPs to reduce dust emissions during the construction period would include watering active work areas and unpaved work roads; use of wind screens; establishment of a routine road cleaning and/or tire washing program; paving of parking areas; establishment of landscaping early in the construction schedule; and monitoring dust at the project boundary.

**Waste Water**
Waste water will increase in the general location of the project area as more residents will be using the utilities and infrastructure provided. The waste water system service lines will be improved to facilitate the increased use. There is no significant impact expected to result from the changes in waste water production.

**Storm Water**
The contractor is responsible to comply with National Pollution Discharge Elimination System (NPDES) requirements which include a Contractors Certification of NPDES Compliance including the BMP checklist and a written BMP plan. The State of Hawai‘i DOH will require a NPDES permit during the construction period as the project site is greater than one acre in size. BMPs would include erosion control measures to minimize potential sediment runoff to surface water and potentially groundwater. Any temporary discharge will be treated and/or controlled to the criteria established by the State Water Quality Standards. Additionally, a permanent no-site detention basin is planned that will manage stormwater runoff. Because these practices will be implemented, no significant impacts to water resources are anticipated under the proposed action.

**Water Resources**
Construction activities should comply with BMPs to reduce the potential of sediment runoff. Runoff in the project area will be controlled by using silt fences and County approved BMPs for reducing the potential of sediment impacts on the wetlands or other water resources. Construction activities will implement BMPs to include sediment barriers to protect neighboring sites and coastal waters from the potential of runoff from the project activities.

**Vegetation and Wildlife**
The threatened Newell’s shearwater, the endangered Hawaiian petrel, and a candidate for listing, the band-rumped storm petrels are known to traverse the project area when flying between the ocean and mountain nesting sites. Seabirds are vulnerable to collision with above ground objects throughout their breeding season of March through December 15. Once grounded, seabirds are vulnerable to predators and are often struck by vehicles along roadways. USFWS recommends using only essential lights, fully shielding all lights and avoiding nighttime construction that requires lighting to avoid and minimize potential impacts to seabirds. Nighttime construction is not anticipated.

The endangered Hawaiian hoary bat roosts in exotic native woody vegetation and, while foraging, will leave her young unattended in “nursery” trees and shrubs. If trees and shrubs suitable for bat roosting are cleared during the breeding season, there is risk that young bats could inadvertently be harmed or killed. As a result, woody plants greater than 15 feet (4.6 meters) tall should not be removed or trimmed from June 1 and September 15.

The USFWS recommended that construction activities be coordinated closely with their agency during construction in order to avoid creating standing water and other attractive nuisances, such as standing water that could attract protected Hawaiian Waterbirds to unsafe construction conditions. The USFWS also recommended that a qualified biologist survey the project area prior to construction, and after a delay of at least 3 days in construction for the presence of Hawaiian goose nests. If a nest is discovered, work should cease immediately and the USFWS should be contacted for further guidance. With these control

measures in place, impacts to biological resources from the Proposed Action would be reduced to a level of insignificance.

**FINDING:** [58.40(g)]

_X__ **Finding of No Significant Impact**
(The project will not result in a significant impact on the quality of the human environment)

___ **Finding of Significant Impact**
(The project may significantly affect the quality of the human environment)

**Preparer Signature:**

**Date:** 4/25/2016

**Name/Title/Agency:** _Max Solmssen/Environmental Planner/CP&E

**RE Approving Official Signature:** _____**Date:** _____

**Name/Title/Agency:** _____

**Statement of Purpose and Need for the Proposal:** [40 CFR 1508.9(b)]

The purpose of the Proposed Action is to satisfy the need for affordable housing on the island of Kaua‘i. The Kaua‘i County Housing Agency mission is to provide the much needed affordable housing to families on Kaua‘i, as the population of Kaua‘i residents is increasing. Facilitating affordable housing opportunities for Kaua‘i residents is one of the county’s top priorities. Following a rapid increase in housing prices in Kaua‘i County in the mid-2000s, a shortage of affordable housing for Kaua‘i residents was pervasive; island-wide. In order to address this housing shortage, the Kaua‘i County Council helped to pass a resolution in 2004 to acquire land for affordable housing. The proposed project site was acquired as a suitable location to provide the needed affordable housing to Kaua‘i residents

**Description of the Proposal:** Include all contemplated actions which logically are either geographically or functionally a composite part of the project, regardless of the source of funding. [24 CFR 58.32, 40 CFR 1508.25]

The Proposed Action is the development of a County of Kaua‘i affordable workforce housing project that would provide the growing County population much needed affordable housing. Lima Ola would include approximately 550 residential units (single family, multi-family and senior resident units) designed with green sustainable energy efficiency features, a community center, vegetated drainage swales, landscaped areas, a water storage tank, and bike and pedestrian paths **[Exhibit 1]**.

**Existing Conditions and Trends:** Describe the existing conditions of the project area and its surroundings, and trends likely to continue in the absence of the project. [24 CFR 58.40(a)]

The project area includes approximately 75 acres of land located in Eleele on the west side of Kauai. The project site is bound the north by open land, to the east by Kaumualii Highway and Eleele Heights residential subdivision, to the west by Wahiawa Stream and to the south by Halewili Road, and the Port Allen industrial/commercial area further to the south.  The project area is currently used for commercial agricultural purposes. Trends likely to continue in the absence of the project include increased residential and commercial development within the area.

# Statutory Checklist

[24CFR §58.5]

Record the determinations made regarding each listed statute, executive order or regulation. Provide appropriate source documentation. Note reviews or consultations completed as well as any applicable permits or approvals obtained or required. Note dates of contact or page references. Provide compliance or consistency documentation. Attach additional material as appropriate. Note conditions, attenuation or mitigation measures required.

| Factors | Determination and Compliance Documentation |
|---|---|
| Historic Preservation<br>[36 CFR 800] | The archaeological inventory survey and cultural impact analysis conducted for the project site concluded that there were no significant historical or cultural resources present within the project area. An abandoned drainage ditch associated with historic agricultural activities was noted, but not considered significant under applicable regulations. The State of Hawaii Historic Preservation Division was provided the archaeological/cultural reports for review, and will be consulted during the environmental review period **[Exhibit 2]**. |
| Floodplain Management<br>[24 CFR 55, Executive Order 11988] | The project area is designated as FEMA Zone X, outside of the 100 year floodplain hazard area. The topography of the project area is gently sloping to the south and site soils provide for adequate drainage across the entire project area. The eastern portion of the project area is located near Wahiawa Stream. Sheetflow during rain events likely drains to the stream and eventually to Hanapepe Bay. A series of vegetated swales are planned that would convey surface stormwater flow to an onsite detention basin. The proposed housing development is not anticipated to have an adverse impact on floodplain function. Additionally, the proposed project should not be impacted by flooding as it is located outside the designated flood hazard area **[Exhibit 3].** |
| Wetlands Protection<br>[Executive Order 11990] | An abandoned irrigation ditch (Pump No.1 Ditch) located at the project site is classified as an intermittent, man-made riverine, which is occasionally flooded. There are no listed natural wetlands or wetland habitats within the project site, however there are wetlands that exist in close proximity to the project site. Hanapēpē River is located approximately 1,000 feet to the northwest of the project site, and Wahiawa Stream is approximately 1,000 feet to the east of the project site. Loss or destruction of wetlands is not expected based on the distance of the wetlands to the project site. Runoff produced during construction activities would be controlled using silt fences and County of Kauai-approved BMPs to reduce the potential of sediment impact to wetlands **[Exhibit 4].** |
| Coastal Zone Management Act<br>[Sections 307(c), (d)] | The Coastal Zone Management Program is promulgated by Chapter 205A, HRS. The objectives and policies of the program are administered by the State of Hawai‘i Office of Planning. Through the CZM Program, each County is required to establish Special Management Areas (SMAs) and shoreline setbacks within which permits are required for development. CZM regulations such as the SMA and Shoreline Setback provisions, which are administered by the Counties, are may apply to HUD-assisted projects. Each County Planning Department should be consulted for the applicability of SMA and Shoreline Setback requirements. The proposed project is not located within the SMA. The proposed project is not |

| | |
|---|---|
| | anticipated to have an adverse impact on the coastal zone. the County of Kaua'i Planning Department will be consulted during the environmental review process for federal CZM consistency review **[Exhibit 5]**. |
| Sole Source Aquifers<br>[40 CFR 149] | Based on the EPA sole source aquifer designation, the Island of Kaua'i does not have any sole source aquifers. The proposed action would be closely coordinated with the County of Kaua'i Department of Water. The availability of water should not be impacted or have adverse impacts to the underlying aquifers. Therefore, no significant impacts to drinking water sources are expected from the proposed action **[Exhibit 6]**. |
| Endangered Species Act<br>[50 CFR 402] | A terrestrial flora and fauna survey was conducted at the project site in order to identify the presence of special status habitats. No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed within the surveyed area, and no designated critical plant habitat occurs within the area. The endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*), may fly over the project site at night while traveling to and from their upland nesting sites to the ocean.<br><br>The following control measures are recommended to avoid and minimize light attraction of the endangered Hawaiian petrel and threatened Newell's shearwater to the project site:<br><br>• Construction activity should be restricted to daylight hours as much as practicable during the seabird breeding season (April through November) to avoid the use of nighttime lighting that could be an attraction to seabirds.<br><br>• All outdoor lights should be shielded to prevent upward radiation at the housing development. This has been shown to reduce the potential for seabird attraction.<br><br>• Outside lights that are not needed for security and safety should be turned off from dusk through dawn during the fledgling fallout period (September 15–December 15).<br><br>The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) was detected at the project site. To prevent direct impacts to the Hawaiian hoary bat, the following control measures are recommended:<br><br>• No trees taller than 15 feet within the project site should be trimmed or removed between June 1 and September 15 when non-volant juvenile bats (bats that cannot fly) may be roosting in the trees.<br><br>• Any fences that are erected as part of the Proposed Action should have a barbless top-strand wire to prevent entanglements of the Hawaiian hoary bat on barbed wire. For existing fences at the project site, |

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| | the top strand of barbed wire should be removed or replaced with barbless wire.<br><br>The United States Fish and Wildlife Service (USFWS) will be consulted during the environmental review period in compliance with Section 7 of the Endangered Species Act.<br><br>The USFWS also recommended that construction activities be coordinated closely with their agency during construction in order to avoid creating standing water and other attractive nuisances, such as standing water that could attract protected Hawaiian Waterbirds to unsafe construction conditions. The USFWS also recommended that a qualified biologist survey the project area prior to construction, and after a delay of at least 3 days in construction for the presence of Hawaiian goose nests. If a nest is discovered, work should cease immediately and the USFWS should be contacted for further guidance. **[Exhibit 7]..** |
| Wild and Scenic Rivers Act<br>[Sections 7(b), (c)] | There are no designated wild and scenic rivers in the state of Hawai'i. There are no anticipated compliance requirements under the wild and scenic rivers act for the proposed housing development **[Exhibit 8]**. |
| Air Quality<br>[Clean Air Act, Sections 176(c) and (d), and 40 CFR 6, 51, 93] | The project site is located in EPA attainment zones for United States Environmental Protection Agency (EPA) National Ambient Air Quality Standards, for all criteria pollutants. The proposed project would result in less than significant short-term impacts to air quality arising from construction activities. The major potential short-term air quality impacts would occur from the generation of fugitive dust. Applicable BMPs would be implemented during construction activities in order to control fugitive dust emissions. These BMPs would include watering active work areas and unpaved work roads; use of wind screens; establishment of a routine road cleaning and/or tire washing program; paving of parking areas; establishment of landscaping early in the construction schedule; and monitoring dust at the project boundary. |
| Farmland Protection Policy Act<br>[7 CFR 658] | The proposed project site is currently used for commercial agricultural purposes. However, important farmlands would not be significantly impacted by the proposed residential use due to the adequate amount of available agricultural lands surrounding the project site, and within the County of Kaua'i. |
| Environmental Justice<br>[Executive Order 12898] | The project will provide affordable housing to residents. The proposed housing development complies with Executive Order 12898 and ensures environmental justice for members of the community, including minority and low-income populations. |

## HUD Environmental Standards Determination and Compliance Documentation

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| Noise Abatement and Control<br>[24 CFR 51 B] | Less than significant short-term noise impacts from construction activities would occur. BMPs (e.g., construction scheduling; insulation/muffling; reduced power options; equipment substitution, selection, retrofit, and maintenance; utilization of staging areas; and non-permanent noise barriers) would be implemented to reduce or eliminate noise. Further, buffer zones between construction activities and residential |

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| | areas would be created, and construction work would be limited to the hours between 7:30 am and 3:30 pm on weekdays. As a result, short-term impacts from construction activities would be less than significant to the surrounding environment. |
| Toxic/Hazardous/Radioactive Materials, Contamination, Chemicals or Gases **[24 CFR 58.5(i)(2)]** | During construction, there may be the potential of petroleum spillage associated with construction vehicles and equipment. To minimize this hazard, all applicable spill and prevention control BMPs would be implemented to ensure that accidental releases are minimized and contained. For example, vehicles and equipment would be regularly inspected for leaks and adequate performance, and would be maintained accordingly. In the long-term, there is potential for petroleum spillage from residential sources (e.g., vehicle leaks and improper disposal of hazardous materials). These potential impacts would be reduced by adherence to all applicable county and state regulations. As a result, implementation of the Proposed Action is expected to have a less than significant impact from hazardous materials and wastes. |
| Siting of HUD-Assisted Projects near Hazardous Operations [24 CFR 51 C] | Surrounding land uses include commercial agriculture, transportation corridors and residential use. Potentially hazardous operations may occur at the Port Allen industrial/commercial area, as well as at the rock quarry to the southeast of the Site. However these areas are located at least one-quarter mile down-gradient from the nearest boundary of the project site and therefore is not anticipated to affect the project site. |
| Airport Clear Zones and Accident Potential Zones [24 CFR 51 D] | The project site is located approximately 1.6 miles northeast of the nearest airstrip and approximately 15 miles from the nearest airport. These distances are outside of the potential airport clear zone or accident potential zone of 2,500 ft. |

# Environmental Assessment Checklist

[Environmental Review Guide HUD CPD 782, 24 CFR 58.40; Ref. 40 CFR 1508.8 &1508.27]

Evaluate the significance of the effects of the proposal on the character, features and resources of the project area. Enter relevant base data and verifiable source documentation to support the finding. Then enter the appropriate impact code from the following list to make a determination of impact. **Impact Codes**: (**1**) - No impact anticipated; (**2**) - Potentially beneficial; (**3**) - Potentially adverse; (**4**) - Requires mitigation; (**5**) - Requires project modification. Note names, dates of contact, telephone numbers and page references. Attach additional material as appropriate. Note conditions or mitigation measures required.

| Land Development | Code | Source or Documentation |
|---|---|---|
| Conformance with Comprehensive Plans and Zoning | 1 | According to the State Land Use Commission district classifications, the parcel is in the agricultural land use district. County zoning at the project area is zoned as Agricultural. An exemption from County zoning is being sought for the Proposed Action under the Hawai‘i Revised Statutes (HRS) 201H process. In addition a petition for Land Use District Boundary Amendment will be processed though the State Land Use commission via the 201H expedited review process. |
| Compatibility and Urban Impact | 1 | The project area will include the conversion of commercial agricultural lands to residential use. However, the proposed action would be compatible with surrounding land uses, which include the urban/residential areas of ‘Ele‘ele Heights, ‘Ele’ele Shopping Center and the Port Allen commercial/industrial area. |
| Slope | 1 | The project site slopes gently in the makai (seaward) direction from north to south. The project site ranges in elevation from approximately 275 to 175 feet above mean sea level, and has an average slope of four percent (4 %) grade. The project site is bound by Kaumuali‘i Highway to the northwest and west, Halewili Road to the south, and agricultural lands to the east and northeast. |
| Erosion | 4 | The project site includes Makaweli silty clay loam. This soil type has a slight to moderate erosion hazard. Construction BMPs, including silt fences/barriers, and following the site NPDES construction permit would reduce erosion impacts during the construction period to a level of insignificance. |
| Soil Suitability | 1 | The subsurface soils at the project site vary from stiff to very stiff clayey silt and silty clays with low expansion potential. These soils are suitable for development. |
| Hazards and Nuisances including Site Safety | 1 | Project construction will increase the possibility of safety issues, hazards and nuisances. The developer(s)/contractor(s) are responsible for addressing these issues through the incorporation of County of Kaua‘i BMPs and adherence to state and federal worker safety regulations, including securing the work site from the public during working and non-working hours. |
| Energy Consumption | 1 | Kaua‘i Island Utility Cooperative (KIUC) is expected to supply the necessary power to the housing development. The proposed action will increase the electrical load demand of the local substation. The proposed action would |

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| Energy Consumption (cont.) | | require new electrical infrastructure. The increase in electrical service to the proposed project would not represent a significant increase in energy use. Once the electrical improvements are conducted, the energy supply will be able to meet the demand of the project area with respect to the surrounding area. KIUC will be consulted during the environmental review period to assure the adequacy of available electricity for the proposed demand from Lima Ola. No significant impact to energy consumption is expected to result from the project. |

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| **Noise -** Contribution to Community Noise Levels | 1 | Under the Proposed Action, less than significant short-term noise impacts from construction activities would occur. Development of the project site would involve excavation, grading, and other typical construction activities. The Proposed Action is not expected to significantly impact any existing sensitive noise receptors within the vicinity of the project site (i.e., ‘Ele‘ele Heights Subdivision). However, residences from the initial phase of construction may be impacted by construction-related noise due to subsequent phases of work. However, these impacts would be less than significant. |
| **Air Quality**<br>Effects of Ambient Air Quality on Project and Contribution to Community Pollution Levels | 1 | Dust may be generated during construction activities. Also, increased vehicular traffic to and from the project area is anticipated. Traffic is expected to increase in the long-term with the development of housing and increased population. Small long-term increases in exhaust emissions are anticipated within the vicinity of the project area; however, this does not constitute a significant effect island-wide. Long-term impacts to air quality from increased traffic circulation within the project area are anticipated to be minimal. Overall, potential impacts to air quality resulting from short-term and long-term changes are minimal and not significant. |
| **Environmental Design**<br>Visual Quality - Coherence, Diversity, Compatible Use and Scale | 1 | The Proposed Action would include a compact residential community that would blend into the adjacent established ‘Ele‘ele community, including Heights Subdivision, as well as the ‘Ele‘ele I Luna subdivision that is planned directly southwest of the project site. The project would include a diverse mix of residential options, pedestrian/bike paths and other sustainable features, such as vegetated drainage swales. The proposed action is consistent with the County of Kaua‘i General Plan. |

| **Socioeconomic** | **Code** | **Source or Documentation** |
|---|---|---|
| Demographic Character Changes | 1 | Demographic changes are expected to be insignificant. Increases in population have been steady on Kaua‘i and therefore there is a need for additional housing. The proposed housing project would include single family and multi-family housing units of varying sizes. Senior and general rental apartments are also planned. This diversity |

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| | | in housing options would likely attract a diverse range of age groups and demographics. |
| Displacement | 1 | The project site is currently used for commercial agricultural purposes. The County has been in communication with the current tenant since the initial planning, and there are suitable lands to replace the land needed for the proposed development, within the County. |
| Employment and Income Patterns | 1 | The Proposed Action would lead to intermittent construction employment as the construction phasing occurs over the years. |

| Community Facilities and Services | Code | Source or Documentation |
|---|---|---|
| Educational Facilities | 1 | The Proposed Action would likely result in an increase in school enrollment at schools within the vicinity of the project area, such as ‘Ele‘ele Elementary. Since the proposed project would be completed in phases, it is not anticipated that the increase in school enrollment would significantly affect educational facilities. |
| Commercial Facilities | 1 | Businesses in the vicinity of the project area may experience gradual increased economic activity from the additional population. There would be no anticipated adverse impacts to commercial facilities. |
| Health Care | 1 | Health care facilities within the vicinity of the project area include Kauai Medical Clinic and Kaua‘i Veterans Memorial Hospital-Waimea. It is not anticipated that the proposed project would adversely impact these facilities. |
| Social Services | 1 | The project area is served by several social service providers in Kaua‘i that can meet the demand created by the proposed action. |
| Solid Waste | 1 | Solid waste disposal services are available in the area through the County of Kaua‘i, Division of Solid Waste. The County has a variety of solid waste services that include a landfill, greenwaste diversion, refuse collections, refuse transfer stations, and recycling and waste management programs. The proposed action is not anticipated to adversely impact solid waste collection services within the area. |
| Waste Water | 1 | Wastewater generated by the Proposed Action would be serviced by the County of Kauai Wastewater Manageme nt Division ‘Ele‘ele WWTP. The Proposed Action would require the design and installation of sewer lines at the project site. The proposed development would generate an average wastewater flow well within the treatment capacity of the ‘Ele‘ele Wastewater Treatment Plant. Therefore, the Proposed Action would have a less than significant impact on the County wastewater system. |

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| Storm Water | 4 | The Proposed Action would include the construction of additional impervious surfaces (paved roads and sidewalks) that would collect and convey stormwater runoff. Therefore an on-site drainage system would be implemented. The drainage system would include vegetated drainage swales located along the internal roadways that would collect and bio-filter stormwater, which would then be deposited into subsurface reinforced concrete pipe culverts. The stormwater would then be channeled to an on-site detention basin that would allow collected surface water to percolate into the underlying aquifer. |
| Water Supply | 1 | The Proposed Action would require the design and installation of potable water lines at the project site. Studies for the project Water Master Plan has shown that the underlying aquifer has enough capacity to supply the projected demand of the proposed development, without resulting in a significant impact to groundwater resources. Coordination with the County Department of Water will continue to ensure that the proposed water system is implemented in accordance with County standards. |
| Public Safety<br>- Police | 1 | The Proposed Action would be included in the patrol area for the Kaua‘i Police Department Waimea District, which provides police services from Halfway Bridge on Kaumuali‘i Highway to the far westside of the island (Polihale), including Koke‘e State Park (Kaua‘i Police Department, 2014). Since the Proposed Action would be located within close proximity of existing towns that are currently patrolled (‘Ele‘ele and Hanapēpē), it would not represent a significant impact to existing law enforcement services. |
| - Fire | 1 | The Proposed Action would be in the response vicinity of the Hanapēpē Fire Station, located approximately 1.3 miles to the west. Since the Proposed Action is in close proximity to an existing fire station and would conform to county fire protection standards, including the installation of fire hydrants and smoke alarms, it would not represent a significant impact to existing fire protection services. |
| - Emergency Medical | 1 | Emergency medical services are available at Kaua‘i Veterans Memorial Hospital in Waimea. |
| Open Space and Recreation<br>- Open Space | 1 | The Proposed Action would include a community center and park, as well as pedestrian and bike paths throughout the community. |
| - Recreation | 1 | There are several County Department of Parks and Recreation facilities located west of the project site. ‘Ele‘ele Nani Park is located approximately one quarter mile from the project site and includes a 7.50 acre neighborhood park with playground equipment. ‘Ele‘ele Park is a 2.86 acre neighborhood park, located approximately 0.35 miles from the project site. ‘Ele‘ele Park includes a multi-purpose field, |

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| | | a comfort station, pavilion and basketball court.<br><br>Hanapēpē Bay is located approximately one mile south of the project site, which has many recreational uses, including biking, boating, swimming, and diving. None of these recreational areas would be adversely affected by the Proposed Action. |
| - Cultural Facilities | 1 | There would be no cultural facilities adversely affected by the proposed project since the project area is currently used for private commercial agriculture production. |
| Transportation | 4 | Implementation of the Proposed Action would result in less than significant, short-term impacts to traffic and circulation during the construction period. Therefore, construction activities would need to comply with HDOT construction traffic control measures. Upon completion, the Proposed Action is expected to generate small long-term traffic and circulation impacts on traffic in the area. In order to address the project-induced projected impacts, improvements to the four intersections surrounding the project site would be implemented. With these control measures implemented, there would be no significant impact to the surrounding roadway network (Hatch Mott MacDonald, 2014). |

| **Natural Features** | | **Source or Documentation** |
|---|---|---|
| Water Resources | 1 | The Proposed Action would not result in adverse effects to water resources within the vicinity of the project area. |
| Surface Water | 4 | A National Pollution Discharge Elimination System (NPDES) permit will be applied for during the construction period. Provisions of the NPDES permit and county construction BMPs would provide controls to reduce/eliminate silt runoff during construction. Long-term surface water would be managed by a stormwater drainage system that would collect, biofilter and convey stormwater to an on-site detention basin. |
| Unique Natural Features and Agricultural Lands | 1 | The project area includes areas designated as State of Hawaii Agricultural Lands of Importance. However, the project area is not included within the Important Agricultural Lands (IALs) as defined by the State of Hawai‘i Land Evaluation and Site Assessment Commission. |
| Vegetation and Wildlife | 4 | No state or federally listed threatened, endangered, or candidate plant species, or rare native Hawaiian plant species were observed within the surveyed area, and no designated critical plant habitat occurs within the area. The endangered Hawaiian petrel (*Pterodroma sandwichensis*) and threatened Newell's shearwater (*Puffinus auricularis newelli*), may fly over the project site at night while traveling to and from their upland nesting sites to the ocean. The endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*) was detected at the project site. To prevent |

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| | | potential impacts to the these special status species, along with other species listed in the EA that may be affected, control measures stated above will be implemented **[Exhibit 7]**. |

| Other Factors | | Source or Documentation |
|---|---|---|
| Flood Disaster Protection Act [Flood Insurance] [§58.6(a)] | 1 | The project area is categorized as FEMA Zone X and defined as an area outside of the 0.2% annual chance floodplain. Flood insurance is available for the project area. |
| Coastal Barrier Resources Act/ Coastal Barrier Improvement Act [§58.6(c)] | 1 | The project area is not located within the Coastal Barriers Resource System (CBRS). Currently, there are no CBRS map units established within the State of Hawai‘i (http://www.fws.gov/CBRA/Maps/Mapper.html). |
| Airport Runway Clear Zone or Clear Zone Disclosure [§58.6(d)] | 1 | The project site is located approximately 1.6 miles northeast of the nearest airstrip (Port Allen Airport). |
| Other Factors | 1 | Not applicable. |

## Summary of Findings and Conclusions

## ALTERNATIVES TO THE PROPOSED ACTION

### Alternatives and Project Modifications Considered [24 CFR 58.40(e), Ref. 40 CFR 1508.9]

(reasonable courses of action that were considered and not selected, such as other sites, design modifications, or other uses of the subject site. Describe the benefits and adverse impacts to the human environment of each alternative and the reasons for rejecting it.)

The County of Kaua‘i has considered the possibility of developing other sites within the County. However, the selection of alternate sites is not a viable alternative to the proposed action, due to the high cost of land within the County and scarce availability of lands for development. After a detailed review of options, the project site was considered the most viable site to provide diverse quality housing options to the most people for an affordable cost.

### No Action Alternative [24 CFR 58.40(e)]

(Discuss the benefits and adverse impacts to the human environment of not implementing the preferred alternative).

Under the No Action Alternative, the affordable housing development project would not be constructed. There would be no disturbance of the existing environment; however, additional needed affordable housing would not be provided to residents on the Island of Kaua‘i. There is a substantial need for additional affordable housing in the area and the Kaua‘i County Housing Agencies’ mission is to facilitate affordable housing opportunities to the residents of Kaua‘i.

### Mitigation Measures Recommended [24 CFR 58.40(d), 40 CFR 1508.20]

(Recommend feasible ways in which the proposal or its external factors should be modified in order to minimize adverse environmental impacts and restore or enhance environmental quality.)

Mitigation measures include roadway intersection improvements to address potential traffic impacts, design and construction measures to reduce potential impacts to special status species found throughout the County, as well as construction BMPs to reduce common construction-related impacts to the affected environment. These measures are described in this document, as well as the accompanying EA.

## Additional Studies Performed

(Attach studies or summaries)

- Traffic Impact Analysis to document existing transportation roadway and intersection conditions, as well as anticipated impacts from the proposed project.
- Biological Study to document existing biological resources within the project site.
- Archaeological/Cultural Impact Analysis to document any existing archaeological/cultural resources within the project area.
- Market Study: research of existing and projected real estate market trends in order to design the proposed project based on area need and preference.
- Noise Assessment to document projected noise impacts from the Proposed Action.
- Air Quality Study to assess existing conditions, as well as projected air impacts from the Proposed Action.
- Preliminary Engineering Report to document the civil engineering components planned for the Proposed Action.
- Water Master Plan to analyze the existing capacity of the existing potable water supply, as well as the projected impacts to the water supply from the Proposed Action

## List of Sources, Agencies and Persons Consulted [40 CFR 1508.9(b)]


B.D. Neal & Associates, 2014. *Draft Air Quality Study for the Proposed Lima Ola Workforce Housing Project.* 25 April 2014.

Cavanaugh and Tocci, 1998. *Environmental Noise, the Invisible Pollutant.* Environmental Excellence in South Carolina. Volume 1, Number 1, University of Southern California Institute of Public Affairs. <http://www.cavtocci.com/portfolio/publications/EnvironmentalNoise.pdf>

CEQ, 2010. *Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions*. Memorandum for Heads of Federal Departments and Agencies.

County of Kaua‘i, 2000. *Kaua‘i County General Plan.* Accessed 5 June 2014. <http://www.kauai.gov/Government/Departments/PlanningDepartment/TheKauaiGeneralPlan/tabid/130/Default.aspx>

County of Kaua‘i, 2004. *Interim Construction Best Management Practices for Sediment and Erosion Control for the County of Kaua‘i.* Department of Public Works.

County of Kaua‘i, 2011. *County of Kaua‘i Agency on Elderly Affairs Four Year Plan on Aging October 1, 2011- September 30, 2015.* Accessed 6 June 2014. <http://kauaiadrc.org/Portals/_AgencySite/docs/kauaiareaplan-final-2012-2015-1-28-2011.pdf>

County of Kaua‘i, 2012a. Kaua‘i County Code, 1987, as Amended. Council of the County of Kaua‘i, November 21, 2012.

County of Kaua‘i, 2012b. *Current CZO with Amendments.* Accessed 7 July 2014. <http://www.kauai.gov/Government/Departments/PlanningDepartment/ZoningandLandUsePermits/CurrentCZOwithAmendments/tabid/583/Default.aspx>

County of Kaua‘i Housing Agency, 2012. *Lima Ola Workforce Housing Development Master Plan County of Kaua‘i Housing Agency.* March 2012.

D.L. Adams Associates, Ltd., 2014. *Environmental Noise Assessment Report Lima Ola Workforce Housing Development, ‘Ele‘ele, Island of Kaua‘i, Hawai‘i*.

DOH, 1969. Title 11: Hawai‘i Administrative Rules. Chapter 46: Community Noise Control.

DOH, 2011. *Islands of Hawai‘i, Kaua‘i, Lana‘i, Maui, Moloka‘i, and O‘ahu.* Scale 1:24,000. Accessed 7 July 2014. June.

DOH, 2012. *State of Hawai‘i Annual Summary 2012 Air Quality Data.* Accessed 20 March 2014. <http://health.hawaii.gov/cab/files/2013/05/aqbook_2012.pdf>

EPA, 1977. *Toward a National Strategy for Noise Control*. U.S. Environmental Protection Agency.

EPA, 2012. *Air and Radiation.* Accessed 20 March 2014. <http://www.epa.gov/air/>

EPA, 2014. *EPA Region 9 Air Quality Maps.* Accessed 10, April 2014. <http://www.epa.gov/region09/air/maps/>

FEMA, 2010a. *Hawai‘i County Flood Insurance Rate Map. Parcel ID: 1500020287F.* Accessed 10 June 2014. <https://msc.fema.gov>

FEMA, 2010b. *Hawai‘i County Flood Insurance Rate Map. Parcel ID: 1500020289F.* Accessed 10 June 2014. <https://msc.fema.gov>

FEMA, 2010c. Digital Flood Insurance Rate Map Database, Kaua‘i County, Hawai‘I, USA. Accessed 7 July 2014. 26 November 2010. < www.msc.fema.gov>

Foote, D. E., Hill, E. L., Nakamura, S., & Stepehens, F., 1972. *Soil Survey, Islands of Kaua‘i, O‘ahu, Maui, Moloka‘i, and Lana‘i, State of Hawai‘i.*

Hatch Mott MacDonald, 2014. *Lima Ola Workforce Housing Project. ‘Ele‘ele, Hawai‘i. Traffic Impact Analysis Final Report.* October.

Kaua‘i Fire Department, 2014. Accessed 5 June 2014. <http://www.kauai.gov/Government/Departments/FireDepartment/tabid/107/Default.aspx>

Kaua‘i Police Department, 2014. Accessed 5 June 2014. <http://www.kauai.gov/tabid/298/Default.aspx>

Kimura International, 2010. *Phase 2: Environmental Site Assessment, TMK (4) 2-1-001: Parcel 027 ‘Ele‘ele, Kaua‘i.* January.

KIUC, 2014. *Energy Information. Power Cost and Generation Fleet.* Accessed 25 June 2014. <http://website.kiuc.coop/content/energy-information-0>

Macdonald, G.A., Abbott, A.T. and Peterson, F.L.,1983. *Volcanoes in the Sea, the Geology of Hawai‘i.* Honolulu, University of Hawai‘i Press.

Mink, John and Stephen Lau, 1992. *Aquifer Identification and Classification for Kaua‘i: Groundwater Protection Strategy for Hawai‘i*, September.

National Wetlands Inventory, 2014. *Hawaii Wetlands.* Accessed 7 July 2014. <http://www.fws.gov/wetlands/>

NOAA, 2014. *Tsunami Hazard Map.* Accessed 17 June 2014. <http://tsunami.csc.noaa.gov/map.html?mapname=KAUA_I-POIPU&submit1=Search+Island+Area>

NRCS, 2014. *National List of Hydric Soils 2014.* Accessed 17 June 2014. <http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/use/hydric/>

OSHA, 2012. *29 CFR, Part 1910, Subpart: G: Occupational Safety and Health Standards.*

Ronald N. S. Ho & Associates, Inc., 2014. From Kanemura, Bryce. “RE: (Pn 213109) Lima Ola - Electric Demand Estimate” Message to Hernan N. Co. 24 March 2014. E-mail.

Scientific Consultant Services (SCS), 2014a. *A Cultural Impact Assessment for a 75-acre Parcel in Hanapēpē Ahupua‘a, District of Kona, Kaua‘i Island, Hawai‘i.* TMK. (4)-2-1-001:054. Prepared for CPE.

SCS, 2014b. *An Archaeological Inventory Survey of a 75-acre Parcel in Hanapēpē Ahupua‘a, District of Kona, Kaua‘i Island, Hawai‘i.* TMK. (4)-2-1-001:054. Prepared for CPE.

State Land Use Commission, 2014. *State Land Use District Boundaries.* Scale: 1:24,000. March.

State of Hawai‘i, 2008. *Hawai‘i Revised Statutes Chapter 343 Environmental Impact Statements.* Updated January 2008.

State of Hawai‘i, 2012. *Land Use District Boundary Maps - Island of Kaua‘i.* Accessed 17 June 2014. <http://luc.hawaii.gov/maps/land-use-district-boundary-maps/ludb-maps-island-of-kauai/>

State of Hawai‘i, 2014. *Kaua‘i Tsunami Evacuation Zones.* Accessed 17 June 2014. <http://www.kauai.gov/Government/Departments/CivilDefenseAgency/tabid/90/Default.aspx>

State of Hawai‘i Environmental Council, 1997. *Guidelines for Assessing Cultural Impacts.* November.

State of Hawai‘i Land Evaluation and Site Assessment Commission, 1986. *Important Agricultural Lands.* Accessed 15 June 2014. <http://planning.hawaii.gov/gis/>

SWCA, 2013. Biological *Resource Assessment for Lima Ola Workforce Housing.* SWCA Project No. 25727.00. October.

U.S. Census Bureau, 2014. *American Fact Finder.* Accessed 5 June 2014. <http://factfinder2.census.gov/>

USFWS, 2014. *National Wetlands Inventory Website.* U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C. Accessed June 2014. <http://www.fws.gov/wetlands/>

USGS, 1996. Hanapepe, HI. Scale 1: 24,000. Accessed 7 July 2014. <http://magis.manoa.hawaii.edu/maps/index.html>

USGS, 2001. *Earthquakes Hazards and Zoning in Hawai‘i.* Accessed October 2013. <http://hvo.wr.usgs.gov/earthquakes/hazards/>

USGS, 2014a. *National Water Information System: Mapper.* Accessed 10 June 2014. <http://maps.waterdata.usgs.gov/mapper>

USGS, 2014b. *Online tools help Hawai‘i breathe easier during trade wind time-outs.* Accessed 25 March 2014. < http://hvo.wr.usgs.gov/volcanowatch/view.php?id=202>

Western Regional Climate Center, 2008. *Hawai‘i Climate Summaries.* Accessed October 2013. <http://www.wrcc.dri.edu/ summary/climsmhi.html>

# Exhibit 1: Site Plan

PDF - Q:\Kauai\County Affordable Housing Lima Ola\PDF
Path - Q:\Kauai\County Affordable Housing Lima Ola\Photoshop\RevConceptMasterPlan_20140715.psd

| LAND AREA SUMMARY | | Acreage | Units |
|---|---|---|---|
| **Housing** | | | |
| Single Family *(Typical lot size: 5,000 - 7,000 SF.)* | ± | 18.0 | 120 - 135 |
| Multi Family | ± | 32.9 | 375 - 435 |
| Elderly | ± | 3.6 | 35 - 50 |
| Community Center / Park | ± | 2.8 | |
| Special Landscape Treatment | | --- | |
| Water Storage Tank | ± | 1.0 | |
| Open Space / Common Area (Detention Basin, Pedestrian Corridor) | ± | 1.4 | |
| Vegetated Swale | | (Acreage Included in Roadway) | |
| Bike/Pedestrian Path | | (Acreage Included in Roadway) | |
| **Roads** | | | |
| County Major Perimeter Road - Mauka section (56' ROW) | ± | 0.8 | |
| Loop Collector Road (56' ROW) | ± | 6.4 | |
| Entry Road - Mauka and Makai (56' ROW) | ± | 0.7 | |
| Mahea Road (56' ROW) | ± | 1.2 | |
| Minor Road (46' ROW) | ± | 2.7 | |
| Future Road Reserve | ± | 3.5 | |
| **TOTAL:** | ± | **75.0** | **530 - 620** |
| | | *ac.* | *units* |

Conceptual Master Plan

# LIMA OLA

DRAFT 07/15/14

County of Kaua'i
Island of Kaua'i

North

Linear Scale (in feet)
0 100 200 400

PBR HAWAII & ASSOCIATES, INC.

Source: Project boundaries provided by Community Planning & Engineering (2014-01-07); Original master plan provided by Kimura International and RM Towill Corporation (March 2012); Google Earth Pro (2014).
Disclaimer: This graphic has been prepared for general planning purposes only and should not be used for boundary interpretations or other spatial analysis.

# Exhibit 2: State Historic Preservation Division Letter

Community Planning and Engineering, Inc.

December 3, 2014

Chairperson William J. Aila Jr.
State of Hawaii Department of Land and Natural Resources

Attention: Ms. Theresa Donham
Deputy State Historic Preservation Officer
601 Kamokila Boulevard, Suite 555
Kapolei, Hawai‘i 96707

Subject: Section 106 National Historic Preservation Act Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Ms. Donham:

Community Planning and Engineering, Inc., on behalf of the Kaua‘i County Housing Agency is in the process of preparing an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project. As part of the environmental review process, and in accordance with Section 106 of the National Historic Preservation Act (NHPA), we are requesting a determination if any documented historic or culturally significant resources exist at, or within close proximity to the subject parcel. Section 106 consultation under the NHPA is triggered due to potential project funding from the United States Department of Housing and Urban Development (HUD). The County of Kaua‘i represents HUD as the responsible federal agency requesting consultation under Section 106 of the NHPA.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. We are enclosing the following reference documents to assist with your review; a site location map which includes the Area of Potential Effect (APE) (Attachment 1), a site plan (Attachment 2) and an archaeological survey and cultural impact assessment that were conducted for the proposed project and submitted to your office in July, 2014 (Attachment 3).

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012.

Sincerely,

Max Solmssen
Project Manager

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

# Exhibit 3: FEMA Map

## NOTES TO USERS

p is for use in administering the National Flood Insurance Program. It t necessarily identify all areas subject to flooding, particularly from local sources of small size. The **community map repository** should be d for possible updated or additional flood hazard information.

in more detailed information in areas where **Base Flood Elevations** and/or **floodways** have been determined, users are encouraged to consult d Profiles and Floodway Data and/or Summary of Stillwater Elevations ontained within the Flood Insurance Study (FIS) report that accompanies M. Users should be aware that BFEs shown on the FIRM represent whole-foot elevations. These BFEs are intended for flood insurance urposes only and should not be used as the sole source of flood n information. Accordingly, flood elevation data presented in the FIS should be utilized in conjunction with the FIRM for purposes of tion and/or floodplain management.

**Base Flood Elevations** shown on this map apply only landward of al Tidal Datum. Users of this FIRM should be aware that coastal flood s are also provided in the Summary of Stillwater Elevations tables in the surance Study report for this jurisdiction. Elevations shown in the Summary ater Elevations tables should be used for construction and/or floodplain ment purposes when they are higher than the elevations shown on this

ies of the **floodways** were computed at cross sections and interpolated cross sections. The floodways were based on hydraulic considerations ard to requirements of the National Flood Insurance Program. Floodway nd other pertinent floodway data are provided in the Flood Insurance port for this jurisdiction.

areas not in Special Flood Hazard Areas may be protected by **flood structures**. Refer to Section 2.4 "Flood Protection Measures" of the surance Study report for information on flood control structures for this on.

**jection** used in the preparation of this map was Universal Transverse (UTM) Zone 4. The **horizontal datum** was NAD 83, GRS80 spheroid. es in datum, spheroid, projection or UTM zones used in the production of r adjacent jurisdictions may result in slight positional differences in map across jurisdiction boundaries. These differences do not affect the of this FIRM.

evations on this map are referenced to the Local Tidal Datum. These flood ns must be compared to structure and ground elevations referenced to e **vertical datum**. For information regarding conversion between the Geodetic Vertical Datum of 1929 and the North American Vertical of 1988, visit the National Geodetic Survey website at w.ngs.noaa.gov or contact the National Geodetic Survey at the address:

rmation Services
N/NGS12
Geodetic Survey
#9202
st-West Highway
ring, Maryland 20910-3282
0-3242

n current elevation, description, and/or location information for **bench** shown on this map, please contact the Information Services Branch National Geodetic Survey at **(301) 713-3242**, or visit its website at w.ngs.noaa.gov.

**ap** information shown on this FIRM was derived from mosaicked 2-foot esolution satellite imagery that meets 1:12,000 scale horizontal accuracy s provided by Digital Globe and the United States Department of re Natural Resources Conservation Service. This information was between July 2002 and January 2004.

p reflects more detailed and up-to-date **stream channel configurations** se shown on the previous FIRM for this jurisdiction. The floodplains and s that were transferred from the previous FIRM may have been adjusted m to these new stream channel configurations. As a result, the Flood and Floodway Data tables in the Flood Insurance Study Report (which authoritative hydraulic data) may reflect stream channel distances that n what is shown on this map.

**te limits** shown on this map are based on the best data available at the ublication. Because changes due to annexations or de-annexations may curred after this map was published, map users should contact appropriate ity officials to verify current corporate limit locations.

efer to the separately printed **Map Index** for an overview map showing t of map panels for this jurisdiction.

the **FEMA Map Information eXchange** at 1-877-336-2627 for information ble products associated with this FIRM. Available products may include ly issued Letters of Map Change, a Flood Insurance Study report, and/or ersions of this map. The FEMA Map Information eXchange may also be by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

**ve questions about this map** or questions concerning the National Flood e Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or FEMA website at www.fema.gov/business/nfip.

**nally Accredited Levee Notes to Users:** Check with your local ty to obtain more information, such as the estimated level of protection (which may exceed the 1-percent-annual-chance level) and Emergency an, on the levee system(s) shown as providing protection for areas on this o maintain accreditation, the levee owner or community is required to e data and documentation necessary to comply with Section 65.10 of the ulations by February 1, 2010. If the community or owner does not provide ssary data and documentation or if the data and documentation provided he levee system does not comply with the Section 65.10 requirements, l revise the flood hazard and risk information for this area to reflect de- tion of the levee system. To mitigate flood risk in residual areas, property and residents are encouraged to consider flood insurance and ring or other protective measures. For more information on flood , interested parties should visit the FEMA Website at w.fema.gov/business/nfip/index.shtm.

## LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDA BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that ha chance of being equaled or exceeded in any given year. The Special Flood Hazard Are area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water- elevation of the 1% annual chance flood.

| | |
|---|---|
| ZONE A | No Base Flood Elevations determined. |
| ZONE AE | Base Flood Elevations determined. |
| ZONE AH | Flood depths of 1 to 3 feet (usually areas of ponding); Base Elevations determined. |
| ZONE AO | Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); depths determined. For areas of alluvial fan flooding, velocit determined. |
| ZONE AR | Special Flood Hazard Area formerly protected from the 1% annual flood by a flood control system that was subsequently decertified. indicates that the former flood control system is being restored to protection from the 1% annual chance or greater flood. |
| ZONE A99 | Area to be protected from 1% annual chance flood by a Feder protection system under construction; no Base Flood El determined. |
| ZONE V | Coastal flood zone with velocity hazard (wave action); no Base Elevations determined. |
| ZONE VE | Coastal flood zone with velocity hazard (wave action); Base Elevations determined. |

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be k of encroachment so that the 1% annual chance flood can be carried without substantial in in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flo average depths of less than 1 foot or with drainage areas les 1 square mile; and areas protected by levees from 1% annual chanc

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Area

1% annual chance floodplain boundary

0.2% annual chance floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zone boundary dividing Special Flood Hazard Areas of differe Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; e in feet*

* Referenced to the LOCAL TIDAL DATUM

A — A — Cross section line

B — - - - - — B — Transect line

87°07'45", 32°22'30" — Geographic coordinates referenced to the North Ame Datum of 1983 (NAD 83), Western Hemisphere

4'76'000"N — 1000-meter Universal Transverse Mercator grid values, zo 4N

600000 FT — 5000-foot grid values: Hawaii State Plane coordinate sys zone 4 (FIPSZONE 5104), Transverse Mercator projection

DX5510 × — Bench mark (see explanation in Notes to Users section o FIRM panel)

● M1.5 — River Mile

MAP REPOSITORY
Department of Public Works, Engineering Division, 3021 Umi Street, Lihue, Hawaii 9
(Maps available for reference only, not for distribution.)

INITIAL NFIP MAP DATE
December 20, 1974

FLOOD HAZARD BOUNDARY MAP REVISIONS
December 20, 1977

FLOOD INSURANCE RATE MAP EFFECTIVE
November 4, 1981

FLOOD INSURANCE RATE MAP REVISIONS
March 4, 1987 - September 30, 1995 – October 18, 2002 – September 16, 2005 – November for description of revisions, see Notice to Flood Insurance Study Users page in the Flood Insurance Study report.

To determine if flood insurance is available in this community, contact your Ins agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET

150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0287F

# FIRM

FLOOD INSURANCE RATE

KAUAI COUNTY, HAWAII

PANEL 287 OF 500

(SEE MAP INDEX FOR FIRM PANEL LA

CONTAINS

| COMMUNITY | NUMBER | PANEL |
|---|---|---|
| KAUAI COUNTY | 150002 | 0287 |

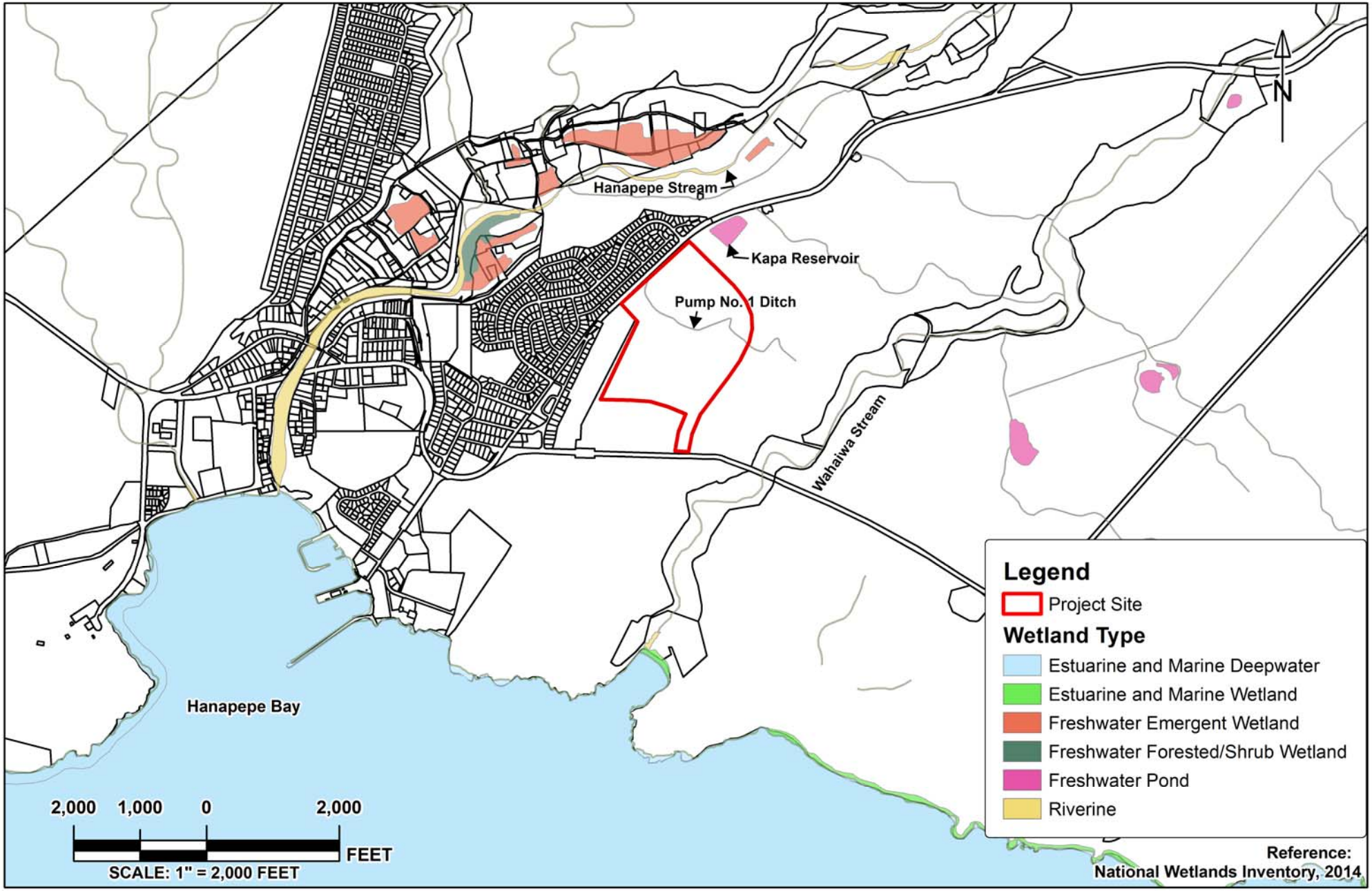
Notice to User: The **Map Number** shown below used when placing map orders; the **Communit** shown above should be used on insurance applica subject community.

MAP NU
150002

MAP RE
NOVEMBER 26

Federal Emergency Management

# Exhibit 4: Wetlands Map




Community Planning and Engineering, Inc.

DRAFT ENVIRONMENTAL ASSESSMENT FOR THE LIMA OLA WORK FORCE HOUSING DEVELOPMENT

WETLANDS MAP
'ELE'ELE, KAUA'I, HAWAI'I

FIGURE 6

# Exhibit 5: Coastal Zone Management Consistency Letter

Community Planning and Engineering, Inc.

December 3, 2014

Mr. Michael Dahilig
County of Kaua‘i Planning Department
4444 Rice Street, Suite A473
Līhu‘e, Hawai‘i 96766

Subject: Compliance with the Farmland Protection Policy Act and Special Management Area (SMA) Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Mr. Dahilig:

Community Planning and Engineering, Inc., on behalf of the Kaua‘i County Housing Agency is in the process of preparing an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343 and HRS 201H. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 - *Environmental Review Procedures for Entities Assuming HUD Environmental Responsibilities*, for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. Funding may be sought from the United States Department of Housing and Urban Development (HUD). Therefore, a finding of compliance with the requirements of the Farmland Protection Policy Act of 1981 (7 U.S.C. 4201 et seq.) must be made for HUD-assisted new construction activities. The County of Kaua‘i is required to provide HUD with a finding from the local planning agency if the proposed site includes prime or unique farmland, or other farmland of statewide or local importance, as identified by the Department of Agriculture, Natural Resources Conservation Service (NRCS). According to the County of Kaua‘i, the subject parcel is zoned Agricultural. The State of Hawai‘i Land Use Commission zoning for the subject parcel is Agricultural. The Site is not included in the inventory of Important Agricultural Lands (IALs) as defined by the State of Hawai‘i Land Evaluation and Site Assessment Commission.

While the subject parcel is zoned Agricultural under both State and County zoning, it has been identified as an ideal location to construct affordable housing near the town center of ‘Ele‘ele, Hanapēpē and Port Allen. Therefore, an exemption from County zoning and a State Land Use District Boundary Amendment from Agricultural to Urban will be processed though the HRS 201H exemption process for the proposed affordable housing project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

HUD also requires that HUD funded projects undergo a Coastal Zone Management (CZM) consistency review as authorized by the Coastal Zone Management Act of 1972. In Hawai‘i the Special Management Area (SMA) permitting system is part of the CZM Program approved by Federal and State agencies. Therefore, concurrence from your office that the proposed project is not located within the SMA is requested.

To assist with the review, enclosed is a project location map and proposed site plan associated with TMK No. (4) 2-1-001:054. Please send your written comments to:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, Hawai‘i 96813

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012.

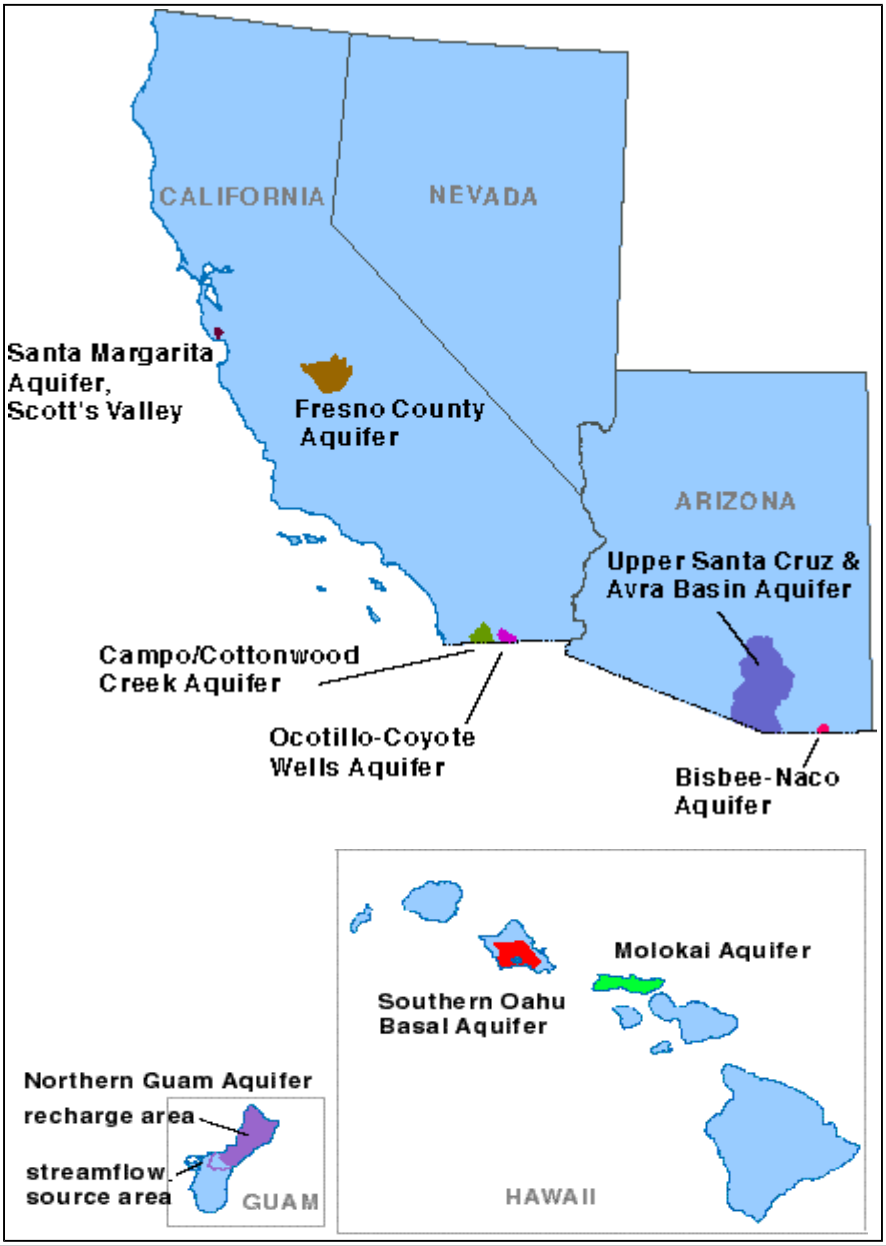
Sincerely,

Max Solmssen
Project Manager

# Exhibit 6: Sole Source Aquifer Designation

# Designated Sole Source Aquifiers in EPA Region IX

## Arizona, California, Hawaii, Nevada, Guam, and American Samoa




Hillary Hecht
EPA Region 9
Ground Water Office, WTR-9
75 Hawthorne Street
San Francisco, CA 94105
phone: (415) 972-3530
e-mail: hecht.hillary@epa.gov

***The 9 designated Sole source aquifers in Region IX are listed below. Contact the coordinator above for more information.***

***DESIGNATED SOLE SOURCE AQUIFERS IN REGION IX:***

| State | Sole Source Aquifer Name | Federal Reg. Cit. | Publ. Date | GIS map |
|---|---|---|---|---|
| AZ | Upper Santa Cruz & Avra Basin Aquifer | 49 FR 2948 | 01/24/84 | yes (PDF) |
| AZ | Bisbee-Naco Aquifer | 53 FR 38337 | 09/30/88 | yes (PDF) |
| CA | Fresno County Aquifer | 44 FR 52751 | 09/10/79 | yes (PDF) |
| CA | Santa Margarita Aquifer, Scotts Valley | 50 FR 2023 | 01/14/85 | yes (PDF) |
| CA | Campo/Cottonwood Creek | 58 FR 31024 | 05/28/93 | yes (PDF) |
| CA | Ocotillo-Coyote Wells Aquifer | 61 FR 47752 | 09/10/96 | yes (PDF) |
| GU | Northern Guam Aquifer System | 43 FR 17867 | 04/26/78 | yes (PDF) |
| HI | Southern Oahu Basal Aquifer | 52 FR 45496 | 11/30/87 | yes (PDF) |

| | | | | |
|---|---|---|---|---|
| HI | Molokai Aquifer | 59 FR 23063 | 04/20/93 | yes (PDF) |

Return to: Sole Source Aquifer program home page

# Exhibit 7: United States Fish and Wildlife Service Consultation Letter

Community Planning and Engineering, Inc.

December 3, 2014

Dr. Loyal Mehrhoff
Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawai‘i 96850

Subject: Section 7 National Historic Preservation Act Consultation
Lima Ola Affordable Housing Development
TMK No. (4) 2-1-001:054
‘Ele‘ele, Kaua‘i, Hawai‘i

Dear Dr. Mehrhoff:

Community Planning and Engineering (CP&E) is acting on behalf of the Kaua‘i County Housing Agency to prepare an Environmental Assessment (EA) in compliance with Hawaii Revised Statues (HRS) 343. The EA is also compliant with the National Environmental Protection Act (NEPA) and 24 Code of Federal Regulations (CFR) Part 58 for a proposed affordable housing project located in ‘Ele‘ele on the Island of Kaua‘i. The proposed project is located within tax map key (TMK) parcel (4) 2-1-001:054, which includes approximately 75 acres of developed land. The EA is being prepared to evaluate and document the possible environmental, social and economic consequences associated with the proposed project. As part of the environmental review process, and in accordance with Section 7 of the Endangered Species Act (ESA), we are requesting consultation to determine if special status or endangered species exist at, or within close proximity to the subject parcel. Consultation under Section 7 of the ESA is triggered due to potential funding from the United States Department of Housing and Urban Development (HUD). The County of Kaua‘i represents HUD as the responsible federal agency requesting a determination.

Approximately 550 residential single family and multi-family units are planned to be built on the subject parcel, which will include apartments and single family homes. We are enclosing the following reference documents to assist with your review; a site location map, a site plan and a biological study that was conducted for the proposed project.

1286 Queen Emma Street, Honolulu, HI 96813
Phone (808) 531 - 4252 / Fax (808) 526 - 2476

We appreciate your timely review and response to this request. If you have any questions or need clarification, please contact me at 833-2225 ext. 1012. All response letters can be sent to the following address:

CP&E
C/O Max Solmssen
1286 Queen Emma Street
Honolulu, HI 96813

Sincerely,

Max Solmssen
Project Manager

# Exhibit 8: Wild and Scenic Rivers Designation

## HAWAII

Hawaii has approximately 3,905 miles of river, but no designated wild & scenic rivers.

Hawaii does not have any designated rivers.

Choose a State Go

Choose a River Go

*Dark and foreboding one minute, sun-drenched and exploding with color the next, tropical rivers span every mood.*