NEIL ABERCROMBIE
Governor

ORLANDO "DAN" DAVIDSON
Executive Officer

LAND USE COMMISSION
Department of Business, Economic Development & Tourism
State of Hawai`i

July 26, 2011

RECEIVED
'11 JUL 26 P1:54
OFC. OF ENVIRONMENTAL QUALITY CONTR

Mr. Gary Hooser, Director
Office of Environmental Quality Control
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813-2437

Dear Mr. Hooser:

Subject: Docket No. A07-778/SCD Kaloko Makai, LLC
Draft Environmental Impact Statement Preparation Notice (DEIS) – Kaloko Makai, Kaloko, North Kona, Hawaii
Tax Map Key: 7-3-09: 17, por. 19, 25, 26, 28, por. 62, and 63

We respectfully request the publication of the DEIS for the subject project in the next available issue of *The Environmental Notice*.

Enclosed please find the following:

1) OEQC Publication Form w/Project Summary Description;
2) Distribution List for the DEIS; and
3) One copy of the DEIS (Vols. 1 and 2).

In addition, two CD-ROMs with the DEIS and Archaeological Inventory Survey are enclosed for your convenience. Please feel free to contact Bert Saruwatari of my office at 587-3822 should you require clarification or any further assistance.

Sincerely,

ORLANDO DAVIDSON
Executive Officer

Enclosures

c: Steven Lim, Esq. (w/o enclosures)
Tracy Fukuda (w/o enclosures)

235 SOUTH BERETANIA STREET • SUITE 406 • HONOLULU, HAWAI`I 96813 • TEL (808) 587-3822 • Fax (808) 587-3827
EMAIL: luc@dbedt.hawaii.gov
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

APPLICANT ACTIONS
SECTION 343-5(C), HRS
PUBLICATION FORM (JANURARY 2013 REVISION)

Project Name **Kaloko Makai**
Island: **Hawaii Island**
District: **North Kona**
TMK: (3) 7-3-09: 017, 025, 026, 028, and 63
Permits:

State of Hawai'i
Land Use Commission
- State Land Use District Boundary Amendment

Department of Health
- Approval of Wastewater Treatment Facility
- NPDES General Permit for Storm Water Associated with Construction Activity
- NPDES Individual Permit for Storm Water Associated with Construction Activity
- NPDES for Hydrotesting
- NPDES for Dewatering
- Noise Permits
- Air Quality Permits
- Underground Injection Control Permits
- Certificate of Need (for medical facilities)

Department of Land and Natural Resources Commission on Water Resource Management
- Well Construction and Pump Installation Permits

Department of Land and Natural Resources Historic Preservation Division
- Chapter 6E, HRS Historic Preservation

Department of Land and Natural Resources, Division of Forestry and Wildlife
- Incidental Take License
- Habitat Conservation Plan

Department of Transportation
- Permits to Perform Work Within State Right-of-Way

County of Hawai'i
Planning Department
- Project District Rezoning
- Subdivision
- Plan Approval

Department of Public Works
- Grading, Grubbing and Stockpiling Permits
- Building Permits
- Permit to Perform Work within County Right-of-Way

Other
Utility Companies
Utility Service Requirements
Permits Regarding Work on Utility Lines

Approving Agency:
(*Address, Contact Person, Telephone*)

State Land Use Commission
P.O. Box 2359
Honolulu, Hawaii 96804
Mr. Daniel Orodenker
808-587-3822

Applicant: (*Address, Contact Person, Telephone*)	**SCD-TSA Kaloko Makai, LLC** 1100 Alakea Street, 27th Floor Honolulu, Hawaii 96813 Mr. Jay Nakamura 808-547-2226
Consultant: (*Address, Contact Person, Telephone*)	**Wilson Okamoto Corporation** 1907 S. Beretania Street, Suite 400 Honolulu, Hawaii 96826 Mr. Earl Matsukawa 808-946-2277

Status (check one only):

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

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

SCD - TSA Kaloko Makai, LLC proposes to develop Kaloko Makai on approximately 1,139 acres of undeveloped land in Kaloko and Kohanaiki, North Kona, Hawaii. Kaloko Makai is identified as a Neighborhood Transit Oriented Development (TOD) in the Kona Community Development Plan and will include up to 5,000 new single- and multi-family residential lots varying in densities, up to 600,000 square feet of gross leaseable area for commercial (office and retail) uses, light industrial uses, recreational facilities (e.g. parks, trails, open spaces), urgent care medical facility, hospital, business center with lodging, three school sites, a Dryland Forest Preserve, and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawaii requirements.

The proposed project is situated on lands within the State Land Use Conservation, Agricultural, and Urban Districts, necessitating a petition for State Land Use District Boundary Amendment to Urban for approximately 798 acres of land that is not currently within the State Land Use Urban District. The preparation of this EIS is being undertaken to address the proposed reclassification of the Conservation District lands, possible use of State lands or funds, anticipated use of County lands and/or funds in connection with development of project elements, including, but not limited to, roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings, and the construction of a wastewater treatment plant.

A previous Draft EIS for this project was prepared and its notice of availability for public review and comment was published in the August 8, 2011 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. The public comment period for that Draft EIS ended on September 21, 2011.

Subsequent to the public comment period for the 2011 Draft EIS, certain aspects of the project description changed and additional studies were undertaken. Therefore, the Applicant prepared this Second Draft EIS to address those changes and to provide an additional opportunity for agency and public review and comment.

Second
Draft Environmental Impact Statement

Kaloko Makai

Kaloko and Kohanaiki, North Kona, Island of Hawai'i
Volume 1 of 2

Prepared For:
SCD-TSA Kaloko Makai, LLC

Prepared By:
Wilson Okamoto Corporation and
Ho'okuleana LLC

August 2013

Second
Draft Environmental Impact Statement

Volume 1 of 2

Kaloko Makai

Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi

Prepared For:
SCD – TSA Kaloko Makai, LLC

Prepared By:
Wilson Okamoto Corporation

and

Hoʻokuleana LLC

August 2013

TABLE OF CONTENTS

Page

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS G-1

CHAPTER 343 DRAFT EIS SUMMARY SHEET S-1

PREFACE P-1

1. INTRODUCTION AND SUMMARY 1-1

1.1 PROFILE 1-1
1.2 APPLICANT 1-7
1.3 ENVIRONMENTAL CONSULTANT 1-7
1.4 ACCEPTING AUTHORITY 1-8
1.5 COMPLIANCE WITH STATE OF HAWAI`I AND COUNTY OF HAWAI`I ENVIRONMENTAL LAWS 1-8
1.6 STUDIES CONTRIBUTING TO THIS EIS 1-9
1.7 EXECUTIVE SUMMARY 1-10
1.7.1 Kaloko Makai 1-10
1.7.2 Summary of Potential Impacts and Proposed Mitigation Measures 1-11
1.7.3 Relationship to Land Use Policies 1-16
1.7.4 Required Permits and Approvals 1-18
1.7.5 Alternatives 1-19
1.7.6 Cumulative and Secondary Impacts 1-19
1.7.7 Rationale for Proceeding with Kaloko Makai Notwithstanding Unavoidable Effects 1-19
1.7.8 Unresolved Issues 1-20

2. PROJECT DESCRIPTION 2-1

2.1 BACKGROUND INFORMATION 2-1
2.1.1 Location and Surrounding Uses 2-1
2.1.2 Land Ownership 2-7
2.1.3 Property Description 2-7
2.1.4 Overview of Region 2-8
2.1.5 History of the Property 2-15
2.2 PROJECT PURPOSE AND NEED 2-18
2.2.1 Purpose and Objectives 2-18
2.2.2 Project Need 2-19
2.2.2.1 Residential Market 2-19
2.2.2.2 Commercial Market 2-21
2.2.2.3 Light Industrial/Business Park Market 2-23
2.2.2.4 Lodge and Business Center Market 2-25
2.2.2.5 Kona Community Development Plan 2-26
2.3 KALOKO MAKAI DESCRIPTION 2-29
2.3.1 Key Components within Kaloko Makai 2-30

2.3.1.1 New West Hawai‘i Regional Acute Care Hospital/Medical Center at Kaloko Makai 2-30
2.3.1.2 Lodge and Business Center 2-45
2.3.1.3 Commercial 2-46
2.3.1.4 Light Industrial 2-46
2.3.1.5 Schools 2-47
2.3.1.6 Parks and Open Space/Buffers 2-47
2.3.1.7 Kaloko Dryland Forest 2-47
2.3.1.8 Kohanaiki Trail 2-47
2.3.1.9 Core Infrastructure 2-48
2.3.1.9.1 Circulation and Roadways 2-48
2.3.1.9.2 Drinking Water 2-51
2.3.1.9.3 Wastewater Treatment 2-51
2.3.2 Use of Public Funds; Use of Public Lands 2-53
2.3.3 Transit Oriented Development Village and Neighborhoods in Kaloko Makai 2-53
2.3.3.1 Background 2-53
2.3.3.2 Overall Kaloko Makai TOD 2-56
2.3.3.2.1 Hospital Neighborhood 2-57
2.3.3.2.2 Middle School Neighborhood 2-58
2.3.3.2.3 Makai Elementary School Neighborhood 2-58
2.3.3.3 Mauka Elementary School TND 2-59
2.3.3.4 Special District Mixed-Use Industrial 2-59
2.3.3.5 Secondary Areas 2-60
2.3.3.6 Open Space 2-61
2.4 DEVELOPMENT TIMETABLE AND PRELIMINARY COSTS 2-61
2.5 ENVIRONMENTALLY RESPONSIBLE PLANNING AND DESIGN 2-62
2.5.1 OEQC’s Sustainable Building Design Guidelines 2-62
2.5.2 Leadership in Energy and Environmental Design (LEED) 2-63
2.5.3 Energy Star Program 2-63
2.5.4 Sustainability Issues 2-64

3. DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES 3-1

3.1. CLIMATE 3-1
3.2. GEOLOGY AND TOPOGRAPHY 3-1
3.3. SOILS 3-2
3.3.1. USDA Soil Conservation Service Soil Survey 3-2
3.3.2. LSB Detailed Land Classification 3-4
3.3.3. Agricultural Land of Importance to the State of Hawai‘i 3-6
3.4. NATURAL HAZARDS 3-8
3.4.1. Flooding 3-8
3.4.2. Tsunami 3-10
3.4.3. Hurricane 3-10
3.4.4. Volcanic 3-11
3.4.5. Earthquake 3-11
3.4.6. Wildfires 3-11

TABLE OF CONTENTS (continued)

Page

3.5. GROUNDWATER RESOURCES AND NEARSHORE MARINE ENVIRONMENT 3-13
3.5.1. Groundwater Resources 3-13
3.5.2. Nearshore Marine Environment and Ponds 3-32
3.5.2.1. Water Chemistry 3-32
3.5.2.1.1. Physical Characteristics of ʻAimakapā and Kaloko Ponds 3-33
3.5.2.1.2. Horizontal and Vertical Stratification 3-33
3.5.2.1.3. Conservative Mixing Analysis 3-35
3.5.2.1.4. Pond Metabolism 3-37
3.5.2.2. Pond Sediment 3-37
3.5.2.3. Biological Community 3-38
3.5.2.4. Endangered Marine Species 3-41
3.5.2.5. Water Quality Standards 3-41
3.6. FLORA 3-50
3.7. FAUNA 3-60
3.7.1 Avian Fauna 3-60
3.7.2 Terrestrial Fauna 3-62
3.7.3 Invertebrate Resources 3-62

4. DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES 4-1

4.1. ARCHAEOLOGICAL AND HISTORIC RESOURCES 4-1
4.1.1. Archaeological Background 4-1
4.1.2. Results of Archaeological Inventory Survey 4-7
4.1.3. Conclusions 4-10
4.2. CULTURAL RESOURCES 4-33
4.2.1. Previous Cultural Impact Assessment (CIA) 4-34
4.2.2. Environmental Setting 4-34
4.2.2.1. Natural Environment 4-34
4.2.2.2. Built Environment 4-35
4.2.3. Traditional and Historic Background 4-36
4.2.3.1. Mythological and Traditional Accounts 4-36
4.2.3.1.1. Kekaha 4-36
4.2.3.1.2 Legend of Ka-Miki 4-38
4.2.4. Early Historic Period 4-40
4.2.4.1. Historic Cultivation 4-42
4.2.4.2. Historic Ranching 4-42
4.2.5. Mid- to Late -1800s 4-43
4.2.6. 1900s 4-45
4.2.6.1. Huʻehuʻe Ranch 4-45
4.2.6.2. Modern Land Use 4-46
4.2.7. Community Consultation Effort 4-47

TABLE OF CONTENTS (continued)

Page

4.2.7.1. Community Responses 4-47
4.2.8. Traditional Practices and Properties 4-48
4.2.8.1. Hawaiian Habitation 4-48
4.2.8.2. Gathering of Plant Resources 4-48
4.2.8.3. Marine and Freshwater Resources 4-49
4.2.8.4. Burials 4-49
4.2.8.5. Trails 4-49
4.3. TRAIL ACCESS 4-53
4.3.1. Kohanaiki Trail 4-53
4.4. ROADWAYS AND TRAFFIC 4-56
4.4.1. Existing Conditions 4-58
4.4.1.1. Existing Roadways 4-58
4.4.2. Existing Transit Service 4-59
4.4.3. Kona CDP 4-59
4.4.4. Levels of Service Analysis of Existing Condition 4-60
4.4.5. Planned Roadway Improvements 4-61
4.5. NOISE 4-86
4.5.1. Traffic Noise 4-86
4.5.2. Aircraft Noise 4-86
4.6. AIR QUALITY 4-95
4.7. VISUAL RESOURCES 4-102
4.8. Public Services and Facilities 4-102
4.8.1. Police Protection 4-102
4.8.2. Fire Protection 4-103
4.8.3. Health Care Services 4-104
4.8.4. Schools 4-105
4.8.5. Recreational Facilities 4-106
4.9. Socio Economic Characteristics 4-107
4.9.1. Population 4-107
4.9.2. Economy and Employment 4-109
4.9.2.1. Employment 4-109
4.9.2.2. Fiscal Impacts 4-112
4.9.3. Market Assessment 4-112
4.9.3.1. Residential Market 4-113
4.9.3.2. Commercial 4-114
4.9.4. Social Impact Assessment 4-117
4.10. INFRASTRUCTURE AND UTILITIES 4-119
4.10.1. Water System 4-119
4.10.2. Wastewater System 4-120
4.10.3. Drainage System 4-129
4.10.4. Solid Waste 4-130
4.10.5. Electrical 4-131
4.10.6. Telephone and Cable Communications 4-133

TABLE OF CONTENTS (continued)

Page

5. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA 5-1
5.1 STATE OF HAWAIʻI 5-1
5.1.1 Chapter 343, Hawaiʻi Revised Statutes 5-1
5.1.2 State Land Use Law, Chapter 205, Hawaiʻi Revised Statutes 5-2
5.1.2.1 State Land Use Commission Decision Making Criteria 5-3
5.1.2.2 Standards for Determining Urban District Boundaries 5-5
5.1.3 Coastal Zone Management Act, Chapter 205A, Hawaiʻi Revised Statues 5-7
5.1.4 Hawaiʻi State Plan, Chapter 226, Hawaiʻi Revised Statues 5-15
5.1.5 State Functional Plans 5-34
5.2 COUNTY OF HAWAIʻI 5-38
5.2.1 County of Hawaiʻi General Plan 5-38
5.2.1.1 General Plan Land Use Pattern Allocation Guide Map 5-60
5.2.2 Keahole to Kailua Development Plan 5-61
5.2.3 Kona Community Development Plan 5-62
5.2.3.1 Kona CDP Guiding Principles 5-65
5.2.3.2 Goals, Objectives, Policies, and Actions 5-69
5.2.4 County of Hawaiʻi Zoning 5-79
5.2.5 County of Hawaiʻi Special Management Area 5-79

6. APPROVALS AND PERMITS 6-1

7. ALTERNATIVES TO THE PROPOSED ACTION 7-1
7.1 NO ACTION 7-1
7.2 NEIGHBORHOOD TOD (WITHOUT HOSPITAL AND 600,000 SQ. FT. COMMERCIAL USE) 7-3
7.3 NEIGHBORHOOD TOD WITH MAXIMUM DENSITY PERMITTED UNDER KONA CDP GUIDELINES 7-7
7.4 EXISTING ZONING (5-ACRE AGRICULTURAL LOTS, GOLF, CONSERVATION) 7-11
7.5 CONVENTIONAL SUBDIVISION DEVELOPMENT (5-UNITS/ACRE; SOME COMMERCIAL AND INDUSTRIAL) 7-15
7.6 ALTERNATE LOCATION 7-19

8. CONTEXTUAL ISSUES 8-1
8.1 RELATIONSHIP BETWEEN THE SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY 8-1
8.2 CUMULATIVE IMPACTS 8-2
8.3 SECONDARY IMPACTS 8-5
8.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES 8-7
8.5 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED 8-8
8.5.1 Rationale for Proceeding with Kaloko Makai notwithstanding Unavoidable Effects 8-9
8.6 UNRESOLVED ISSUES 8-10
8.6.1 Transportation Improvements 8-10
8.6.2 Archaeological and Historic Resources 8-10

TABLE OF CONTENTS (continued)

Page

8.6.3 Type of Transit Oriented Development Village 8-10

9. CONSULTATION 9-1

9.1 Pre-Consultation 9-1

9.2 Environmental Impact Statement Preparation Notice Consultation 9-1

9.2.1 Meetings with Elected Officials, Agencies and Stakeholders 9-4

9.3 Agencies and Parties To Be Consulted during the Draft EIS. 9-4

10. LIST OF PREPARERS 10-1

11. REFERENCES 11-1

LIST OF FIGURES

Figure 2-1 Regional Location Map 2-3
Figure 2-2 Tax Map Key: 7-3-009: 017, 025, 026, 028, and 063 2-4
Figure 2-3 Project Site Photos 2-5
Figure 2-4 Existing and Proposed Uses Within the Vicinity of the Project Site 2-6
Figure 2-5 State Land Use District Map 2-9
Figure 2-6 State Conservation District Subzones 2-10
Figure 2-7 County General Plan Land Use Pattern Allocation Guide 2-11
Figure 2-8 County of Hawaiʻi Zoning 2-12
Figure 2-9 Kona Community Development Plan Official Kona Land Use Map 2-13
Figure 2-10 Proposed State Land Use District Boundary Amendment Petition Area 2-14
Figure 2-11 Kaloko Makai Overall Land Use Plan 2-33
Figure 2-12 Kaloko Makai Land Use Plan Phase 1 2-35
Figure 2-13 Kaloko Makai Land Use Plan Phase 2 2-37
Figure 2-14 Kaloko Makai Land Use Plan Phase 3 2-39
Figure 2-15 Kaloko Makai Overall Land Use Plan Without Hospital 2-41

Figure 3-1 Soils Map 3-3
Figure 3-2 Land Study Bureau Map 3-5
Figure 3-3 Agricultural Lands of Importance in the State of Hawaiʻi 3-7
Figure 3-4 Flood Zone Map 3-9
Figure 3-5 Hualālai Aquifer; noting Kiholo and Keauhou Areas (From WUDP) 3-14
Figure 3-6 Location of Wells Within or Near Kaloko Makai Project Site 3-15
Figure 3-7 Salinity and Temperature Profile Through the Water Column of Well 4160-02 (September 14, 2012) 3-16
Figure 3-8 Composite Profile Through the Water Column of the Kamakana Borehole (Profiles of 4/12/10, 6/5/10, and 8/18/10) 3-18
Figure 3-9 Profile Through the Water Column of the Kamakana Borehole After Fresh Water was Encountered (May 12, 2010) 3-20

TABLE OF CONTENTS (continued)

Page

LIST OF FIGURES (continued)

Figure 3-10 Underground Injection Control Area, Island of Hawai'i 3-26
Figure 3-11 Water Quality Standards Map, Island of Hawai'i 3-42
Figure 3-12 Honokōhau Bay, Class A Waters 3-43

Figure 4-1 Previous Archaeological Studies in the Vicinity of the Project Area 4-5
Figure 4-2 Archaeological Sites 4-31
Figure 4-3 TIAR Study Area 4-57
Figure 4-4 Recommended 2025 Without Project Lane Geometry 4-68
Figure 4-5 Recommended 2025 Lane Geometry 4-70
Figure 4-6 Recommended 2035 Lane Geometry 4-75
Figure 4-7 Recommended 2045 Without Project Lane Geometry 4-77
Figure 4-8 Recommended 2045 Lane Geometry 4-81
Figure 4-9A Intersection Improvement Summary 1 of 2 4-82
Figure 4-9B Intersection Improvement Summary 2 of 2 4-83
Figure 4-10 Locations of Existing Average Aircraft Departure Flight Tracks in Project Environs 4-87
Figure 4-11 Locations of Existing Average Aircraft Arrival Flight Tracks in Project Environs 4-88
Figure 4-12 Locations of Existing Average Aircraft Training Flight Tracks in Project Environs 4-89
Figure 4-13 2008 14 CFR Part 150 Noise Contours For Kona International Airport at Keahole 4-90
Figure 4-14 Kona CDP Official Public Facilities and Service Map – Wastewater Management 4-122
Figure 4-15 Wastewater Treatment Schematic 4-127
Figure 4-16 Wastewater Management System 4-128

Figure 5-1 Special Management Area 5-80

LIST OF TABLES

Table 1-1 Proposed SLUB Amendment 1-11

Table 2-1 Projected Market Unit Average Pricing at Kaloko Makai (2010 dollars) 2-20
Table 2-2 Illustrative Summary of Maximum Potential Residential Sales Absorption at Kaloko Makai, 2015 to 2045 2-21
Table 2-3 Projected Supportable Commercial Areas in the Primary Trade Area 2-22
Table 2-4 Projected Supportable Commercial Market Absorption and Kaloko Makai Share of the Primary Trade Area 2-23
Table 2-5 Projected Demand for Additional Light Industrial and/or Business Park Lands in the Primary Trade Area 2-25
Table 2-6 Estimated Allocation by Land Use Type and Phase 2-31

TABLE OF CONTENTS (continued)

Page

LIST OF TABLES (continued)

Table 3-1 Tidal Lags and Amplitudes 3-19
Table 3-2 Drinking Water and Non-Drinking Water Demand Average Daily Use 3-22
Table 3-3 Approximated Changes to the Basal Groundwater Flowing Beneath the Kaloko Makai Project Site 3-29
Table 3-4 Native (and early Polynesian introduced) Plants 3-52

Table 4-1 Archaeological Site Density by Parcel and Acreage 4-7
Table 4-2 Summary Occurrences of Formal Feature Types 4-11
Table 4-3 Summary Occurrences of Formal Site Function 4-11
Table 4-4 Archaeological Site Summary for TMK Parcel 17 4-12
Table 4-5 Archaeological Site Summary for TMK Parcel 25 4-15
Table 4-6 Archaeological Site Summary for TMK Parcel 26 (Keahole Pt. Quad) 4-21
Table 4-7 Archaeological Site Summary for TMK Parcel 26 (Kailua Quad) 4-21
Table 4-8 Archaeological Site Summary for TMK Parcel 28 (Keahole Pt. Quad) 4-26
Table 4-9 Mitigation measures recommended for each parcel 4-29
Table 4-10 Existing Conditions Intersection Levels of Service Analysis Summary 4-61
Table 4-11 Intersection Mitigation Summary 4-63
Table 4-12 2025 With Project Phase 2 Intersection Level of Service Analysis Summary 4-67
Table 4-13 2025 With Project Phase 1 Intersection Level of Service Analysis Summary 4-69
Table 4-14 2035 Without Project Conditions Intersection Level of Service Analysis Summary 4-73
Table 4-15 2035 With Project Phase 2 Intersection Level of Service Analysis Summary 4-74
Table 4-16 2045 Without Project Intersection Level of Service Analysis Summary 4-76
Table 4-17 2045 With Project Phase 3 Intersection Level of Service Analysis Summary 4-79
Table 4-18 Intersection Level of Service Analysis Summary, Without Recommended Mitigations 4-84
Table 4-19 Intersection Level of Service Analysis Summary, with Recommended Mitigations 4-85
Table 4-20 Calculations of Project and Non-Project Traffic Noise Contributions (2045) 4-92
Table 4-21 Year 2011 and 2045 Distances to 65 and 75 DNL Contours 4-92
Table 4-22 Summary of State of Hawai‘i and National Ambient Air Quality Standards 4-96
Table 4-23 Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations Along Roadways Near Kaloko Makai Village Project: Present and Without Project 4-99
Table 4-24 Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations Along Roadways Near Kaloko Makai Village Project: With Project 4-99
Table 4-25 Estimated Worst-Case 8-Hour Carbon Monoxide Concentration Along Roadways Near Kaloko Makai Village Project: Present and Without Project 4-100
Table 4-26 Estimated Worst-Case 8-Hour Carbon Monoxide Concentrations Along Roadways Near Kaloko Makai Village Project: With Project 4-100
Table 4-27 Estimated Indirect Air Pollution Emissions From Kalok Makai Project Electrical Demand 4-101
Table 4-28 BOE Policy on School Design Enrollment Guidelines 4-105

TABLE OF CONTENTS (continued)

Page

LIST OF TABLES (continued)

Table 4-29 Summary of Projected Economic and Fiscal Impacts....4-111
Table 4-30 Illustrative Summary of Maximum Potential Residential Sales Absorption at Kaloko Makai, 2015 to 2045....4-114
Table 4-31 Projected Supportable Commercial Market Absorption and Kaloko Makai Share of the Trade Area....4-116
Table 4-32 Potential R-1 Recycled Water Uses at Kaloko Makai....4-126

Table 8-1 Planned Residential and Commercial Developments in the Project Vicinity 8-4

LIST OF APPENDICES

Volume 2 of 2

Appendix A	Market Assessment for Kaloko Makai, Mikiko Corporation, April 2012.
Appendix B	Service Area Health Care Facilities Forecast – Kaloko Makai, Cattaneo & Stroud, Inc., June 2011.
Appendix C	Assessment of the Potential Impact of the Proposed Kaloko Makai Project on Water Resources, Tom Nance Water Resource Engineering, Revised July 2013.
Appendix D	Assessment of Marine and Pond Environments in the Vicinity of the Kaloko Makai Project, Marine Research Consultants, December 2012.
Appendix E	Botanical Survey of Kaloko Properties, Isle Botanica, December 2006.
Appendix F	Survey of Avian and Terrestrial Mammalian Species, Rana Productions, Ltd., September 2006.
Appendix G	Update Flora and Fauna Surveys for the Kaloko Makai Development, Rana Biological Consulting Inc. and AECOS Consultants, May 17, 2012.
Appendix H	Survey of Terrestrial Invertebrate Resources at Kaloko Makai, Steven Lee Montgomery, Ph.D., November 2008
Appendix I	Summary Report of Archaeological Inventory Survey for Kaloko Makai, Cultural Surveys Hawaii, Inc., May 2008. *The Archaeological Inventory Survey (March 2008 and May 2008) consists of seven volumes. The complete report has been filed with Department of Land and Natural Resources State Historic Preservation, the Office of Environmental Quality Control, State Land Use Commission, and Office of Hawaiian Affairs.*
Appendix J	Cultural Impact Assessment for Kaloko Makai, Cultural Surveys Hawaii, Inc., May 2008.
Appendix K	Traffic Impact Study for Kaloko Makai, KOA Corporation, September 12, 2012.
Appendix L	Acoustic Study for the Proposed Kaloko Makai Project, Y. Ebisu & Associates, August 2012.
Appendix M	Air Quality Study for the Proposed Kaloko Makai Project, B.D. Neal & Associates, October 31, 2012.
Appendix N	Economic and Fiscal Impact Assessment for Kaloko Makai, Mikiko Corporation, January 2013
Appendix O	Kaloko Makai Social Impact Assessment, John M. Knox & Associates, Inc., June 2011.
Appendix P	Preliminary Engineering Report for Kaloko Makai, Wilson Okamoto Corporation, July 2013.
Appendix Q	Sustainability Plan, Hookuleana, LLC, November 2012
Appendix R	EISPN Comment and Response Letters
Appendix S	Draft EIS Comment and Response Letters

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS

AAQS – Ambient Air Quality Standards

ACS – American Community Survey

ADF – Average Daily Flow

ADT – Average Daily Traffic Counts

ALISH - Agricultural Lands of Importance in the State of Hawai‘i

AMSL – Above Mean Sea Level

ANOVA – Analysis of Variance

BMP – Best Management Practices

BNR – Biological Nutrient Removal

BWS – Board of Water Supply

CDPH – California Department of Public Health

CEMP – Comprehensive Environmental Monitoring Program

CIA – Cultural Impact Assessment

COL – Conclusions of Law

COZ – Change of Zone

CWRM – Commission on Water Resource Management

CZM – Coastal Zone Management

dBA or dB – Decibels

DBED&T – Department of Business Economic Development & Tourism

DEM – County of Hawai’i, Department of Environmental Management’s

DLNR – Department of Land and Natural Resources

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS (CONTINUED)

DLNR -DOFAW - Department of Land and Natural Resources Department of Forestry and Wildlife

DNL – Day-Night Average Sound Level

DO – Dissolved Oxygen

DOBOR - Division of Boating and Ocean Recreation

D&O – Decision and Order

DOE – Department of Education

DOH – Department of Health

DOT – Department of Transportation

DPP – Department of Planning & Permitting

DPS – Department of Public Safety

DWS – County Department of Water Supply

DEIS – Draft Environmental Impact Statement

EIS – Environmental Impact Statement

EISPN – Environmental Impact Statement Preparation Notice

ENV – Department of Environmental Services

EPA – Environmental Protection Agency

ESA – Endangered Species Act

FAA – Federal Aviation Administration

FEMA – Federal Emergency Management Association

FHA – Federal Housing Administration

FIRM – Flood Insurance Rate Map

FMA – Fishery Management Area

FOF – Findings of Fact

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS (CONTINUED)

FONSI – Finding of no Significant Impact

FTE – Full Time Equivalent

FWHA – Federal Highway Administration

FY – Fiscal Year

GPM – Gallons per Minute

HAR – Hawaiʻi Administrative Rules

HCP – Habitat Conservation Plan

HELCO – Hawaiʻi Electric and Light Company

HHSC – Hawaiʻi Health Systems Corporation

HIMB – Hawaii Institute of Marine Biology

HOST – Hawaiʻi Ocean and Science Technology

HRS – Hawaii Revised Statutes

HUD – Department of Housing and Urban Development

Hz – Hertz

ICBO – International Conference of Building Officials

ITE – Institute of Traffic Engineers

KAHO – Kaloko-Honokōhau National Park

KCH – Kona Community Hospital

KHNHP – Kaloko-Honokōhau National Historical Park

Km – Kilometers

KNI – Kealakekua Bay North Inside

KNO – Kealakekua Bay North Outside

K-to-K Plan – Keāhole to Kailua Development Plan

Kona CDP- Kona Community Development Plan

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS (CONTINUED)

Leq – Equivalent sound level

Ldn – Day/Night sound level

LOS – Level of Service

LSB – University of Hawai‘i Land Study Bureau

LUC – State Land Use Commission

LUPAG – County General Plan Land Use Pattern Allocation Guide

LUO – Land Use Ordinance

m – meter

m^2 – square meter

$\mu g/m^3$ – micrograms per cubic meter

mg/m^3 – milligrams per cubic meter

Mgd – Million Gallons Per Day

MLCD – Marine Life Conservation District

Mph – Miles Per Hour

MSL–Mean Sea Level

NELHA - Natural Energy Laboratory of Hawai‘i

NKID - North Kona Improvement District Project Sewer Master Plan

NOAA – National Oceanic and Atmospheric Administration

NPDES – National Pollutant Discharge Elimination System

NPS – National Parks Service

NRCS – U.S. Department of Agriculture Natural Resources Conservation Service

NTU – Nephelometric Turbidity Units

OEQC – Office of Environmental and Quality Control

OHA– Office of Hawaiian Affairs

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS (CONTINUED)

OP – Office of Planning

PATH – Peoples Advocacy for Trails Hawaii

PD – Project District

PER – Preliminary Engineering Report

pH – Potential Hydrogen

PIM – Public Infrastructure Map

PPP - Pollution Prevention Plan

PPT – Parts per thousand

PTA – Primary Trade Area

QAPP – Assurance Project Plan

RO – Reverse Osmosis

ROW – Right of Way

SCD – Stanford Carr Development

SHPD – State Historic Preservation Division

SIHP – State Inventory of Historic Places

SMA – Special Management Area

SY – Sustainable Yield

TDN – Total Dissolved Nitrogen

TIAR – Traffic Impact Analysis Report

TMK – Tax Map Key

TON – Total Organic Nitrogen

TOP – Total Organic Phosphorous

TN – Total Nitrogen

TP – Total Phosphorous

GLOSSARY OF ACRONYMS AND TECHNICAL TERMS (CONTINUED)

TN - Total Nitrogen

TND – Traditional Neighborhood Design

TOD – Transit Oriented Development

TON – Total Organic Nitrogen

TOP – Total Organic Phosphorous

TP – Total Phosphorous

UA – Urban Area

UBC – Uniform Building Code

UFC – Uniform Fire Code

UHM – University of Hawaiʻi at Manoa

USFWS – United States Fish and Wildlife Service

USGS – United States Geological Survey

UV – Ultraviolent Light

WMA – Wildlife Management Area

WWPTF – Wastewater Pre-Treatment Facility

WWTP – Wastewater Treatment Plant

CHAPTER 343 SECOND DRAFT EIS SUMMARY SHEET

Project Name:	Kaloko Makai
Location:	Kaloko and Kohanaiki, North Kona, Island of Hawai‘i
Applicant:	SCD – TSA Kaloko Makai, LLC
Accepting Authority:	**State of Hawai‘i Land Use Commission**
Tax Map Key (TMK):	(3) 7-3-009: 017, 025, 026, 028 and 063
Land Area:	1,138.866 acres

Description of Project and Action:
The Project will consist of an approximately 1,139 acre master planned, mixed-use community village that integrates diverse housing offerings, mixed-use commercial and retail growth and employment opportunities, and a range of community services and facilities (inclusive of medical, lodging, and civic uses as well as recreational opportunities). Kaloko Makai is planned to have approximately 5,000-single and multi-family units, up to 600,000 square feet of gross leasable area for commercial (office and retail) uses, a 120-room Lodge and Business Center, 75-acres of light industrial uses, three public school sites and a Dryland Forest Preserve of at least 150 acres, with additional park and open space uses. Kaloko Makai will also provide 40-acres of land to be used for the development of a regional hospital.

Beneficial Impacts
Project implementation will result in impacts (discussed in Chapters 3 and 4), both beneficial and adverse, to the natural and human environments. Measures to mitigate potentially significant adverse impacts to non-significant levels will be included in the project development.

Anticipated beneficial impacts of the Proposed Action include the following:

- Provision of 5,000 homes
- Increased housing choices
- Increase housing inventory to meet future demands
- Support approximately 3,100 FTE project related jobs on-site by 2045
- Generate approximately $8.8 million in additional county revenues
- Contribute approximately $4.9 to $6.2 million per year net additional state revenues during build-out, with net additional revenues of some $2.8 million per year after 2045
- Preservation of native Dryland Forest
- Preservation of Kaloko-Kohanaiki historic trail
- Planned growth in an area designated for urban growth by the Kona Community Development Plan (CDP)
- Provision of a pedestrian and transit-friendly community

Potentially Significant Adverse Effects and Mitigation Measures
The project will transform the lands that are currently vacant and undeveloped into a master planned, mixed-use community village. For areas of concern, the range of identified impacts and appropriate mitigation measures that are either recommended or planned to ensure that potential adverse impacts are minimized or mitigated to non-significant levels are further discussed in Chapters 3 and 4.

Cumulative impacts are those that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Together with other existing and anticipated future development in the area, the project has the potential to generate cumulative impacts including traffic volumes on regional transportation facilities, increased demand for school facilities, potable water, public services, coastal resources, and impacts on open space. Cumulative impacts are further discussed in Chapter 8.

Potential secondary impacts are discussed in Chapter 8 and include: potential air quality impacts associated with the project's electrical power and solid waste disposal requirements.

Alternatives Considered:
The alternatives that have been considered are:

1. No Action
2. Neighborhood TOD (With Hospital and 600,000 Sq. Ft. Commercial Use) (Preferred Alternative)
3. Neighborhood TOD (Without Hospital but with 600,000 Sq. Ft. Commercial Use)
4. Neighborhood TOD with Maximum Density Permitted under Kona CDP Design Guidelines
5. Existing Zoning (5-acre Agricultural Lots, Golf, Conservation)
6. Conventional Subdivision Development (5-units/acre; Some Commercial and Industrial)
7. Alternate Location

See Chapter 7 for further discussion of the alternatives.

Unresolved Issues:

There are a few issues that remain unresolved at the time of the preparation of this Second Draft EIS. They relate to the level of regional transportation improvements required to service the project, final approval of the Archaeological Inventory Surveys that have been submitted to SHPD, and whether the project will include a regional hospital as proposed. Unresolved issues are summarized in Chapter 8 and are expected to be resolved prior to implementation of the proposed action.

Compatibility with Land Use Plans and Policies:

The project is generally compatible with and supportive of relevant State and County land use policies, plans and controls, as described in Chapter 5. The Kona CDP has identified Kaloko Makai as a site for a Neighborhood Transit Oriented Development (TOD) on the Official Kona Land Use Map.

Listing of Permits or Approvals:

State of Hawai‘i
Land Use Commission
- State Land Use District Boundary Amendment

Department of Health (DOH)
- Approval of Wastewater Treatment Facility
- National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Associated with Construction Activity
- NPDES Individual Permit for Storm Water Associated with Construction Activity
- NPDES for Hydrotesting
- NPDES for Dewatering
- Noise Permits
- Air Quality Permits
- Underground Injection Control Permits
- Certificate of Need (for medical facilities)
- Approval of private water system / desalination system

Department of Land and Natural Resources (DLNR)
- Trail Crossings

DLNR, Commission on Water Resource Management (CWRM)
- Well Construction and Pump Installation Permits

DLNR, State Historic Preservation Division (SHPD)
- Chapter 6E, HRS Historic Preservation

Department of Transportation (DOT)
- Permits to Perform Work Within State Right-of-Way

County of Hawai‘i
Planning Department
- Project District Rezoning
- Subdivision
- Kona CDP Design Center
- Plan Approval

Department of Public Works
- Grading, Grubbing and Stockpiling Permits
- Building Permits
- Permit to Perform Work within County Right-of-Way

Other
Utility Companies

Utility Service Requirements
Permits Regarding Work on Utility Lines

PREFACE

This Environmental Impact Statement (EIS) is prepared pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS), and Title 11, Chapter 200, Hawaiʻi Administrative Rules, Department of Health, State of Hawaiʻi. Proposed is an Applicant action by SCD – TSA Kaloko Makai, LLC to develop Kaloko Makai, an approximately 1,139 acre master planned community in Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi.

Kaloko Makai will be a compact, mixed-use village that integrates diverse housing offerings, mixed-use commercial and retail growth and employment opportunities, and a range of community services and facilities (inclusive of medical, lodging, and civic uses as well as recreational opportunities). Kaloko Makai will be a "Transit Oriented Development" (TOD) and "Traditional Neighborhood Design" (TND) community consistent with the Guiding Principles and Elements of the Kona Community Development Plan. The central TOD village is designed around a transit station and made up of three neighborhoods, centered on venues of community-wide importance (such as the potential regional hospital and/or schools/parks). Kaloko Makai also includes a TND neighborhood mauka of the central TOD village. The two areas will be linked through interconnecting roads and trails. A Special District light industrial area is located along Queen Kaʻahumanu Highway (makai of the central TOD village).

The proposed project is situated on lands within the State Land Use Conservation, Agricultural, and Urban Districts, necessitating a petition for State Land Use District Boundary Amendment to Urban for that portion of the project area that is not currently within the State Land Use Urban District. Reclassification from the Conservation and Agricultural Districts to the Urban District is being sought, to be followed by a County of Hawaiʻi Project District Rezoning. Approximately 190 acres of Urban District lands within TMK parcel (3) 7-3-009:025 were reclassified in the 1980's for golf use (this project was abandoned), and a Motion to Amend Conditions for this area will be processed with the State Land Use Commission to conform the proposed development of these existing Urban District lands with the proposed development of the Petition Area.

In accordance with HRS Chapter 343, HRS, privately initiated EIS documents must be accepted by the government agency empowered to issue a permit or approval for the proposed project. For Kaloko Makai, the State of Hawaiʻi Land Use Commission is anticipated to be the accepting authority since a State Land Use District Boundary Amendment is the first approval being sought for the Kaloko Makai project.

The preparation of this EIS is being undertaken to address the proposed reclassification of the Conservation District lands, possible use of State lands or funds, anticipated use of County lands and/or funds in connection with development of project elements, including, but not limited to, roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings, and the construction of a wastewater treatment plant. While the specific nature of each improvement is not known at this time, the EIS is intended to address all current and future instances involving the use of State and/or County lands or funds relating to the project.

A previous Draft EIS for this project was prepared and its notice of availability for public review and comment was published in the August 8, 2011 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. The public comment period for that Draft EIS ended on September 21, 2011.

Subsequent to the public comment period for the 2011 Draft EIS, certain aspects of the project description changed, and additional studies were undertaken. Therefore the Applicant prepared this Second Draft EIS to address those changes and to provide an additional opportunity for agency and public review and comment. Specifically, the following changes are reflected in this Second Draft EIS:

First, the Applicant reduced the size of commercial/retail space from 1.1 million square feet to approximately 600,000 square feet. Although the market study included with the 2011 Draft EIS demonstrated a demand for the originally proposed 1.1 million square feet, the Applicant has chosen to reduce that component of the project to 600,000 square feet.

Second, the approximately 18-acre off-site potable well field mauka of Kaloko Makai is no longer being considered as a potential alternative water source for the project and has been eliminated.

Third, the originally proposed "Petition Area" for Land Use Commission reclassification has been reduced from 948.866 acres to 798.866 acres. Excluded is the 150 acres of dryland forest, which will remain in the Agricultural District .

Fourth, the Applicant has modified the project design to avoid any "take" of listed endangered and threatened plant species. This eliminates the need to prepare a Habitat Conservation Plan (HCP) and obtain an Incidental Take License (ITL).

Finally, in accordance with information provided by the County of Hawaiʻi, the Traffic Impact Assessment Report assumes that Ane Keohokālole Highway from Hina Lani Street to Kaiminani Drive (Phase III) would be completed by 2028.

Toward incorporating these changes in this Second Draft EIS, supporting studies were updated, as needed, and will be appended to the document. Responses to comments received on the 2011 Draft EIS have been prepared in the context of preparing this Second Draft EIS and have been distributed, with copies appended herein, in Appendix S.

1. INTRODUCTION AND SUMMARY

This Second Draft EIS is prepared pursuant to Chapter 343, HRS, and Title 11, Chapter 200, Hawaiʻi Administrative Rules (HAR), Department of Health, State of Hawaiʻi. Proposed is an Applicant action by SCD – TSA Kaloko Makai, LLC to develop Kaloko Makai, an approximately 1,139 acre master planned community in Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi.

1.1 PROFILE

Project Name:	Kaloko Makai
Location:	Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi
Petitioner/Applicant:	SCD – TSA Kaloko Makai, LLC
Tax Map Key (TMK):	(3) 7-3-009: 017, 025, 026, 028 and 063
Land Area:	1,138.866 acres
Petition Area:	798.866 acres
Existing Use:	Vacant, undeveloped open land with lava and scrub vegetation
Proposed Action:	Kaloko Makai will be a compact, mixed-use village that integrates diverse housing offerings, mixed-use commercial and retail growth and employment opportunities, and a range of community services and facilities (inclusive of medical, lodging, and civic uses as well as recreational opportunities). Kaloko Makai will be a TOD and TND community consistent with the Guiding Principles and Elements of the Kona Community Development Plan. The central TOD village is designed around a transit station and made up of three neighborhoods, centered on venues of community-wide importance (such as the potential regional hospital and/or schools/parks). An additional TND neighborhood mauka of the central TOD village will be linked to the central TOD through interconnecting roads and trails. A Special District light industrial area located along Queen Kaʻahumanu Highway (makai of the central TOD village).
Existing Land Use Designation:	(3) 7-3-009:017 – 224.430 acres State Land Use: Conservation Subzone: General General Plan LUPAG: Urban expansion Kona Community Development Plan: Kona Urban Area Zoning: Open

(3) 7-3-009:025 – 360.131 acres
State Land Use: Agricultural - 170 acres
Urban - 190 acres
General Plan LUPAG: Urban expansion
Kona Community Development Plan: Kona Urban Area
Zoning: A-5a

(3) 7-3-009:026 – 194.324 acres
State Land Use: Agricultural
General Plan LUPAG: Urban expansion
Kona Community Development Plan: Kona Urban Area
Zoning: A-5a

(3) 7-3-009:028 – 313.112 acres
State Land Use: Agricultural
General Plan LUPAG: Conservation - 150 acres
Urban expansion - 163 acres
Kona Community Development Plan: Kona Urban Area
Zoning: A-5a

(3) 7-3-009:063 – 46.869 acres
State Land Use: Agricultural
General Plan LUPAG: Urban expansion - 47 acres
Kona Community Development Plan: Kona Urban Area
Zoning: A-5a

Proposed Land Use Designation:

Approximately 798 acres
Conservation to Urban – 224 acres
Agricultural to Urban – 574 acres

Kona Community Development Plan

Kaloko Makai Neighborhood Transit Oriented Development (TOD);[1]
Within Kona Urban Area

Keāhole to Kailua Development Plan:

Urban Expansion, Residential Village and Golf Course

Permits and Approvals:

<u>State of Hawai‘i</u>
Land Use Commission

- State Land Use District Boundary Amendment

Department of Health (DOH)

- Approval of Wastewater Treatment Facility

[1]Pursuant to Policy ECON-1.1 of the Kona Community Development Plan, if a hospital is located within a Neighborhood TOD, that TOD shall automatically be designated a Regional Center TOD.

- NPDES General Permit for Storm Water Associated with Construction Activity
- NPDES Individual Permit for Storm Water Associated with Construction Activity
- NPDES for Hydrotesting
- NPDES for Dewatering
- Noise Permits
- Air Quality Permits
- Underground Injection Control Permits
- Certificate of Need (for medical facilities)
- Approval of private water system / desalination system

Department of Land and Natural Resources (DLNR)

- Trail Crossings

DLNR, Commission on Water Resource Management (CWRM)

- Well Construction and Pump Installation Permits

DLNR, State Historic Preservation Division (SHPD)

- Chapter 6E, HRS Historic Preservation

Department of Transportation (DOT)

- Permits to Perform Work Within State Right-of-Way

<u>County of Hawai‘i</u>
Planning Department

- Project District Rezoning
- Subdivision
- Kona Design Center
- Plan Approval

Department of Public Works

- Grading, Grubbing and Stockpiling Permits
- Building Permits
- Permit to Perform Work within County Right-of-Way

<u>Other</u>
Utility Companies
Utility Service Requirements
Permits Regarding Work on Utility Lines

Accepting Authority: State of Hawai‘i Land Use Commission

Parties Consulted During EISPN Process:

Federal
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Department of Agriculture Natural Resources Conservation Service
U.S. National Park Service, Kaloko-Honokohau National Historical Park
U.S. National Park Service, Ala Kahakai National Historic Trail
Federal Highway Administration

State of Hawai‘i
Department of Agriculture
Department of Business Economic Development & Tourism (DBED&T) Land Use Commission
DBED&T Office of Planning
DBED&T Housing and Community Development Corporation of Hawai‘i
DBED&T Energy, Resources and Technology Division
Department of Land and Natural Resources (DLNR)
DLNR, State Historic Preservation Division
Department of Health (DOH)
Office of Environmental Quality Control (OEQC)
Department of Education (DOE)
Department of Transportation (DOT)
Office of Hawaiian Affairs (OHA)
Department of Agriculture (DOA)
Department of Hawaiian Home Lands (DHHL)
University of Hawai‘i at Manoa (UHM) Environmental Center

County of Hawai‘i
Office of the Mayor
Planning Department
Planning Department, Kona CDP Action Committee
Planning Department, Kona CDP Design Center
Department of Water Supply
Department of Public Works
Department of Parks and Recreation
Department of Environmental Management
Department of Public Works
Civil Defense Agency
Police Department
Fire Department

Elected Officials
Councilmember Brenda Ford, District 7
Former Councilmember Angel Pilago, District 8
Senator Josh Green, M.D., District 3
Representative Denny Coffman District 6
Representative Robert Herkes, District 5

Public Utility Agencies
Hawai‘i Electric Light Company
Hawaiian TelCom
Oceanic/Time-Warner Cable

Organizations
Hawai‘i Leeward Planning Conference
Kona Hawaiian Civic Club
Kona Outdoor Circle
Kona Traffic Safety Committee
Kona-Kohala Chamber of Commerce
Na Kokua Kaloko-Honokohau
Peoples Advocacy for Trails Hawai‘i (PATH)

Parties Consulted During Draft EIS Process:

Federal
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
U.S. Geological Survey
U.S. Department of Agriculture Natural Resources Conservation Service
U.S. National Park Service, Kaloko-Honokohau National Historical Park
U.S. National Park Service, Ala Kahakai National Historic Trail
U.S. Federal Highway Administration

State of Hawai‘i
Department of Agriculture (DOA)
Department of Business Economic Development & Tourism (DBED&T)
DBED&T, Land Use Commission
DBED&T, Office of Planning
DBED&T, Strategic Industries Division
DBED&T, Housing and Community Development Corporation of Hawai‘i
DBED&T, Hawai‘i Public Housing Authority
Department of Defense
Department of Education
Department of Human Services

Department of Labor and Industrial Relations
Department of Land and Natural Resources (DLNR)
DLNR, State Historic Preservation Division
Department of Health (DOH)
DOH, Office of Environmental Quality Control (OEQC)
DOH Environmental Planning Office
Department of Transportation
Office of Hawaiian Affairs (OHA)
Department of Hawaiian Home Lands (DHHL)
University of Hawaiʻi at Manoa (UHM) Environmental Center

County of Hawaiʻi
Office of the Mayor
Planning Department
Planning Department, Kona CDP Action Committee
Planning Department, Kona CDP Design Center
Department of Water Supply
Department of Public Works
Department of Parks and Recreation
Department of Environmental Management
Department of Public Works
Civil Defense Agency
Police Department
Fire Department
Office of Housing and Community Development

Elected Officials
Councilmember Brenda Ford, District 7
Former Councilmember Angel Pilago, District 8
Senator Josh Green, M.D., District 3
Representative Denny Coffman District 6
Representative Robert Herkes, District 5

Public Utility Agencies
Hawaiʻi Electric Light Company
Hawaiian TelCom
Oceanic/Time-Warner Cable

Organizations
Hawaiʻi Leeward Planning Conference
Kona Hawaiian Civic Club
Kona Outdoor Circle
Kona Traffic Safety Committee
Kona-Kohala Chamber of Commerce
Na Kokua Kaloko-Honokohau
Peoples Advocacy for Trails Hawaiʻi (PATH)

Other
Honolulu Star Advertiser
Hawaiʻi Tribute Herald
West Hawaiʻi Today

Library Distribution
Hawaiʻi State Library
Kailua – Kona Library
Hilo Library
Kaimuki Library
Kāneʻohe Library
Pearl City Library
University of Hawaiʻi at Mānoa Hamilton Library
University of Hawaiʻi at Hilo
Legislative Reference Bureau

1.2 APPLICANT

The Applicant is SCD – TSA Kaloko Makai, LLC a Hawaiʻi limited liability company

Contact: Stanford Carr
Stanford Carr Development, LLC
1100 Alakea Street, 27th Floor
Telephone: (808) 537-5220
Facsimile: (808) 537-1801

1.3 ENVIRONMENTAL CONSULTANT

SCD – TSA Kaloko Makai LLC's environmental planning consultants for Kaloko Makai are Wilson Okamoto Corporation and Hoʻokuleana LLC.

Contact: Earl Matsukawa
Tracy Fukuda
Wilson Okamoto Corporation
1907 South Beretania Street, Suite 400
Honolulu, Hawaiʻi 96826
Telephone: (808) 946-2277
Facsimile: (808) 946-2253

Peter T. Young
Jennifer Barra
Hoʻokuleana LLC
1539 Kanapuʻu Drive
Kailua, Hawaiʻi 96734
Telephone: (808) 226-3567

1.4 ACCEPTING AUTHORITY

In accordance with HRS Chapter 343, HRS, privately initiated Environmental Impact Statement (EIS) documents must be accepted by the government agency administering a permit or approval for the proposed project. For Kaloko Makai, the State of Hawai`i Land Use Commission is anticipated to be the accepting authority since a State Land Use District Boundary Amendment is the first approval being sought for the Kaloko Makai project.

The preparation of this EIS is being undertaken to address the proposed reclassification of the Conservation District lands, possible use of State lands or funds, anticipated use of County lands and/or funds in connection with development of project elements, including, but not limited to, roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings, and the construction of a wastewater treatment plant. While the specific nature of each improvement is not known at this time, the EIS is intended to address all current and future instances involving the use of State and/or County lands or funds relating to the project.

Contact: Daniel E. Orodenker, Executive Officer
State Land Use Commission
Department of Business, Economic Development & Tourism
P.O. Box 2359
Honolulu, Hawaiʻi 96804
Telephone: (808) 587-3822
Fax: (808) 587-3827

1.5 COMPLIANCE WITH STATE OF HAWAI`I AND COUNTY OF HAWAI`I ENVIRONMENTAL LAWS

This Second Draft EIS is prepared pursuant to Chapter 343, HRS, and Title 11, Chapter 200, HAR, Department of Health, State of Hawaiʻi. Proposed is an Applicant action by SCD – TSA Kaloko Makai, LLC to develop Kaloko Makai, an approximately 1,139 acre master planned community in Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi.

The proposed project is situated on lands within the State Land Use Conservation, Agricultural and Urban Districts, necessitating a petition for State Land Use District Boundary Amendment. Reclassification of the Conservation and Agricultural Districts to the Urban District is being sought, to be followed by a County of Hawai`i Zone Project District Rezoning. Approximately 190 acres of Urban District lands within TMK parcel (3) 7-3-009:025 were reclassified in 1980s for golf use (this project was abandoned), and a Motion to Amend Conditions for this area will be processed with the State Land Use Commission to conform the proposed development of these existing Urban District lands with the proposed development of the Petition Area.

The Environmental Impact statement Preparation Notice (EISPSN) was submitted to the Office of Environmental Quality Control (OEQC) on September 10, 2010. Notice of availability of the EISPN was published in the September 23, 2010 issue of the OEQC's *The Environmental Notice*. Copies of the EISPN were distributed to the appropriate agencies and other organizations (see Chapter 9).

The 30-day public comment period ended on October 23, 2010. Comments and responses on the EISPN were incorporated in the Draft EIS and the letters are included in Appendix R.

A previous Draft EIS for this project was prepared and its notice of availability for public review and comment was published in the August 8, 2011 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. The public comment period for that Draft EIS ended on September 21, 2011.

Subsequent to the public comment period for the 2011 Draft EIS, certain aspects of the project description changed, and additional studies were undertaken. Therefore the Applicant prepared this Second Draft EIS to address those changes and to provide an additional opportunity for agency and public review and comment. Specifically, the following changes are reflected in this Second Draft EIS:

First, the Applicant reduced the size of commercial/retail space from 1.1 million square feet to approximately 600,000 square feet. Although the market study included with the 2011 Draft EIS demonstrated a demand for the originally proposed 1.1 million square feet, the Applicant has chosen to reduce that component of the project to 600,000 square feet.

Second, the approximately 18-acre off-site potable well field mauka of Kaloko Makai is no longer being considered as a potential alternative water source for the project and has been eliminated.

Third, the originally proposed "Petition Area" for Land Use Commission reclassification has been reduced from 948.866 acres to 798.866 acres. Excluded is the 150 acres of dryland forest, which will remain in the Agricultural District .

Fourth, the Applicant has modified the project design to avoid any "take" of listed endangered and threatened plant species. This eliminates the need to prepare a Habitat Conservation Plan (HCP) and obtain an Incidental Take License (ITL).

Finally, in accordance with information provided by the County of Hawaiʻi, the Traffic Impact Assessment Report assumes that Ane Keohokālole Highway from Hina Lani Street to Kaiminani Drive (Phase III) would be completed by 2028.

Toward incorporating these changes in this Second Draft EIS, supporting studies were updated, as needed, and will be appended to the document. Responses to comments received on the 2011 Draft EIS have been prepared in the context of preparing this Second Draft EIS and have been distributed, with copies appended herein, in Appendix S.

1.6 STUDIES CONTRIBUTING TO THIS EIS

A number of specific technical studies were prepared for Kaloko Makai, and the reports are included as appendices to this EIS. These studies include:

- Market Assessment
- Sustainability Plan

- Service Health Care Facilities Forecast
- Groundwater Resource Assessment
- Nearshore Marine Environment Assessment
- Botanical Survey
- Avian and Terrestrial Mammalian Species Survey
- Terrestrial Invertebrate Survey
- Archaeological Inventory Survey: A summary of the Archaeological Inventory Survey (AIS) is included in Appendix I. The AIS consists of seven volumes. The complete report has been filed with the State Historic Preservation Division, State Land Use Commission, Office of Environmental Quality Control, and Office of Hawaiian Affairs.
- Cultural Impact Assessment
- Traffic Impact Assessment Report
- Acoustic Study
- Air Quality Study
- Preliminary Engineering Report
- Economic and Fiscal Impact Assessment
- Social Impact Assessment

1.7 EXECUTIVE SUMMARY

1.7.1 Kaloko Makai

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities, focused around an initial urgent care medical facility with land available for a new Kona regional hospital.

SCD - TSA Kaloko Makai, LLC proposes to develop Kaloko Makai on approximately 1,139 acres of undeveloped land in Kaloko and Kohanaiki, North Kona, Hawaiʻi. Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at a variety of densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), urgent care medical facility, hospital, lodge and business center, three school sites, a Dryland Forest Preserve, and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai`i requirements.

Kaloko Makai has been designated as a Neighborhood Transit Oriented Development (TOD) in the Official Kona Land Use Map of the *Kona Community Development Plan* (County Ordinance No. 08-131, September 2008). As mentioned previously, the Applicant is setting aside land in anticipation of a regional hospital being sited within Kaloko Makai TOD[2]. Whether or not the identified land is developed with a regional hospital, this Second Draft EIS assesses the proposed project as a Neighborhood TOD and not as a Regional TOD, which would allow for greater density (see Chapter 7 for more details).

[2] *Pursuant to Policy ECON-1.1 of the Kona Community Development Plan, if a hospital is located within a Neighborhood TOD, that TOD shall automatically be designated a Regional Center TOD.*

Kaloko Makai is situated on lands within the State Land Use Conservation, Agricultural and Urban Districts, necessitating a State Land Use District Boundary Amendment to reclassify approximately 949 acres from Conservation and Agricultural Districts to the Urban District, and a subsequent County of Hawai`i Project District Rezoning (see Table 1-1).

Table 1-1
Proposed SLUB Amendment

Tax Map Key	Total Acres	Existing State Land Use District	Proposed Land Use Reclassification	Acres
(3) 7-3-009:017	224.430	Conservation	Urban	224.430
(3) 7-3-009:025	360.131	Agricultural	Urban	170.131
		Urban (190-acres)	---	---
(3) 7-3-009:026	194.324	Agricultural	Urban	194.324
(3) 7-3-009:028	313.112*	Agricultural	Urban	163.112
(3) 7-3-009:063	46.869	Agricultural	Urban	46.869
			Total Petition Area	798.866

* At least 150 acres of Dryland Forest will remain in Agricultural District.

1.7.2 Summary of Potential Impacts and Proposed Mitigation Measures

The Kaloko Makai project was conceived, planned and designed to be consistent with the Hawai`i County *General Plan*, the *K-to-K Plan* and the *Kona Community Development Plan* (Kona CDP). Over the 30-year projected development schedule, 5,000 homes will be integrated into transit- and pedestrian-oriented urban and traditional neighborhood centers. Interconnecting the communities is the historic Kohanaiki Trail, which runs mauka-makai through the entire length of the project, providing pedestrian access throughout the project.

Appropriate mitigation measures have been incorporated into the overall community planning. For areas of particular concern, the following summarizes mitigation measures recommended or planned to minimize or mitigate potential adverse impacts.

Groundwater Resources and Nearshore Marine Environment – Kaloko Makai is not anticipated to impact groundwater, marine waters or ocean biology, as noted in the conclusions of groundwater and marine water analysis reports that prepared on behalf of the project. This conclusion is based on analysis of potential impacts of Kaloko Makai's proposed water, wastewater, irrigation (including fertilizer application) and drainage systems. Sections 3.5 and 4.10 contain further discussion, as well as the documents in the Appendices C and D.

Flora – The Kaloko Makai property has been the subject of numerous botanical surveys over the years. Based on these surveys, four listed endangered plant species are found within the project site.

- ʻaiea (*Nothocestrum breviflorum*)
- hala pepe (*Pleomele hawaiiensis*)
- uhiuhi (*Caesalpinia kavaiensis*)
- maʻaloa (*Neraudia ovata*)

In addition, the plant koʻokoʻolau (*Bidens micrantha ssp. Ctenophylla*), which is proposed for listing as an endangered species, is located within portions of the Kaloko Makai property.

Kaloko Makai anticipates that no listed endangered plants will be "taken" in the development and construction of the Kaloko Makai project.

As part of the project proposal, at least 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

Three individual endangered plants (two hala pepe and one ʻaiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall).

Section 3.6 contains further discussion. Botanical surveys are included as Appendix E and G.

Fauna/Invertebrates – No avian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawaiʻi's endangered species programs were observed during the course of the survey.

No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

Section 3.7 contains further discussion. Avian and terrestrial mammalian species surveys, as well as a terrestrial invertebrate survey are included as Appendixes F, G and H.

Archaeological Resources – A total of 341 archaeological sites were identified in the course of the archaeological inventory survey work that was conducted between March 2007 and April 2008(59 sites in TMK 17, 121 sites in TMK 25, 120 sites in TMK 26 and 41 sites in TMK 28). Based on historic background literature and previous archaeological studies, the site density appears consistent with general ideas about settlement of this area with site density increasing substantially in the mauka portions of the project area.

The types, functions and distribution of sites present match closely to the anticipated finds for the Intermediate and Upland zones of the Kekaha region of North Kona. The lands of Kekaha contain three general terrestrial zones that directly influenced land usage of prehistoric and historic populations. These three zones include: 1) Coastal; 2) Intermediate or Transitional and; 3) Upland.

There are a total of sixty-five (65) confirmed burials at more than thirty sites (55% of these are located in parcel 26.) All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawaiʻi Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan

submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval. Section 4.1 contains further discussion. A summary of the archaeological inventory survey is included as Appendix I. As previously noted, the AIS consists of seven volumes. The complete report was filed with the State Historic Preservation Division on October 30, 2008 with copies distributed to the State Land Use Commission, Office of Environmental Quality Control, and Office of Hawaiian Affairs.

Cultural Resources – With the possible exception of intermittent gathering of plant materials, there are no other traditional or customary native Hawaiian rights being exercised within the project area. The historic Kohanaiki Trail (Road to the Sea) runs through (*mauka-makai*) the entire length of the project; it will be restored and will interconnect the communities within the project. Section 4.2 contains further discussion. A cultural impact assessment is included as Appendix J.

Trails and Access – Kohanaiki Trail is a long mauka/makai trail originating in the Kohanaiki Homesteads. Generally, the trail parallels the nearby Kaloko/Kohanaiki ahupuaʻa wall, on the Kohanaiki side. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity. The Trail will be at least 10-feet wide and will be bordered by perpetual open space buffers of at least 10-feet wide on each side. In combination with the buffers, the total width of this perpetual public right of way will be at least 30-feet throughout its length across Kaloko Makai. Kaloko Makai proposes to incorporate the trail into the Kaloko Makai project, interconnecting the communities and providing pedestrian access throughout the project. Section 4.3 contains further discussion.

Traffic – Consistent with the polices of the Kona CDP, Kaloko Makai will develop the TOD and TND following the Village Design Guidelines that promote transit-oriented and pedestrian oriented development, increase in transit use and management of traffic congestions.

Major roadways providing access to the project site include Queen Kaʻahumanu Highway, Hina Lani Street and Māmalahoa Highway (Hawaiʻi Belt Road). Ane Keohokālole Highway will bisect the property and the TOD transit station will be located within Kaloko Makai on this road corridor.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

Utilizing the Village Design Guidelines Kaloko Makai will minimize motor vehicle activity on area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic and a traffic impact assessment report is included as Appendix K.

The project will increase traffic demands and congestion in the project area. The cumulative increase in traffic demands including those generated by Kaloko Makai, other projects in the vicinity or local roads during peak travel periods is assessed in Section 4.4. Mitigation measures to address cumulative traffic impacts are recommended.

Noise – In the short-term, construction noise will be unavoidable during the duration of the construction of the proposed project. Operation of construction equipment and vehicles will raise ambient noise levels in the project vicinity. Mitigation measures such as the use of properly muffled construction equipment and incorporation of DOH construction noise limits pursuant to the provisions of the State DOH Administrative Rules, Title 11, Chapter 46, Community Noise Control are applicable to the project. In the long-term, traffic-generated noise to the community will be mitigated by adequate setbacks from the highway, in conformance with federal highway standards, sound attenuating walls, total closure and air-conditioning, in addition to the utilization of sound attenuating windows and window fixtures. Section 4.5 contains further discussion. An acoustic study is included as Appendix L.

Existing and future residences which are located along the Hina Lani Street, between Māmalahoa Highway and Queen Kaʻahumanu Highway, may be impacted by the future traffic noise along the roadway if setback distances from roadway centerline are less than 223 feet. As traffic noise along public roadways such as Hina Lani Street is generated by non-project as well as project traffic, mitigation of off site traffic noise impacts are generally performed by individual property owners along the roadways' rights-of-way or by public agencies during roadway improvement projects. These mitigation measures ordinarily take the form of increased setbacks, sound attenuating walls, total closure and air-conditioning, in addition to the utilization of sound attenuating windows and window fixtures. Where adequate setbacks beyond the 65 DNL noise contour are not available, Kaloko Makai proposes to utilize 6 foot high sound walls as an effective means of traffic noise attenuation for single story structures, or at the ground floors of multistory structures. Along the future Ane Keohokālole Highway, project residences and buildings used by the public will require setback distances in the order of 96 to 103 feet from the centerline of the highway, or sound attenuation walls constructed along the rights-of-way may be required for traffic noise mitigation.

Air Quality - Potential air quality impacts during construction of the project will be mitigated by complying with the State DOH Hawaiʻi Administrative Rules, Title 11, Chapter 60, Air Pollution. The construction contractor(s) is responsible for complying with the State DOH regulations that prohibit visible dust emissions at property boundaries. Compliance with State regulations will require adequate measures to control airborne dust by methods such as water spraying and sprinkling of loose or exposed soil or ground surface areas and dust-generating equipment, and the use of wind screens in sensitive areas during construction. No significant impacts on air quality are anticipated with appropriate mitigation during the construction phase and no violations of federal and state air quality standards are anticipated in the long-term. An air quality study is included as Appendix M.

Water – Kaloko Makai's water demand will require development of additional water sources, storage and transmission facilities. The Applicant is investigating three alternative sources for potable supply: 1) on-site wells at about the 710-foot elevation on the mauka portion of the project; 2) on-site wells at the 710-foot elevation with reverse osmosis (RO) treatment; and 3) on-site wells at 363-foot elevation with desalinization of saline groundwater. Storage and transmission facilities will also be required. Section 4.10.1 contains further discussion.

Wastewater – An on-site wastewater treatment plant is the preferred alternative for processing Kaloko Makai wastewater. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce

reclaimed water meeting the highest (R-1) water standards for general irrigation within Kaloko Makai, thus reducing the use of potable water for irrigation. Section 4.10.2 contains further discussion.

Drainage – There are no streams or natural drainageways in or near the project site. The surrounding area consists of barren a`ā and pāhoehoe lava fields which are highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata. Stormwater over Kaloko Makai will either percolate directly into the ground (in natural and landscaped areas) or will be collected in a system of catch basins and drain lines and disposed of in drywells located throughout the community. Drainage from Kaloko Makai is not expected to have an adverse effect on groundwater or coastal marine waters. Section 4.10.3 contains further discussion.

Solid Waste – Kaloko Makai will work with the County to identify and implement feasible alternatives for residential curbside collection, including source-separated recyclables. To reduce solid waste generation, Kaloko Makai will incorporate waste diversion and reduction facilities into its design and recycling will be encouraged. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the Puʻuanahulu landfill. Section 4.10.4 contains further discussion.

Electrical – Electrical power supply for Kaloko Makai will be provided by the existing power grid that traverses through the project site. Kaloko Makai will seek to incorporate alternative energy generation strategies such as use of solar power or photovoltaic systems. Kaloko Makai will also consider possibilities for net energy metering in building design to allow residents and businesses to lower electricity costs and provide energy back into the system. Section 4.10.5 contains further discussion.

Housing – The North Kona area is appropriately seeing urban infill development and proposals, consistent with the 2008 Kona Community Development Plan and the 2010 draft Kona Village Design Guidelines. Kaloko Makai is strategically located along the major regional traffic corridor Queen Ka`ahumanu Highway, between the town of Kailua-Kona and the Kona International Airport. This rapidly developing area comprises the northwestern portion of the North Kona District and is the residential, commercial and industrial heart of West Hawaiʻi. The area has a long-standing and growing residential base and will continue to be the focus of residential and related development as the Island's population grows.

Currently entitled projects are estimated to yield up to 8,200 of the potential demand for 17,800 housing units in the market area by 2045, if they are built out within this time frame and developed to the maximum levels of their respective current plans and entitlements. Despite an assumed strong and sustained rate of new home production, entitlements within the market area account for only about half the projected need. Therefore, without further land entitlement, the area could still face an approximately 9,600-unit shortage by 2045.

Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at low- and medium-densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), urgent care medical facility, two

elementary schools, a middle school, Dryland Forest Preserve, and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai`i requirements. Section 4.9.3 contains further discussion.

Economic and Fiscal – Kaloko Makai would generate significant, on-going economic and fiscal benefits for residents of Hawai‘i, as well as for the County and State governments. Development of facilities would generate employment and consequent income and taxes. In addition, by attracting new residents to the Island of Hawai‘i and generating additional real estate sales activity, the Project is expected to support long-term impacts, including additional consumer expenditures, employment opportunities, personal income and government revenue enhancement. Specifically, Kaloko Makai will contribute: 1) approximately 3,100 direct FTE jobs on-site at its retail, office, industrial, lodge, and medical-related facilities, 2) roughly $8.8 million per year in net additional county revenues upon completion, 3) an estimated $4.9 to $6.2 million per year net additional state revenues during build out, with net additional revenues of some $2.8 million per year after 2045. Section 4.9.2 contains the full discussion.

Public Services – Kaloko Makai will contribute to increased State and County tax revenues in the form of increased property, general excise and increased income taxes from increased employment. Section 4.10 contains further discussion.

1.7.3 Relationship to Land Use Policies

State Land Use Law, Chapter 205, Hawai‘i Revised Statutes – The Property is currently in the State Urban, Agricultural and Conservation land use districts, necessitating a State Land Use District Boundary Amendment to reclassify approximately 798.866 acres from Conservation and Agricultural Districts to the Urban, and a subsequent County of Hawai‘i Project District Rezoning. Section 5.1.2 contains further discussion.

Coastal Zone Management Act, Chapter 205A, Hawai‘i Revised Statutes – The Coastal Zone Management (CZM) Area as defined in Chapter 205A, HRS, includes all the lands of the State. As such, the Property is within the Coastal Zone Management Area. The Property is not located within the County’s Special Management Area. Section 5.1.3 contains discussion of Kaloko Makai’s consistency.

Hawai‘i State Plan, Chapter 226, Hawai`i Revised Statutes – The *Hawai‘i State Plan* (Chapter 226, HRS), establishes a set of goals, objectives, and policies that serve as long-range guidelines for the growth and development of the State. Development of Kaloko Makai serves to implement many of the goals, objectives, and policies set forth by the Hawai`i State Plan. Section 5.1.4 contains further discussion.

State Functional Plans – The *Hawai‘i State Plan* directs State agencies to prepare functional plans for their respective program areas. There are 13 state functional plans that serve as the primary implementing vehicle for the goals, objectives and policies of the *Hawai‘i State Plan*. Section 5.1.5 contains discussion of Kaloko Makai’s consistency.

County of Hawai‘i General Plan – The County of Hawai‘i's *General Plan* is the policy document for the long-range comprehensive development of the island of Hawai‘i. The General Plan designation for the Kaloko Makai site is "Urban Expansion" and “Conservation” (150-acre Native Dryland Forest.) The Urban Expansion Area "allows for a mix of high density, medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined." The 150-acre Native Dryland Forest will be preserved. Section 5.2.1 contains discussion of Kaloko Makai’s consistency.

Keāhole to Kailua Development Plan - The *Keāhole to Kailua Development Plan (“K-to-K Plan”)* identifies the Keāhole to Kailua area was a major future urban growth area and they recognized the need for such a plan to serve as an implementing tool for the General Plan of the County of Hawai`i. The K-to-K Plan notes land uses in the area of the proposed Kaloko Makai project are Residential, Urban Expansion and Golf Course. Section 5.2.2 contains discussion of Kaloko Makai’s consistency.

Kona Community Development Plan – The Kona Community Development Plan (CDP) is a long-term plan whose purposes include to: Articulate Kona's residents' vision for the North and South Kona districts; Guide and accommodate regional growth and development; Provide a feasible plan to improve existing infrastructure and support future growth; Direct growth to appropriate areas; Create a partnership plan of action to improve the quality of life in Kona and Monitor the progress and effectiveness of the plan. Section 5.2.3 contains discussion of Kaloko Makai’s consistency.

The Kona CDP responds to the effects of rapid growth in the community and directs growth in Kona to the Urban Area (UA). Within this Kona UA, growth would be directed to compact villages located along proposed transit routes or to infill areas within, or adjacent to, existing development. The general locations of these villages are within the TODs. The Official Kona Land Use Map defines the Kona UA and the general locations, spacing and type of TOD Villages.

The Kaloko Makai project has been designated as a Neighborhood TOD in the Official Kona Land Use Map. The Applicant is setting aside land in anticipation of a regional hospital being sited within Kaloko Makai TOD. Kona CDP economic policy ECON-1.1 at page 4-128 states that, if the land is developed with a regional hospital the Neighborhood TOD at Kaloko Makai shall be designated as a Regional Center TOD. However, the proposed project will be designed and assessed herein as a Neighborhood TOD.

County of Hawai‘i Zoning – The existing Hawai‘i County zoning for the Kaloko Makai project does not permit the proposed uses; therefore, a Change of Zone request will be submitted to the County of Hawai‘i to change the zoning to Project District (PD). Section 5.2.4 contains further discussion. Section 5.2.4 contains discussion of Kaloko Makai’s consistency.

1.7.4 Required Permits and Approvals

Permit/Approval	Responsible Agency	Status	Anticipated Submittal Date
State Land Use District Boundary Amendment	State Land Use Commission (LUC)	Petition previously filed; processing on hold until EIS process completed.	--
Project District Rezoning Application	County Planning Department (PD)	Application to be filed following LUC acceptance of the EIS	Second Qtr. 2014
State Land Use District Boundary Amendment	State LUC	Motion to Amend to be filed.	Third Qtr. 2014
Subdivision Approval	County PD	Application to be submitted after the Project District Rezoning application is approved.	First Qtr. 2016
Plan Approval	County PD	Application to be filed after the Project District Rezoning and bulk lot Subdivision application is approved.	Third Qtr. 2016
NPDES Individual Permit	State Department of Health (DOH)	Application to be submitted prior to Building/Grading Permits.	2017
Grading/Building Permits	County Department of Public Works	Application to be filed after the Project District Rezoning and prior to any ground disturbance.	2017
Approval for Wastewater Treatment Facility	State DOH	Application to be filed after the Project District Rezoning and Plan Approval application is approved.	2017
Well Construction/Pump Installation Permits	State Commission on Water Resource Management	Application to be filed prior to start of well construction.	2017
Underground Injection Control Permit	State DOH	Application to be filed after the Project District Rezoning and prior to installation of dry wells.	2017
Permit to Perform Work within a State Right-of-Way	State Department of Transportation	Application to be filed after the Project District Rezoning and prior to start of construction.	2017
Permit to Perform Work within a County Right-of-Way	County Department of Public Works	Application to be filed after the Project District Rezoning and prior to start of construction.	2017
Certificate of Need (for medical facilities)	State DOH	Several entities have been pursued to partner with on the hospital facility.	--
Approval of private water system / desalination system	State DOH	Application to be filed after Project District Rezoning and Plan Approval application is approved.	2017
Air Quality Permits	State DOH	Prior to start of construction.	2017
Noise Permits	State DOH	Prior to start of construction.	2017

1.7.5 Alternatives

The alternatives that have been considered are:

1. No Action
2. Neighborhood TOD (Without hospital and 600,000 sq. ft. of commercial use)
3. Neighborhood TOD with Maximum Density Permitted Under Kona CDP Guidelines
4. Existing Zoning (5-acre Agricultural Lots, Golf, Conservation)
5. Conventional Subdivision Development (5-units/acre; Some Commercial and Industrial)
6. Alternate Location

See Chapter 7 for further discussion of the alternatives.

1.7.6 Cumulative and Secondary Impacts

Cumulative and secondary impacts are impacts that may result from other reasonably foreseeable actions within the area, regardless of who initiates the action. To assess the cumulative and secondary impacts of Kaloko Makai in context with other proposed projects in the region, projects proposed on property currently within the State Urban District were used as the basis of reasonably anticipated development in the area.

Cumulative and secondary impacts resulting from these projects, along with the Kaloko Makai, are likely to include increased traffic and greater demands on public infrastructure systems and services. Chapter 8 discusses cumulative and secondary impacts.

1.7.7 Rationale for Proceeding with Kaloko Makai Notwithstanding Unavoidable Effects

In light of the above-mentioned potential impacts, Kaloko Makai should proceed because adverse impacts can be mitigated and are offset by substantial positive factors, including:

- Compliance with the *County of Hawaiʻi General Plan* (February 2005), which designates the Kaloko Makai property for Urban Expansion.
- Compliance with the *County of Hawaiʻi Kona Community Development Plan* (September 2008), which designates the site as part of the Kona UA and as a TOD; consistency with the vision, principles and goals of the Kona CDP.
- Substantial consistency with policies of the *Hawaiʻi State Plan*, State Functional Plans, and the Coastal Zone Management Act.
- Approximately 5,000 new single-family and multi-family home in a live-work-play environment to meet island-wide housing needs
- Homes for a variety of income ranges, including affordable housing
- Medical facilities, possibly to include a hospital, and related jobs
- Construction and related jobs
- School sites
- Recreational resources

- Preservation and restoration of the Kohanaiki Trail and the preservation of archaeological and cultural sites, including burials.
- The provision of diverse housing opportunities makai of Queen Ka'ahumanu Highway.
- The public benefit of setting aside the 150-acre Dryland Forest as a preserve.
- The wages, taxes and overall positive economic impacts of Kaloko Makai.

1.7.8 Unresolved Issues

There are three issues that remain unresolved at the time of the preparation of this Second Draft EIS. They are summarized below and are expected to be resolved prior to implementation of the proposed action.

Transportation Improvements – The project will increase traffic demands and congestion in the project area. The cumulative increase in traffic demands, including those generated by Kaloko Makai and other projects in the vicinity on local roads during peak travel periods is assessed in Section 4.4. Mitigation measures to address cumulative traffic impacts are recommended. The configurations of those improvements, timing of completion and allocation of funding for these improvements are unresolved.

The general configuration of the project's internal roadways is known, but the precise roadway design standards that will be applicable to the internal roadway network within Kaloko Makai have not been finalized by the County of Hawai'i Planning Department and Department of Public Works. As a compact, mixed-use TOD, Kaloko Makai should be designed to be consistent with the Kona CDP and related Village Design Guideline. However, those Guidelines have somewhat different standards than those used more generally by the County Department of Public Works. Prior to project development, Applicant will obtain County approval of the internal roadways.

Archaeological and Historic Resources – The archaeological surveys were submitted to SHPD for review in October 2008. At the time of the preparation of this Second Draft EIS, SHPD was still reviewing the archaeological inventory surveys.

Type of Transit Oriented Development Village – According to the Kona CDP Official Land Use Map, Kaloko Makai is designated as a Neighborhood Village.

An economic policy noted in the Kona CDP (ECON-1.1) incentivizes a hospital as a stimulus for the healthcare industry. Kona needs a new hospital to replace its existing outdated and out-of-place facility. The new hospital should be located on the Ane Keohokālole Highway (mid-level road) for optimum accessibility by automobile or transit in this future growth area.

The commercial land use allowed under the Neighborhood TOD is sufficient to accommodate a variety of retail and office uses. If a hospital is situated within the project, medical offices and other hospital-related businesses will be developed in the vicinity. If the hospital is not located within the project, the commercial uses will address local retail and office demand.

Applicant has offered to provide 40 acres of land located along Ane Keohokālole Highway for the development of a regional hospital. Applicant will not be developing the hospital, but several

entities have been approached to undertake the development. Applicant will continue to pursue a hospital developer, and will continue dialog with those entities on the potential development of the new regional hospital/medical center at Kaloko Makai.

On May 23, 2011, Stanford Carr sent a letter to Bruce Anderson, CEO of Hawai'i Health Systems Corporation offering 40-acres of land to the appropriate entity to build and operate a hospital. In part, that letter stated, "This letter is to confirm that SCD - TSA Kaloko Makai LLC is willing to convey to the State, HHSC or other appropriate entity, at no cost, 40-acres of land within the Kaloko Makai project for a new regional acute care Hospital." "This proposal does not suggest Kaloko Makai will construct, pay for or operate a Hospital facility. However, Kaloko Makai is prepared to give the 40-acre site within the project for the new hospital facility."

In response to that offer, on July 20, 2011, Bruce Anderson responded to Stanford Carr stating, in part, "On behalf of the Hawaii Health Systems Corporation Board of Directors, I want to express our appreciation and assure you that we are taking your offer seriously and are excited about the prospect of a future new facility at Kaloko Makai. The need for a new facility is recognized in the West Hawaii Region HHSC Strategic plan. The suggested start date for planning such a facility in this plan is 2012. The proposed site is also consistent with the Kona Community Development Plan. Therefore, pursuant to your offer, the HHSC West Hawaii Regional System Board has directed its Strategic Planning Committee to evaluate your offer and the proposed site for a new hospital. "

This page intentionally left blank.

2. PROJECT DESCRIPTION

This section of the Second Draft EIS includes background information, description of neighboring properties and developments (in place and proposed,) a general description of the proposed Kaloko Makai project, the development timeframe and preliminary development costs.

2.1 BACKGROUND INFORMATION

2.1.1 Location and Surrounding Uses

Kaloko Makai will be located in Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi (see Figure 2-1). Kaloko Makai consists of approximately 1,139 acres and includes five parcels identified as Tax Map Key: (3) 7-3-009: 017, 025, 026, 028, and 63 (see Figure 2-2). The project site is presently vacant and undeveloped (see Figure 2-3). It consists of large, barren masses of pāhoehoe and aʻā lava and is overgrown with scrub vegetation consisting mostly of Christmas berry, koa haole and fountain grass. The southern portion (TMK: 7-3-009: 028) of the project site consists of a 150-acre native Dryland Forest. Access to the project site is from Queen Kaʻahumanu Highway, Ane Keohokālole Highway and Hina Lani Street.

The project site is located approximately one mile mauka of the coastline and lies between elevations ranging from approximately 100 feet above mean sea level (msl) at the western end to 700 feet above msl at the eastern end.

Lands surrounding the project site are largely undeveloped, with the exception of the Kaloko Industrial Park to the south and Kohanaiki Business Park to the north. The existing and proposed uses in the vicinity of Kaloko Makai are further described below (see Figure 2-4).

The Kaloko Industrial Park Phases I and II are located to the south (across Hina Lani Street from the Kaloko Makai site). It includes industrial and business establishments such as light manufacturing, warehousing and distribution operations, a Costco Wholesale facility and Home Depot. Kaloko Industrial Park Phases III and IV will consist of approximately 73-improved one-acre lots. Intended uses include light industrial, business and commercial uses consistent with the existing light industrial uses developed in Phases I and II of the Kaloko Industrial Park project.

West (makai) of the project site is Queen Kaʻahumanu Highway and directly across the highway is Kaloko-Honokōhau National Historical Park (KHNHP). Administered by the U.S. National Park Service, the 1,178-acre park contains extensive natural and cultural resources, such as two large fishponds, wetlands, 185 anchialine pools, 627 acres of marine habitat and archaeological sites. Nearly all of the land has been designated a national historical landmark (see Figure 2-4).

The Kohanaiki Business Park, a 26-lot light industrial development, is located immediately north of and adjacent to the project site. Access to the industrial park is from Queen Kaʻahumanu Highway and Hulikoa Drive.

Located immediately east (mauka) of the project site is the proposed Kaloko Heights project, which has plans for a 409-acre residential development to include approximately 1,400-single-family and

multi-family units, commercial and park development. Also proposed is the Shopoff Group's Kula Nei project, located northeast and adjacent to the project site. Kula Nei is a low-density residential subdivision that will consist of 270-market and affordable residential units. The project will also include a neighborhood park, trails, greenbelts and supporting infrastructure.

Further north, approximately three miles from the project site is the Kona International Airport at Keāhole, which is operated by the State Department of Transportation, Airports Division. Immediately south of the Airport is the Natural Energy Laboratory of Hawaiʻi (NELHA), a publicly-funded research facility and the Hawaiʻi Ocean and Science Technology (HOST) Park. East (mauka) of the Airport and Queen Kaʻahumanu Highway is the State-developed Keāhole Agricultural Park.

Further south of Kaloko Makai is the State Department of Land and Natural Resources, Division of Boating and Ocean Recreation's 450-slip Honokōhau Small Boat Harbor, Honokōhau Village, the West Hawaiʻi Civic Center, and the County of Hawaiʻi's Kealakehe Regional Wastewater Treatment Plant, located approximately 1 to 1.5 miles from Kaloko Makai.

The Department of Hawaiian Home Land's Villages of Laʻi ʻŌpua project is located approximately one mile south of the project site. When fully developed, the project will include approximately 1,740 single- and multi-family residential units, recreational facilities, community facilities, neighborhood commercial complexes, several parks, and several preserve sites.

Approximately 3.5 miles south from the project site is Kailua-Kona town, the major commercial and business hub of the region. Queen Liliʻuokalani Trust's (QLT) proposed Keahuolu development is located near the QLT Center.

A number of residential developments located in the vicinity of Māmalahoa Highway neighbor the project site. These include Kona Palisades, Kona Acres, Kona Coastview, Kona Wonder View, Kaloko Housing Project and Kona Highlands to the north/northeast; Kona Heavens to the east; and, Kealakehe Homesteads, Kona Chocho Estates, and Kona Macadamia Acres.

Adjacent to and immediately south of the project site, Lanihau Partners L.P. proposes to develop approximately 337 acres of land for development of the West Hawaiʻi Business Park, also known as Kaloko-Honokōhau Business Park, a proposed light industrial development. The development will include a mixture of industrial and commercial uses that allow the retention and expansion of the existing quarry and quarry-related uses.

Also adjacent to and south of the project site, above the West Hawaiʻi Business Park, is Kona View Estates Subdivision (327 Kona LLC). The project site has an initial phase consisting of 29, vacant 1-acre lots with agricultural zoning. This phase of the project received final subdivision approval in 2006 and has completed all of its infrastructure improvements. The remainder of the land immediately adjoining Kaloko Makai remains vacant and undeveloped.

Further south, approximately 1.6 miles from the project site, the Queen Liliʻuokalani Trust is planning to develop some 546 acres near Makalapua Center. The project was granted State Land Use District reclassification from the Agricultural and Conservation Districts to the Urban District in 1991. However, no residential uses were proposed at that time.

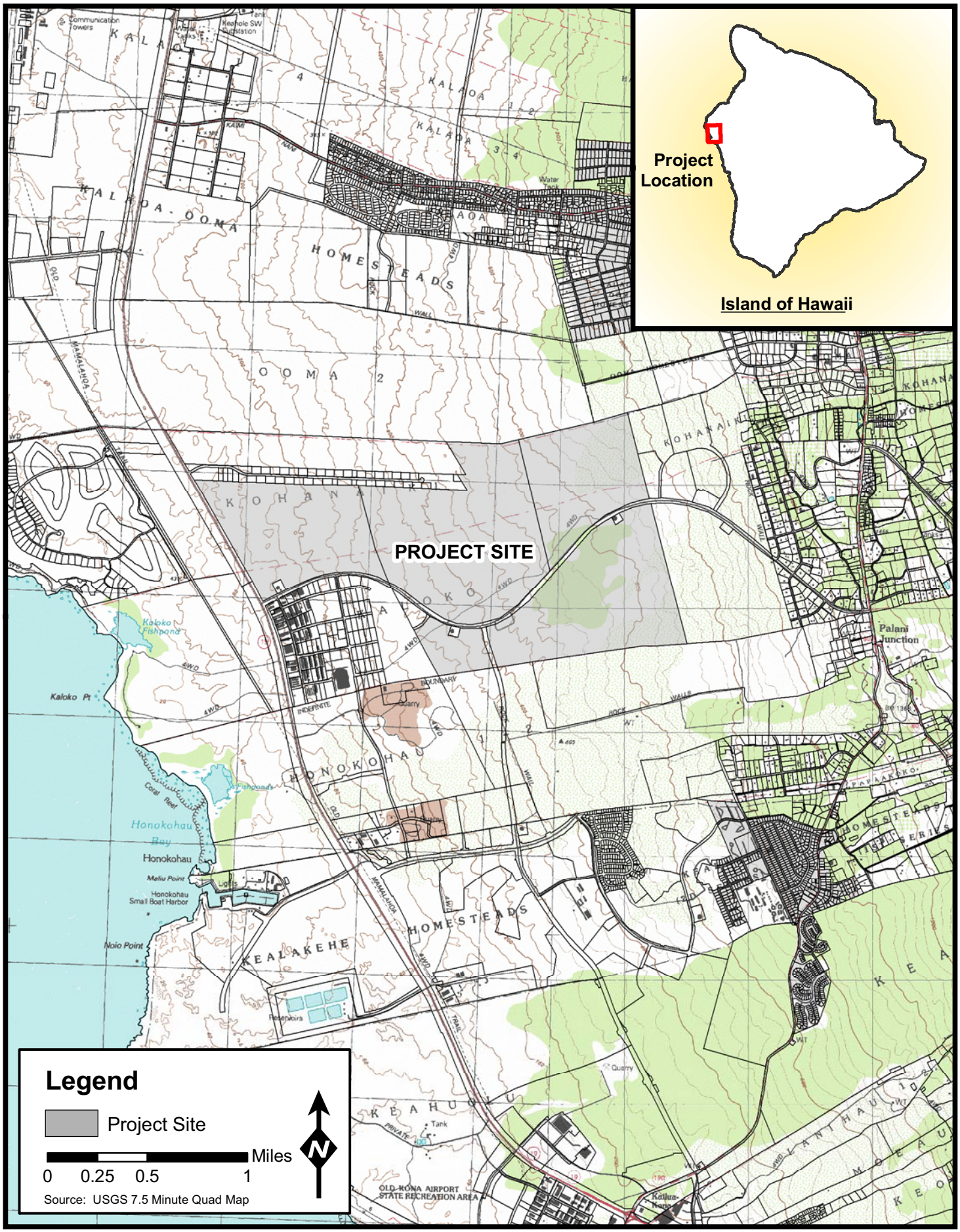


FIGURE 2-1
Regional Location Map
Kaloko Makai

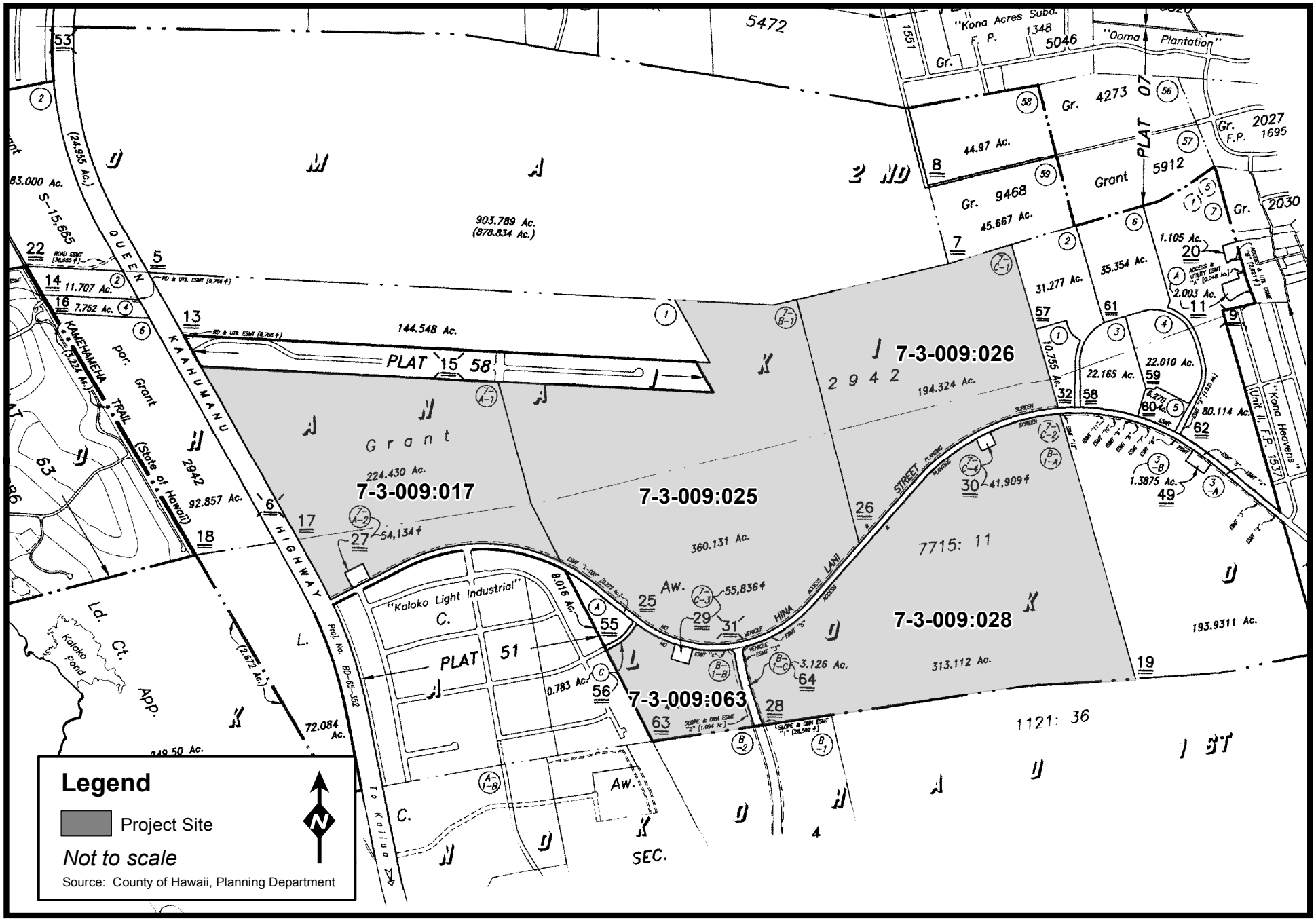


FIGURE 2-2
Tax Map Key: 7-3-009: 017, 025, 026, 028 and 063
Kaloko Makai

Facing makai from east end of project site, showing dense vegetation.

Facing northwest from south side of ahupuaʻa wall, with large ʻa ʻā flow visible on horizon.

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 2-3
Project Site Photos
Kaloko Makai

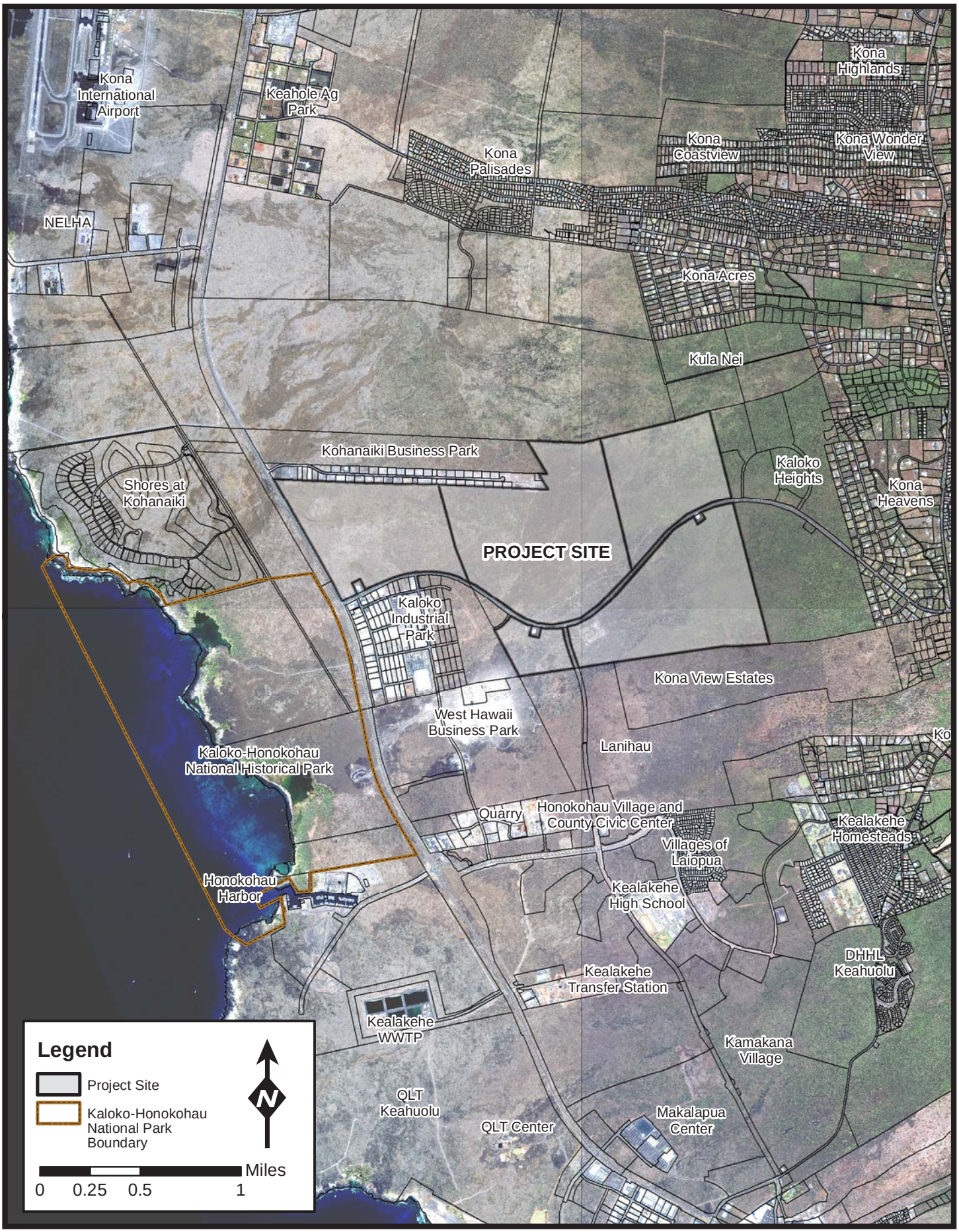


FIGURE 2-4

Existing and Proposed Uses Within the Vicinity of the Project Site

Kaloko Makai

The development of Kamakana Villages at Keahuolu is being undertaken by the State HHFDC, in collaboration with Forest City Hawaiʻi Kona, LLC. The project will consist up to 2,300 units on 270 acres of land. The project is intended to be a mixed-use TOD community with 50% of units to be sold or rented as affordable units, and will include commercial space and public facilities. The State Land Use Commission approved the reclassification from the Agricultural District to the Urban District in November 2010. Infrastructure development is underway, and the first residential units are anticipated to be made available between 2014 – 2017. This project is located about two miles south from the project site along Palani Road and mauka (east) of Makalapua Center.

Northwest of the project site and makai of Queen Kaʻahumanu Highway, is the Shores of Kohanaiki, a resort development on approximately 470 acres of land, planned to contain 500 homes, a private golf course, and a 128-acre coastal park.

The University of Hawaiʻi plans to develop lands north of Kona Palisades and Keāhole Agricultural Park for a new Hawaiʻi Community College at Palamanui campus, in cooperation with the developers of the related, proposed mixed-use community of Palamanui. Groundbreaking for the access road connecting Kona Palisades to the Hawaiʻi Community College at Palamanui campus site was held in March 2011; it was completed in 2012. Groundbreaking for the college was held in June of 2013. Construction of Phases 1A and 1B of the 8-acre campus is underway and is expected to open in 2015.

2.1.2 Land Ownership

As shown in Figure 2-2, the 1,138.866-acre Kaloko Makai property (the Project Site) is comprised of:

- (3) 7-3-009:017 – 224.430 acres
- (3) 7-3-009:025 – 360.131 acres
- (3) 7-3-009:026 – 194.324 acres
- (3) 7-3-009:028 – 313.112 acres
- (3) 7-3-009:063 – 46.869 acres

SCD - TSA Kaloko Makai, LLC is the recorded fee owner of the Kaloko Makai property.

2.1.3 Property Description

The property is approximately 1,139 acres in total land area. It is presently vacant and undeveloped. The project site occupies an area of relatively uniform slope, ranging from 5 to 8%. The lowest elevation along the makai boundary of the site is approximately 100-feet above mean sea level (msl). Along the mauka boundary, the site reaches an elevation of about 700-feet above msl. The site has a generally irregular surface with localized mounds and depressions throughout, as is characteristic of non-eroded lava flows.

The project site is located on the lower western slope of Hualālai, a dormant shield-type volcano. Hualālai Volcano last erupted in 1801 along its northwest rift zone, which represents the major geologic structure in the area.

The U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) classifies the soil in the project site as pāhoehoe lava flows (rLW), aʻā lava flows (rLV), Kaimū extremely stone peat (rKED) and Punalu`u extremely rocky peat (rPYD). Although, the project area was part of an extensive pre-Contact Hawaiian settlement in the region of North Kona, the area receives low rainfall and has low agricultural ratings. The area hasn't been actively used for agriculture.

The natural drainage system of the project site consists of rainfall percolating through the layers of very porous lava to the ground-water table. There are no definable streams or natural drainage ways within or in the immediate vicinity of the site as the basaltic rocks of the substrata are highly permeable.

The surrounding area consists of barren aʻā and pāhoehoe lava fields which are also highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata.

The current land use designations of the Property are as follows:

- State District: Conservation, Agricultural and Urban (see Figure 2-5)
- Conservation District: General Subzone (see Figure 2-6)
- General Plan: Urban Expansion and Conservation (see Figure 2-7)
- County Zoning: Agricultural 5-acre and Open (see Figure 2-8)
- Kona CDP Official Land Use Map: Neighborhood Transit Oriented Development (TOD) (see Figure 2-9)

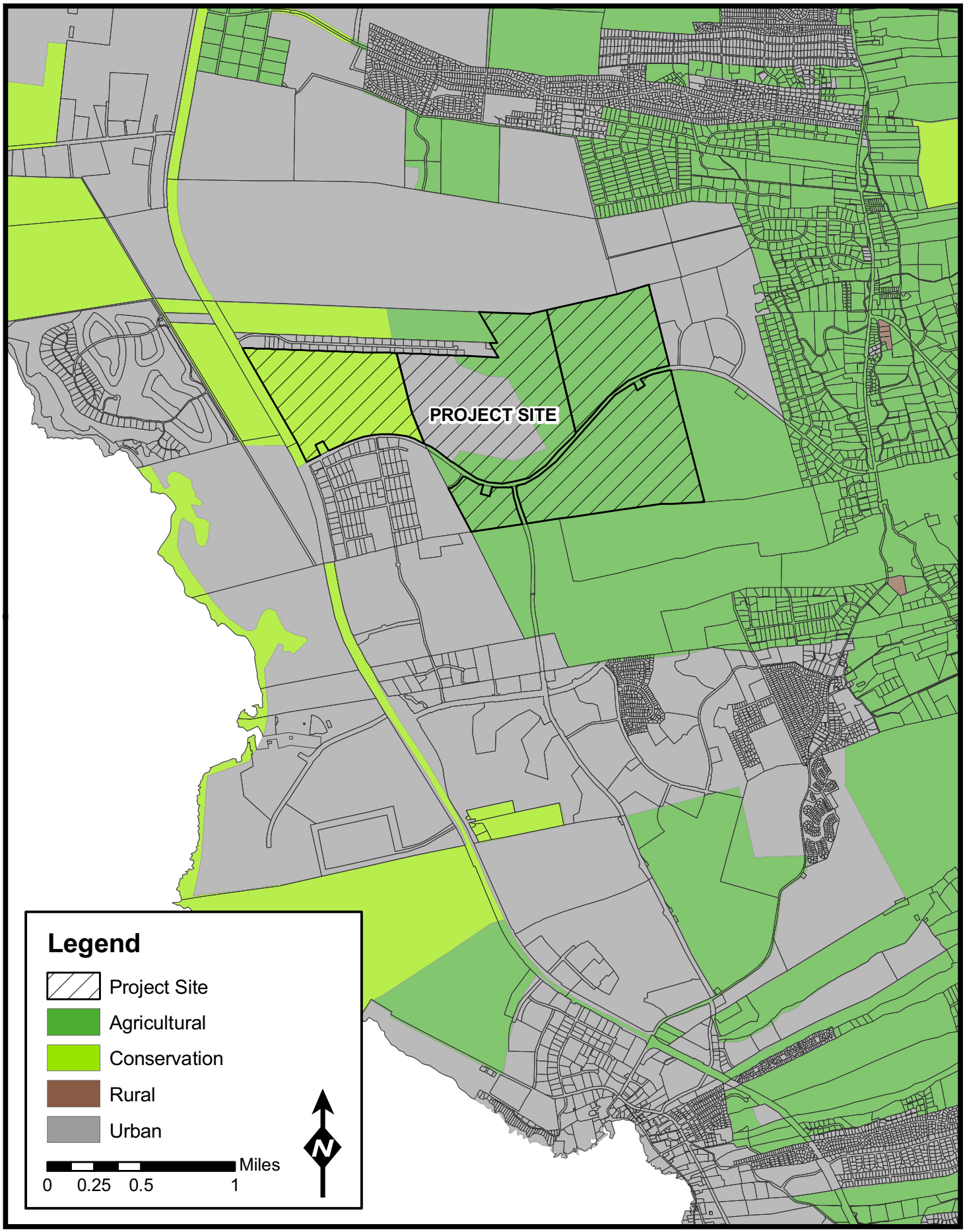
The development is situated on lands currently within the State Land Use Conservation, Agricultural and Urban Districts necessitating, a State Land Use District Boundary Amendment to reclassify approximately 798.866 acres from Conservation and Agricultural Districts to the Urban, and a subsequent County of Hawaiʻi Zone Change (see Figure 2-10 and Table 1-1). Applicant will not be seeking a boundary amendment for approximately 150 acres of land in the Agricultural District; Applicant has designated this area as the Dryland Forest and intends to retain the Agricultural District designation for that area.

The project site is approximately one mile from the shoreline and is not within the Special Management Area.

2.1.4 Overview of Region

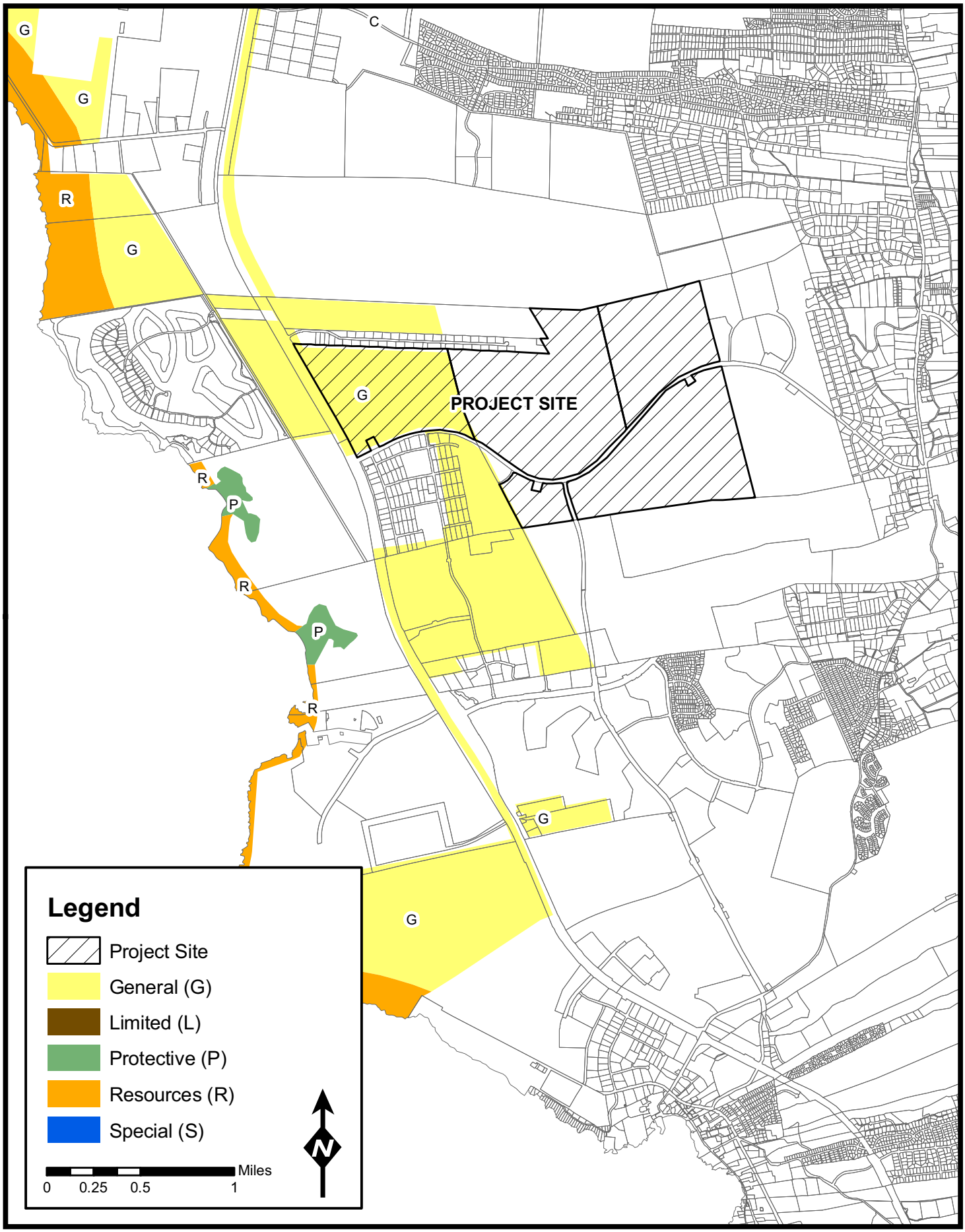
Kaloko Makai includes portions of the ahupuaʻa of Kohanaiki and Kaloko. Kohanaiki means "small barrenness"; Kaloko literally translates to "the pond." The project lies at the southern end of the Kekaha region, the portion of North Kona extending from Honokōhau to ʻAnaehoʻomalu.

The character of Kekaha - as it had been established in the Hawaiian consciousness - is represented in a traditional saying recorded by Mary Kawena Pukui and in a brief description by John Papa ʻIʻī. The saying, "Kekaha wai ʻole na Kona", translates to "waterless Kekaha of the Kona district." Pukui states that "Kekaha in Kona, Hawaiʻi, is known for its scarcity of water but is dearly loved by its inhabitants" (Pukui 1983:184).



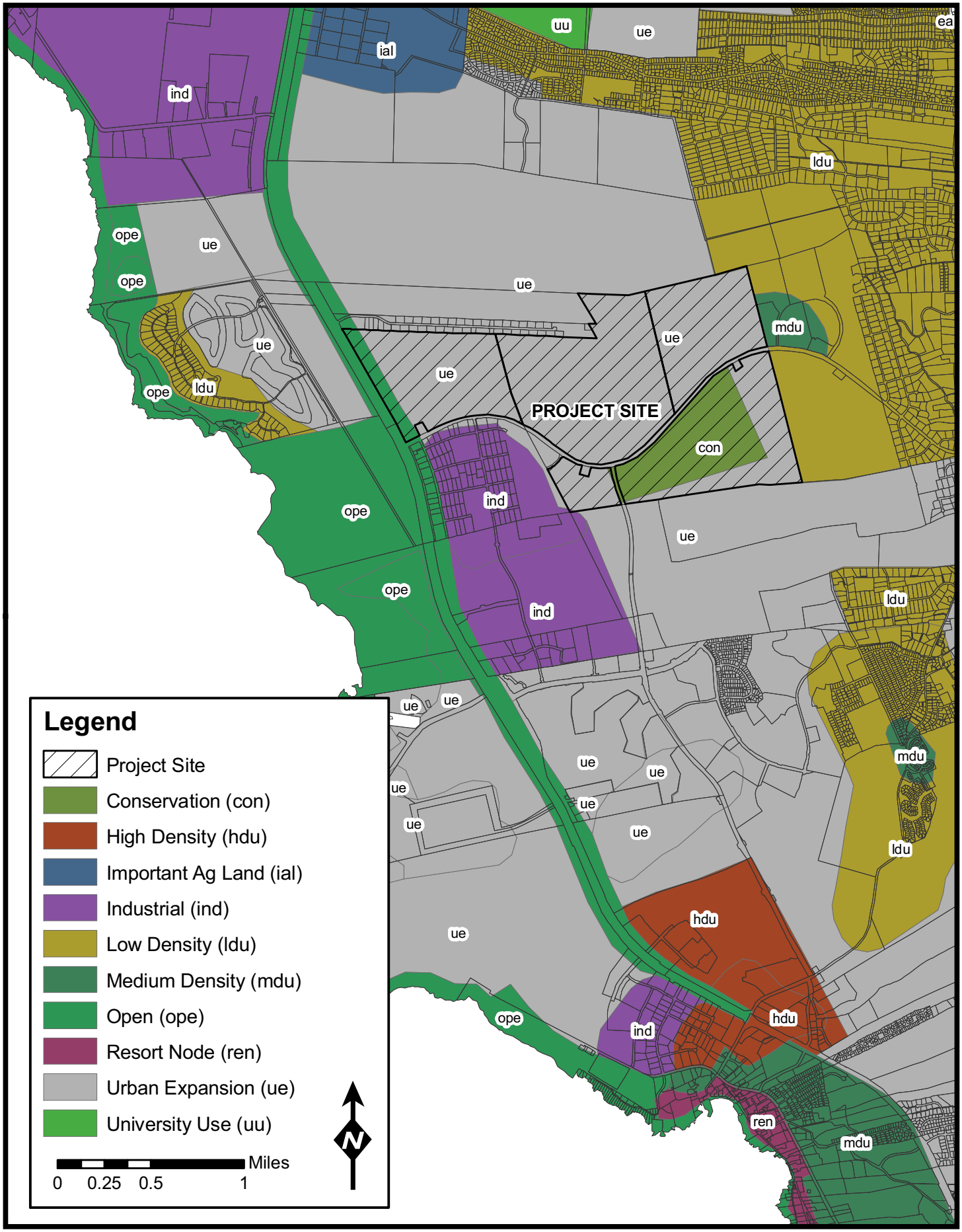
WILSON OKAMOTO CORPORATION

FIGURE 2-5
State Land Use District Map
Kaloko Makai



WILSON OKAMOTO CORPORATION

FIGURE 2-6
State Conservation District Subzones
Kaloko Makai

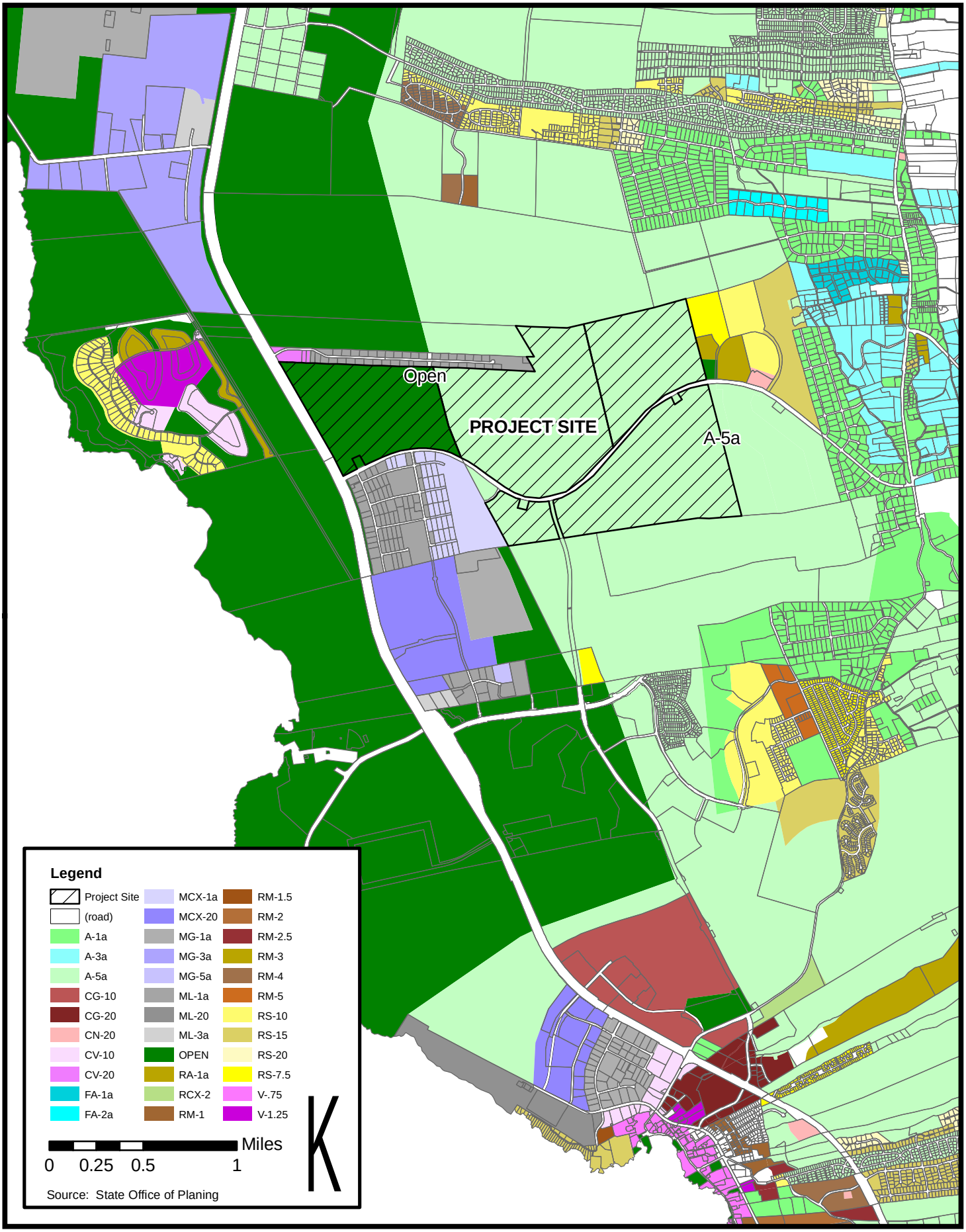


WILSON OKAMOTO CORPORATION

FIGURE 2-7

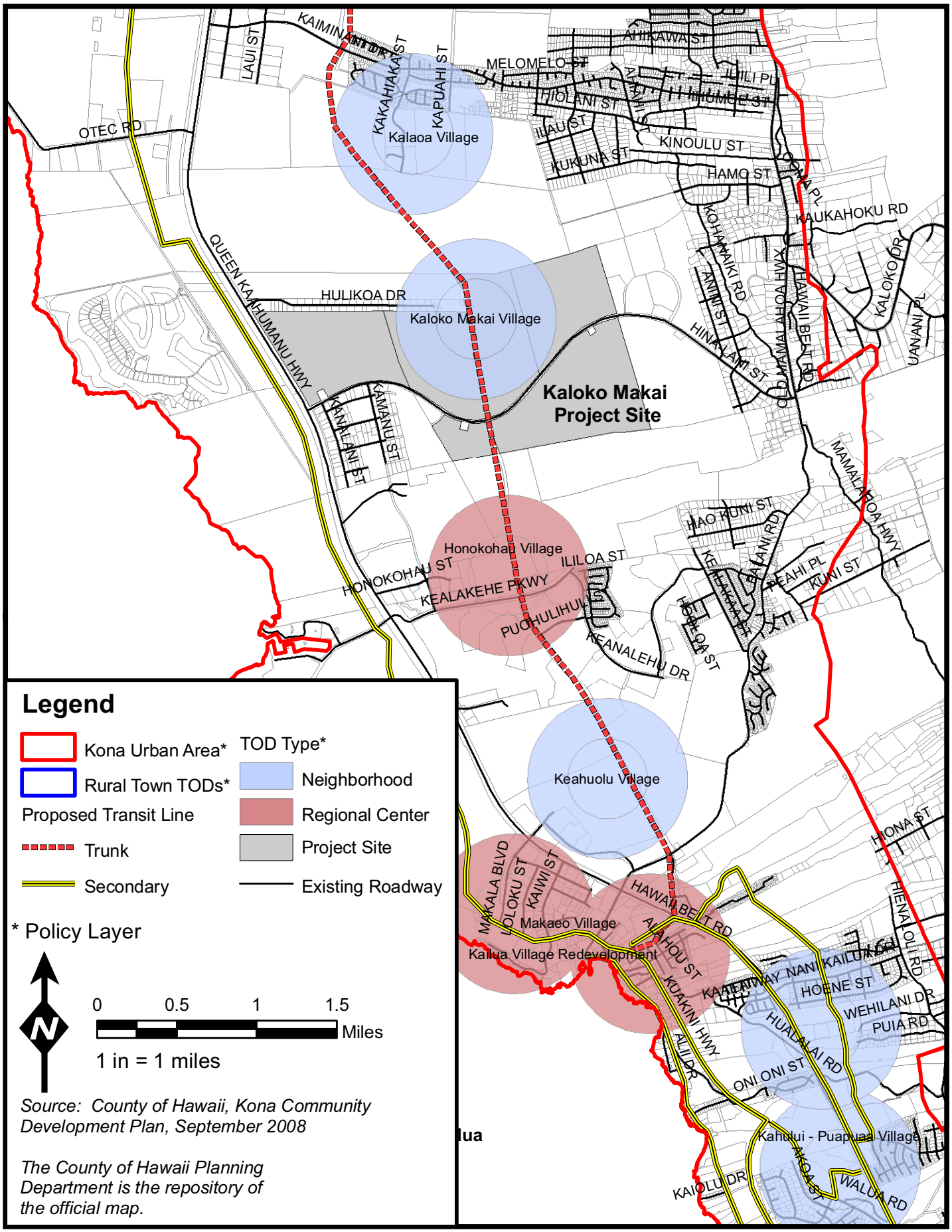
County General Plan Land Use Pattern Allocation Guide

Kaloko Makai



WILSON OKAMOTO CORPORATION

FIGURE 2-8
County of Hawaii Zoning
Kaloko Makai



Source: County of Hawaii, Kona Community Development Plan, September 2008

The County of Hawaii Planning Department is the repository of the official map.

WILSON OKAMOTO CORPORATION

FIGURE 2-9

Kona Community Development Plan Official Kona Land Use Map

Kaloko Makai

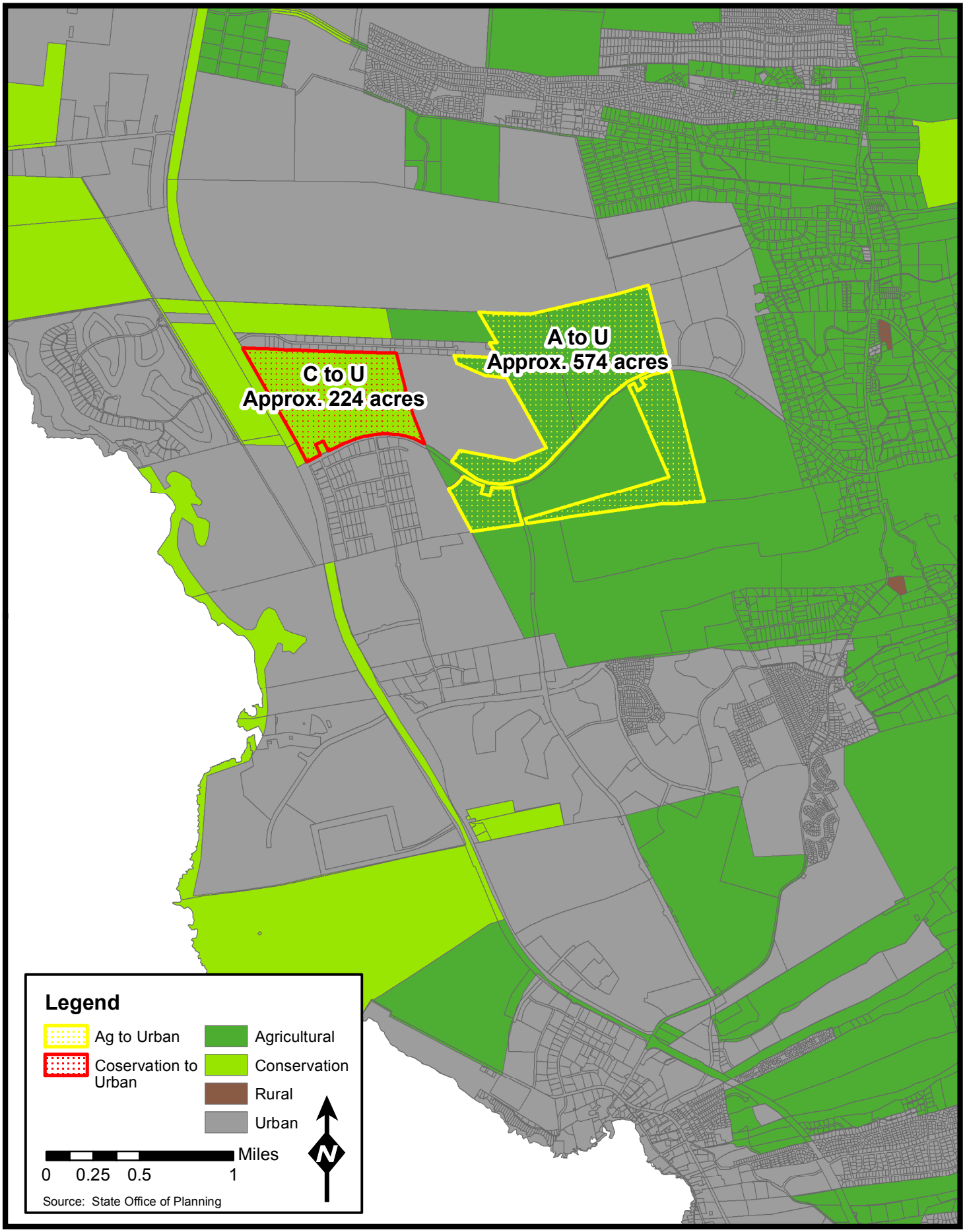


FIGURE 2-10

Proposed State Land Use District Boundary Amendment Petition Area

Kaloko Makai

WILSON OKAMOTO CORPORATION

ʻĪʻī describes the winds of Kekaha:

> ...a cold wind from Kekaha, the Hoolua. Because of the calm of that land, people often slept outside of [sic] the tapa drying sites at night. It is said to be a land that grows cold with a dew-laden breeze, but perhaps not so cold as in Hilo when the Alahonua blows. (ʻĪʻī 1959:122)

These passages suggest that Kekaha was contextually identified by its austere physical environment. A legend told in Maguire (1966) reveals the importance of water resources in this general area (see also Wolforth 2005:8-9). The story takes place at the Cave of Mākālei, which is located outside of the current project area near ʻAkahipuʻu (a nearby mountain).

The story focuses on a man named Koʻamokumokuoheʻeia, who moved to this area and was told by the current residents that water was very scarce. Water, he was told, could be obtained in "celebrated" caves, but these caves were kapu (forbidden), and if caught, trespassers would be killed by the owner of the cave. However, Koʻamokumokuoheʻeia discovered a very small cave entrance that no else knew about. The cave had water dripping from its roof (Maguire 1966:30).

Koʻamokumokuoheʻeia and his father used carved ʻōhiʻa and wiliwili trees to capture the dripping water, and his family was thus able to survive during dry spells. This legend demonstrates difficulty of procuring water in this region, and highlights the importance of water collection caves for survival.

Kamakau records that during the 1770s, "Kekaha and the lands of that section" were held by descendants of the Nahulu line, the Ka-meʻe-ia-moku and Ka-manawa, the twin half brothers of Keʻe-au-moku, the Hawaiʻi Island chief (Kamakau 1961:310). The Great Seal of the State of Hawaiʻi depicts Kameʻeiamoku and Kamanawa (Springer 1989:23).

2.1.5 History of the Property

The project area is part of the traditional region known as Kekaha, extending from Honokōhau to ʻAnaehoʻomalu in North Kona. Despite being a dry place, the project area contains many unique resources - including dozens of subterranean lava tubes and caverns used to collect water. The project area was part of an extensive pre-Contact Hawaiian settlement in the region of North Kona that continued to support a subsistence-based lifestyle into the early historic era.

Radiocarbon dating from nearby sites definitively shows the general area has been utilized by humans for at least 1,000 years (Walker and Haun, 1988).

The project area is associated with specific moʻolelo (oral history) about (a) the sixteenth or seventeenth century ruler of Hawaiʻi Island, Lono-i-ka-makahiki, who was involved in several famous battles with the chiefs of Maui (including Kama-lala-walu) and other parts of Hawaiʻi, (b) Kamehameha I, whose remains were reportedly interred near Kaloko Fishpond, (c) ʻUmi-a-Liloa, who frequented the famous fisheries of Kaloko and Kohanaiki, and (d) the Nahulu chiefs (including Ka-meʻe-ia-moku and Ka-manawa).

The project area is also associated with legendary references to Ka-Miki (a thirteenth century supernatural legendary figure,) various moʻo (water spirits) that resided at fishponds at and near the seashore, and Hualālai; and more general references to water-collection lava tubes and the unique environmental conditions of the region.

Oral history interviews (Maly and Maly 2002) relate that in the mid-1800s only a few residences were on the coastal lands, in the uplands above 900 ft. elevation and in the vicinity of Māmalahoa Highway (east of the project area). The land between 900 ft. and the coast was cattle, donkey and goat pasturage. Mauka/makai trails through Kohanaiki, Kaloko, Kalaoa and Honokōhau were utilized by upland families to access the coast to fish, and gather water during upland droughts.

The division of Kohanaiki - through sales of Government lands -continued throughout the remainder of the nineteenth and into the twentieth century. Grant 2942 in 1864 awarded to Hulikoʻa 929.75 acres which included the width of the ahupuaʻa, extending makai from Kaiakoili's grant. In 1871, Grant 3086 awarded 154 acres to Kapena; this parcel extended makai from Hulikoʻa's grant to the shoreline.

At the time of the Māhele, Hulikoʻa was a resident of Kohanaiki (Maly and Maly 2003:4). Although Maly and Maly (2003:60) reviewed all Māhele claims, no additional references to Hulikoʻa were found. However, based on traditional patterns of residency in the region, it is "likely they had primary residences in the uplands, near sheltered māla ʻai (agricultural fields), and kept near shore residences for seasonal fishing, collection of salt, access to water in dry periods, and for access to other resources of the coastal zone" (Maly and Maly 2003:60).

Kaloko is documented during the 1870s in testimonies by Hawaiians before the government's Boundary Commission. Testifying on August 12, 1873, Nahuina (who had earlier received LCA 10327 in Kaloko) describes himself as "born at Kaloko North Kona Hawaiʻi at the time of Keikepuipui, the building of the heiau at Kailua, and have always lived there" and states that the boundaries of Kaloko were shown to him by his father, the former konohiki of the ahupuaʻa.

During the 1880s, Kona lands - including Kaloko and Kohanaiki - were surveyed by J.S. Emerson for the Hawaiian government. A portion of his Registered Map (RM) 1449, Akapipuʻu Section shows a trail through the project area; the trail actually ran from the Kohanaiki Homesteads to the Kaloko fishpond. Emerson produced three maps corresponding to the project area during this time period: Registered Map (RM) 1280, RM 1449 and RM 1512.

Archaeological research shows the project area contains many culturally and historically significant sites and features. Sites in the project area include permanent and temporary habitation structures - many of which incorporate natural features of subterranean lava tubes into their design, agricultural features (including extensive rock mounds used to plant sweet potatoes), at least 65 burials located in approximately two dozen burial sites, ahu (stone markers), trails, petroglyphs, ahupua`a boundary walls, papamū (traditional gaming site) and others.

The project area is also associated with the unique history of Hawaiian-style ranching and paniolo ("Hawaiian cowboys"), including the well-documented Hu`ehu`e Ranch.

Historic documents related to the Government Homestead Program of the late 1880s indicate officials determined that goats were the only animals that were adept at grazing within arid, rocky Kaloko and Kohanaiki (Maly and Maly 2003:76, 79). Goats were present in the area prior to the late 1880s and may have been present within the project area. Limited cattle ranching was practiced at the same time, although by 1900, cattle ranching had for the most part replaced the goats (Maly and Maly 2003:75).

Ranching steadily increased. Once John Maguire purchased the former chiefly lands of Kaloko in 1906 after the deaths of Kalākaua and Kapiʻolani (Kelly 1971:29), the ahupuaʻa uplands were developed into the Huʻehuʻe Ranch.

Thus, by the turn of the century, Huʻehuʻe Ranch, utilized both the upper forest lands and lower kula lands to the shore for ranching purposes. Oral history interviews with elder former ranch hands record that this use extended across the Kapena and Huliko`a grant lands of Kohanaiki, from the fee and leasehold lands of Kaloko and ʻOʻoma. Nineteenth century goat drives gave way to formalized cattle drives and round ups on these lands. (Maly and Maly 2003:78)

The Maguire/Stillman family held Hu`ehu`e Ranch until they sold it on July 8, 1966. At that time, the Kona Coast Company, a partnership between the Kaloko Land Corporation, Mauna Loa Cattle Corporation (which later was separately held by members of the Karl B. Rodi family), and Foothill Land Corporation (which was later succeeded by the David Pacific Corporation and Davis family members) was established.

Until the construction of the Queen Kaʻahumanu Highway in the 1970s, access to the "kula kai (shoreward plains)" (Maly and Maly 2003:101) was limited to local residents. The 1924 USGS map shows the mauka/makai road connecting the Kohanaiki Homesteads with the Kaloko fishpond, and crossing the project area at the ahupua`a boundary between Kohanaiki and Kaloko.

In the first half of the twentieth century, the primary method of travel was "by foot or on horse or donkey, and those who traveled the land, were almost always native residents of Kalaoa, ʻOʻoma, Kohanaiki, Kaloko and Honokōhau" (Maly and Maly 2003:99). Huʻehuʻe Ranch bulldozed a jeep road to the shore around 1955 during the construction of the Kailua pier, and this was used primarily by the ranch employees for duties or for going fishing along the coast.

While the present project area is largely undeveloped, surrounding areas have seen increasing modern use. The Huʻehuʻe Ranch jeep road and other signs of animal husbandry activity can be seen on the 1959 USGS map.

In 1985, the Land Use Commission approved a boundary amendment of 190-acres of land within the Kaloko Makai property for an 18-hole golf course and appurtenant facilities. These include a clubhouse, maintenance building, driving range, practice greens and parking. The proposed golf course was not intended to be a part of, nor associated with any type of resort development. The golf course was proposed to primarily serve the resident population and is oriented for public use. (LUC FOF, COL and D&O A84-566-TSA). However, no golf course development has taken place.

More recent nearby development is largely industrial, and the Kaloko Industrial Area is just southwest of the project area, including large stores such as Home Depot and Costco. Huliko‘a Road is also heavily developed, primarily as an industrial area, along a portion of the north border of the project area. Hina Lani Street runs along the south border of the project area, and leads mauka to a residential area (Kona Heavens) before the Palani junction (at Māmalahoa Highway,) as well as leading makai to the modern Queen Ka‘ahumanu Highway.

2.2 PROJECT PURPOSE AND NEED

2.2.1 Purpose and Objectives

The purpose of the Kaloko Makai project is to create a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities, focused around an initial urgent care medical facility with land available for a new Kona regional hospital. If the hospital is not located within Kaloko Makai, residential units will remain at 5,000 units and there will be approximately 600,000 sq. ft. of commercial space (see Chapter 7). A Lodge and Business Center will support the commercial needs within the Transit Oriented Development (TOD) including the potential Hospital and the recently selected Kealakehe Judiciary site. Kaloko Makai has been designated as a Neighborhood TOD in the Official Kona Land Use Map of the *Kona CDP*.

As a mixed-use community, the objectives of Kaloko Makai are to:

- Create a diverse, sustained community of mixed uses, including residential, retail and commercial spaces, light industrial areas, recreational spaces, and open space.
- Cultivate intrinsic respect for the land and natural surroundings, develop an inherent Hawaiian sense of place and nourish a sustaining living environment.
- Provide housing for the working families of Hawai’i nearby areas of workforce demand, resultantly improving overall quality of life through the reduction of commuting and facilitation of everyday function.
- Openly embrace a diversity of people and activities through offering mixed uses and housing types.
- Contribute to the social fabric of the community by providing infrastructure and facilities, and by including school, hospital, recreational, and civic sites.
- Engender and incorporate intelligent, planned sustainability by design.
- Emphasize non-vehicular transit for mainstream community-wide travel

Kaloko Makai is strategically located along the major regional traffic corridor of Queen Ka‘ahumanu Highway, between the town of Kailua-Kona and the Airport. Likewise, it is centrally located on Ane Keohokālole Highway, also known as the Mid-Level Road, which will run through the development; this is the major transit corridor called for in the *Kona CDP*. The area also has a long-standing and growing residential base.

This area will continue to be the focus of such development as the Island’s population grows, given its proximity to the Airport and other existing infrastructure. This region is also the commercial and

industrial heart of West Hawai‘i, serving the Airport and the needs of the visitor, agriculture, ranching, technology and other industries of the western half of the Island.

The project is designed to support non-vehicular travel (key elements of the *Kona CDP*). Project objectives include developing health care facilities in Kona that provide a range of health care services and creating opportunities for on-site employment in retail, commercial, light industrial uses to reduce peak hour traffic impacts and provide higher quality of life for Kaloko Makai residents.

2.2.2 Project Need

Mikiko Corporation prepared a Market Assessment for Kaloko Makai. Following is a summary of the findings and conclusion in that report. The report is included in its entirety as Appendix A.

Kaloko Makai is situated in a region that is rapidly developing, with immediate access to Kona International Airport and is adjacent to the well established commercial and light industrial-service centers of North Kona and Kailua Kona which serve the needs of the visitor, agriculture, ranching, and technology industries, among others, which populate the western half of the island.

Kaloko Makai is located within proximity to regions that will continue to be the focus of further development as the Island’s population grows, and has the potential to be a major cornerstone of residential, commercial, and light industrial growth as a center of community, commercial, and economic activity.

2.2.2.1 Residential Market

Housing in the Area

The two census tracts 215.01 and 217.01 are considered Kaloko Makai’s Competitive Regional Market Area for residential market conditions. Current and competitive housing opportunities within the market do not satisfy existing nor forecast demand. Kaloko Makai will stabilize this imbalance and seek to facilitate the continued economic development of the region.

As current economic conditions improve, the market area should be poised for a significant share of the Islands’ anticipated future population growth, and will lead to further exponential growth in demand for housing within the region.

Currently entitle projects are estimated to yield up to 8,200 units of the potentially demanded 17,800 new housing units in the market area by 2045, assuming all proposed and entitle projects are built out within this timeframe and developed to the maximum levels of their respective current plans and entitlements. Furthermore, Mikiko’s research concludes that even if one assumes aggressive and unprecedented levels of future development, without further State entitlement of additional housing developments, the market area is forecast to experience a shortfall of some 9,600 primary homes by 2045.

Residential Buyer Mix and Pricing

Considering the location, characteristics and types of residential developments proposed, about 85% of Kaloko Makai homes are anticipated to be used as primary homes, most for existing Island residents. Kaloko Makai would offer homes primarily in compact or multifamily settings, in adherence with the Kona CDP.

Kaloko Makai would consist of homes, ranging from the traditional single-family homes to mixed-use, mid- and higher-density multifamily units. The exact mix of units by type will be determined upon finalizing agreements with government agencies and during the years of build-out, as market conditions and preferences materialize.

Pricing of affordable units at the Project will be set in accordance with County and State guidelines to be determined in consultation with government agencies. For illustrative purposes, according to County guidelines in effect as of September 1, 2010, conforming affordable housing prices will include:

- For-sale units priced from $202,500 to $366,200, for those offered to families of two to four persons earning 110% to 120% of the median income; and
- One- to two-bedroom rental units priced from $1,037 to $1,500 per month, including utilities, and offered to households earning 80% to 100% of the median income.

Market priced properties will offer a wide range of products, in today's dollars (2010) from mid- to high-$200,000s and up Table 2-1 offers a summary of the project's proposed average pricing for market priced properties.

The target market is the local, rather than the offshore, buyer. Overall, the project is intended to respond to already-anticipated economic growth, rather than to generate more of it.

Table 2-1
Projected Market Unit Average Pricing at Kaloko Makai (2010 dollars)

	Average sales price*	**Approximate average density (units/gross acre)**
T3 – Predominantly single-family**	$475,000	3 to 6
T4 & T5 – multi- or single-family**	$370,000	8 to 16
Overall, market homes	$396,000	3 to 16

**For market-priced units only.*
*** T3 – T5 refers to transect zones densities established by the Kona CDP Village Design Guidelines.*
Source: Mikiko Corporation, April 2012 (see Exhibit 4-2 in Appendix A for further information)

Projected Residential Sales Absorption

The first residential product at Kaloko Makai is projected to be available for sale in 2015. Thereafter, it is anticipated that the 5,000 maximum proposed units, homes and lots could be absorbed over 30 years at an average rate of 170 units per year, as summarized in Table 2-2.

Table 2-2
Illustrative Summary of Maximum Potential Residential Sales Absorption at Kaloko Makai, 2015 to 2045

	Affordable Homes	Market Homes	Maximum Total Housing
Maximum Inventory	700-1,000	4,000-4,300	5,000
Average Annual Sales*	22-32	130-140	170 (rounded)

* Assumes several but not all products are marketed simultaneously in any given year. Thus, since market home sales may extend over a longer period than affordable home sales, the overall average rate is less than the sum of the two sub-market rates shown.
Source: Mikiko Corporation, April 2012

Kaloko Makai Proposal

Kaloko Makai is planned to respond to the market and demographic trends as well as the community needs. The project will serve a County population that is changing in terms of size, geographic dispersion, age profile and lifestyle. Over the course of approximately 30 years Kaloko Makai will deliver the anticipated needed homes in a diverse, planned community. The project's inventory could represent a significant solution for the anticipated future unmet demand for some 9,600 new housing units through 2045, based on currently entitled projects and their plan maximums.

Furthermore, Kaloko Makai will respond to varying spectrums of demand for housing within the North Kona/South Kohala area by providing a wide range of housing opportunities inclusive of affordable housing alternatives. Kaloko Makai will seek to create and sustain a mixed-income community allowing for unparalleled social diversity.

2.2.2.2 Commercial Market

Supply and Demand

The Primary Trade Area (PTA) (Trade Area is defined as the geographic area within which most consumers for a given commercial locale (shopping center, office building, etc., originate) for commercial uses at Kaloko Makai is considered to be the entire North Kona and South Kohala districts of the Island. Commercial uses consist of retail and office space.

As of December 2010, the PTA had over 2.6 million square feet of retail space and 74% or 1.9 million square feet of this was located in the North Kona District. Office supply and demand is evaluated in

terms of rentable building area. As for office space, North Kona has an estimated 529,000 square feet of rentable building area.

A total of 2.2 million square feet of planned commercial inventory was identified in North Kona and South Kohala. Within the PTA, North Kona is the focus of commercial development interest, with an estimated 1.8 million square feet of potential retail- and /or office-based commercial spaces proposed on lands that are entitled and planned for commercial development, as of December 2010.

Retail supply and demand is based on daytime residents and average daily visitors, while office supply and demand is based on civilian employees who reside in the PTA. Additional future retail- and office-based market needs are considered related to growth in population and civilian labor force numbers respectively. The potentially rapidly increasing resident population of the Trade Area itself would anchor demand in the area.

In total, the retail- and office-market analyses indicate support for up to 5.5 million square feet of commercial area by 2025, or 7.2 million by 2045, as summarized in Table 2-3.

Table 2-3
Projected Supportable Commercial Areas in the Primary Trade Area (square feet)

	2025	2035	2045
Retail-based demand	4,500,00	5,500,000	5,800,000
Office-based demand	1,000,000	1,300,000	1,400,000
Total	5,500,000	6,800,000	7,200,000

Note: Represents total projected supportable areas, including existing and entitled/planned developments.
Source: Mikiko Corporation, April 2012

Kaloko Makai Proposal

Kaloko Makai proposes up to 600,000 square feet of gross leasable area of various commercial uses at Kaloko Makai, including retail and office. If developed to the full-proposed capacity of 600,000 square feet, Kaloko Makai's commercial spaces could represent some 8% of the PTA's projected total 2045 inventory. It could also represent a venue for about half of the currently unplanned but future supportable commercial space in the Trade Area.

This demand will include that for spaces in shopping centers, medical-support and other office complexes, as well as and mixed-use developments. As for residential development, the first finished commercial building products are assumed to be available for use within 10 years of LUC's SLUBA approval.

Development and lease-up of the proposed commercial areas are anticipated to be supported by future market conditions in the Trade Area as summarized in Table 2-4:

Table 2-4 Projected Supportable Commercial Market Absorption and Kaloko Makai Share of the Primary Trade Area (Cumulative square feet)			
	2025	2035	2045
Kaloko Makai potential development phasing	430,000	560,000	600,000
Total Supportable Commercial Areas in PTA	5,500,000	6,800,000	7,200,000
Kaloko Makai as Share of Future PTA	8%	8%	8%
Source: Mikiko Corporation, April 2012			

2.2.2.3 Light Industrial/Business Park Market

Primary Trade Area and Analytical Approach

Light industrial areas can support business parks, manufacturing, energy production, research & development, wholesale, office, retail and other uses. They often serve a super-regional or Island-wide market. This analysis profiles market trends within the North Kona and South Kohala Districts also considered the PTA for light industrial and business park uses. However, the realized demand for such lands at Kaloko might be stronger than presented herein due to further potential interest from a broader market base.

This analysis does not consider industrial-uses or industrial-designated lands at military bases, harbors, universities or airports.

Market trends for light industrial warehouse buildings are reflective of the current economic downturn highlighted in the residential and commercial markets. The PTA as a whole reflected a 14% vacancy in total warehouse space as of the end of 2010, according to data provided by Colliers Monroe Friedlander (CMF). This is up significantly from an estimated 8% in 2008. Positive space absorption was however reported to have resumed in 2010.

Considering planned and entitled potential future developments, plus areas in current use, the PTA could have as much as 1,110 gross acres of private business or industrial park lands by 2045, assuming all future projects are developed to their estimated capacities and before 2045.

Due to the proximity of Kaloko Makai's designated light industrial and/or business park land uses to viable commercial centers of development, Kaloko Makai's limited light industrial and/or business park lands are poised as attractive market offerings, and offer considerable market synergy and contributory value to bordering commercial uses.

Supply and Demand

The light industrial lands of the PTA are concentrated in North Kona District, which showed approximately 400 gross acres as of December 2010. This represented 82% of the total PTA supply of 490 acres. The majority of lands are situated along Queen Ka‘ahumanu Highway and adjacent to Kaloko Makai, at Kaloko Industrial Park and Kohanaiki Business Park. Twelve percent of industrial lands remain un-built, according to County tax records, but may be encumbered with ground leases or otherwise in use.

There were about 620 gross acres of land entitled and planned for business park/industrial use in PTA as of December 2010, excluding lands at government-owned and operated facilities such as the Airport and harbors. As in the existing inventory, the largest areas entitled future inventory are also in the immediate vicinity of Kaloko Makai. These lands include West Hawaii Business Park, Kaloko Industrial Park Phase III and IV, and the Department of Hawaiian Home Lands (DHHL) Kalaoa lands.

Considering the potential future developments, plus areas already in use, the PTA could offer some 1,110 gross acres of private business or industrial park lands by 2045, assuming all future projects are developed to their estimated capacity by that date.

Demand for future business park/industrial lands in the PTA can be expected to stem from increases in civilian employment in the area, particularly in business and industrial categories such as energy production, construction, wholesaling and research and development.

Of the 490 gross acres supplied in the PTA in 2010, 440 gross acres are estimated to have been occupied. This would mean that in 2010, there was an excess supply compared to market demand.

The PTA is anticipated to support up to 1,160 gross acres of light industrial/business park lands by 2045, based on the projected rise in civilian employed persons in the PTA. Removing the existing and entitled potential future supply, the area is seen to be able to support an additional 50 to 120 gross acres of light industrial land.

Kaloko Makai Proposal

The Kaloko Makai plan designates 75 acres of light industrial and/or business park land uses in the Special District located at its makai end fronting Queen Ka‘ahumanu Highway.

Approximately 25 acres of these lands have been identified by the State Department of Transportation (DOT) for an eventual highway interchange at the entrance to the Project. Thus, industrial/business activity on those lands will be interim uses and only 50 gross acres (approximately 40 net usable acres after allowing for circulation and infrastructure) are seen as long-term light industrial land uses (see Table 2-5).

Due to the proximity of its designated light industrial or business park land uses to viable commercial centers of development, Kaloko Makai’s limited light industrial/business park lands are poised as attractive market offerings, and offer considerable market synergy and contributory value to bordering commercial uses.

Table 2-5 Projected Demand for Additional Light Industrial and/or Business Park Lands in the Primary Trade Area (gross acres)			
	2016-2025	2026-2035	2036-2045
Net un-entitled demand at end of period*	100	120	50
Additional Supply from Kaloko Makai			
New Development (areas in use during each period)	25	50	50
Less DOT Interchange**	0	-25	0
Net Additional Supply at end of each period	25	25	50
Remaining unmet demand	0	-25	0

* In addition to existing light industrial areas and all entitled and planned areas in the Trade Area.
** Hypothetical timing of DOT interchange land acquisition
Source: Mikiko Corporation, April 2012

2.2.2.4 Lodge and Business Center Market

The Kaloko Makai Lodge and Business Center is proposed to cater to the business and leisure demands generated by other uses in Kaloko Makai and its surrounding area. It is envisioned to offer up to 120-rooms, a business center, and meeting and conference spaces.

Supply and Demand

Due to the small size and non-traditional market orientation of the proposed Lodge and Business Center, this assessment does not rely on a macro supply and demand analysis for the Island or region. Rather, the analysis considers visitor trends in the context of selected comparison hotel properties in Kona that appear to serve visitor markets such as those envisioned for Kaloko Makai.

While the Kaloko Makai Lodge and Business Center may attract first-time and repeat visitors coming to Kona, the focus of its marketing and operations targets visitors drawn to specific uses in the TOD, as well as visitors needing accommodations away from the traditional resort core (Kailua to Keauhou). The Kaloko Makai Lodge and Business Center will be primarily marketed to the following types of visitors:

- Kamaʻaina travelers
- Persons visiting family and friends in Kaloko Makai or neighboring areas
- Families/friends visiting people at the Hospital
- Visiting medical staff involved with the Hospital and Medical Complex
- Professionals and other parties to proceedings at the recently selected Kealakehe Judiciary site
- Airline crews needing accommodations easily accessible to Kona International Airport
- Airline commuters needing accommodations easily accessible to the Airport
- Budget-conscious business and leisure travelers wanting to avoid the core resort areas

- Youth and adult athletic teams wanting affordable accommodations away from resort areas

Focusing solely on hotel properties, Kona showed 2,519 rooms in the Hawaii Tourism Authority's (HTA) 2010 inventory. Approximately 51% of these units are classified as deluxe or luxury units. A few Kona hotels also cater to and attract a fair share of interisland and value-oriented traverlers, particularly those not seeking a resort vacation experience. These hotels offer favorable price points for the traveler who does not need a resort experience and prefers value and convenience.

Based on HTA's 2009 data on out-of-State travelers to Kona, selected statistics of interest to the market segments proposes for the Kaloko Makai Lodge and Business Center are summarized below:

- Kona area hosted 6.8 million visitor-days in 2009, of which 88% were domestic travelers an 12% international.
- The average out-of State traveler party size was 2.1 persons.
- 39% traveled on group, package or group and package arrangements, while 61% were independent travelers.
- 49% stayed in hotels, while 9% stayed with friends or relatives, and 15% in a rental house, B&B or cruise ship.
- Approximately 14% of visitors traveled to conduct business (other than those reporting travel for meetings, conventions and incentive events, referred to at "MCDI"), visit friends and relatives, attend sporting events or other miscellaneous purposes, including those travelling on government, military, or school business.

In context, this "non-pleasure" and "non-MCI"(meetings, conventions and incentives) market could theoretically require some 1,000 accommodation units per day, a good share of which is likely to be with friends and relatives or in other non-traditional or non-commercial accommodations. However, the remainder of this sizeable market patronizes area hotels and other commercial accommodations for their overnight stays, and is representative of the markets being targeted by Kaloko Makai. Inter-island business and other travelers are not counted in the HTA data and represent a significant expansion of this potential market.

Kaloko Makai Proposal

The Kaloko Makai Lodge and Business Center is proposed to cater to the business and leisure demands generated by other uses in Kaloko Makai and its surrounding are. It is envisioned to offer up to 120-rooms, a business center, and meeting and conference spaces. The business center could provide "an office away from home", with a range of services and amenities.

The Kaloko Makai Lodge and Business Center concept is to focus on local, business and other market sources that seek convenient access and value-based rates over resort and recreational facilities.

2.2.2.5 Kona Community Development Plan

The County of Hawaiʻi General Plan section 15.1 (February 2005, as amended) calls for the preparation of community development plans "to translate the broad General Plan statements to specific actions as they apply to specific geographical areas." The General Plan requires CDPs be

adopted as an "ordinance", giving the plans force of law. The CDPs are long-term plans with a planning horizon to the year 2020, consistent with the General Plan.

The Hawai'i County Planning Department recognized that only with broad public input can the Kona residents take ownership of the Kona Community Development Plan (CDP,) by which they may embrace the vision and commit to a better future. Initiated in September 2005, this plan is the result of an extensive public process. Community outreach included public meetings, more than 100 small group meetings, workshop, charrettes, working group meetings and steering committee meetings.

The Kona CDP was adopted by County Council via ordinance in September 2008. The purposes of the Kona CDP are:

- Articulate Kona's residents' vision for the planning area;
- Guide regional development in accordance with that vision, accommodating future growth while preserving valued assets;
- Provide a feasible infrastructure financing plan to improve existing deficiencies and proactively support the needs of future growth;
- Direct growth to appropriate areas;
- Create a plan of action where government and the people work in partnership to improve the quality of life in Kona for those who live, work, and visit;
- Provide a framework for monitoring the progress and effectiveness of the plan and to make changes and update it, if necessary.

The Kona CDP recognizes that the General Plan Land Use Pattern Allocation Guide's (LUPAG) Urban Area is larger than needed in order to accommodate the projected growth within the planning horizon, so it emphasizes that future growth within the urban area is encouraged in a pattern of compact villages at densities that support public transit.

Transit-Oriented Developments (TODs) and Traditional Neighborhood Developments (TNDs) are identified as the planning tool to manage this anticipated growth within the defined "Kona Urban Area." The Kona CDP defines these as compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4-mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2-mile).

The distinction between a TOD and TND is that the approximate location of a TOD is currently designated on the Official Kona Land Use Map along the trunk or secondary transit route and contains a transit station, while TND locations have not been designated and may be located off of the trunk or secondary transit route at a location approved by a rezoning action.

TODs integrates housing, employment, shopping and recreation opportunities. Villages would be designed around transit stations/stops which would reduce the need for daily trips and financially support the expanded transit system. TOD Urban Villages are located a minimum of one mile apart, between major transit stations, along Keohokālole Highway trunk route in order to preserve the transit efficiency of this route.

Transect Zones (T-Zones) organize the density, complexity and intensity of the land use within the TOD Village. The operating principle is that there is an urban core with a main center focus such as a transit station and plaza. This urban core area, which is spatially defined based on walkable distances called Pedestrian Sheds, has the highest density, complexity, and intensity of uses. The land uses transition to less dense uses moving away from the center.

The Kaloko Makai project was conceived, planned and designed to be consistent with the Hawaiʻi County *General Plan*, the *Keāhole to Kailua Development Plan* (K-to-K Plan) and the *Kona CDP.* Kaloko Makai is situated in the Kona Urban Area of the Kona CDP and Urban Expansion Area in the General Plan and serves to implement these planning documents.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities, to include a potential urgent care medical facility, together with land available (at no cost) for a new Kona regional hospital.

Kaloko Makai has been designated as a Neighborhood Transit Oriented Development (TOD) in the Official Kona Land Use Map of the *Kona CDP*.

Kaloko Makai supports many of the Guiding Principles of the Kona CDP. Further discussion on how Kaloko Makai supports the Kona CDP's Guiding Principles is included in Section 5.2.3.1.

Kaloko Makai is situated in a region that is rapidly developing, with immediate access to Kona International Airport and is adjacent to the well established commercial and light industrial-service centers of North Kona and Kailua Kona which serve the needs of the visitor, agriculture, ranching, and technology industries, among others, which populate the western half of the island.

The Kona CDP notes (among other incentives described in the Kona CDP and is associated documents) the following incentives, as described in the calibrated Village Design Guidelines, a part of the Kona CDP):

- Expedited Review. Within ninety (90) days after a project district application has been accepted by the Planning Director, the Director shall forward the application to the Planning Commission.
- Environmental Review Concurrent Processing. The Planning Director shall enable and allow the Applicant to concurrently process the environmental document according to the procedures of HRS Chapter 343.
- State Land Use Boundary Amendment Concurrent Processing. If a State Land Use District Boundary Amendment is necessary, the Planning Director may accept the application, review the application to determine consistency with the decision criteria, suspend the processing of the Project District until a decision is made by the State Land Use Commission and express the County's support of the application before the State Land Use Commission as consistent with the County of Hawai'i CDP and County of Hawai'i General Plan. The

Project District process may then immediately resume upon favorable approval by the State Land Use Commission.

- Village Design Zones and Rebuttable Presumption. The Planning Director, Planning Commission and County Council shall review a Village Design Zone Project District application with a rebuttable presumption that the project furthers the Purpose of Chapter 25 Zoning Code and is consistent with the goals, objectives, and policies of the County General Plan and County of Hawai'i CDP, provided that the proposed location is generally consistent with the Official County of Hawai'i Land Use Map and the master plan consistent with the Village Design Zone.

In addition, Policy LU-2.6: TOD/TND Public Infrastructure and Facilities, states: "To encourage the development of TODs and TNDs, public financing sources shall pay 100% for:

- Major proposed trunk transit route,
- A transit station (or transit station component if the transit station is part of a private mixed-use project) within the Urban Core ,
- A major park or plaza within the urban core.

Likewise, the Kona CDP states: "Public Financing of Infrastructure. In recognition of the regional benefits of major roads and transit stations, these types of improvements within TODs shall be funded with general revenue funding sources." (Kona CDP, Page 4-34).

The Planning Director, Planning Commission and County Council shall review the TOD application with a rebuttable presumption that the project furthers the intent of Chapter 25 Zoning Code and is consistent with the goals, objectives, and policies of the County General Plan and Kona CDP, provided that the proposed location is generally consistent with the Official Kona Land Use Map and the master plan consistent with the Village Design Guidelines.

2.3 KALOKO MAKAI DESCRIPTION

Kaloko Makai will consist an approximately 1,139 acre master planned, mixed-use community village that integrates diverse housing offerings, mixed-use commercial and retail growth and employment opportunities, and a range of community services and facilities (inclusive of medical, lodging, and civic uses as well as recreational opportunities). Kaloko Makai is planned to have approximately 5,000-single and multi-family units, up to 600,000 square feet of gross leasable area for commercial (office and retail) uses, a 120-room Lodge and Business Center, 75-acres of light industrial uses, three public school sites and a 150-acre Dryland Forest Preserve, with additional park and open space uses. Kaloko Makai will also provide 40-acres of land to be used for the development of a regional hospital. However, if the land is not used for a regional hospital Kaloko Makai will remain as a Neighborhood TOD and still have 5,000 housing units and 600,000 sq. ft. for commercial use (see Chapter 7 for further discussion).

The residential units (single-family and multi-family) will be offered at a range of densities, types and affordability. The project include centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), urgent care medical facility, two Elementary Schools, a

Middle School and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems) (see Figure 2-11). Affordable housing will be provided on-site in accordance with County of Hawaiʻi requirements.

Kaloko Makai has been designated as a Neighborhood TOD in the Official Kona Land Use Map of the *Kona CDP*, as shown in Figure 2-9. The Kaloko Makai project was conceived, planned and designed to be consistent with the Hawaiʻi County *General Plan*, the *K-to-K Plan* and the *Kona CDP.*

2.3.1 Key Components within Kaloko Makai

The site is approximately 1,139-acres, extending mauka from Queen Kaʻahumanu Highway. The Queen Kaʻahumanu portion is located just north of the existing Kaloko Industrial Park. Hina Lani Street forms the southern (Kailua-side) border of the lower part of the property, and the upper part includes land on both sides of Hina Lani Street. Table 2-6 illustrates the proposed Conceptual Land Use Plan in three phases (proposed land use categories and acreages) (see Figures 2-12 – 2-14).

Residential components in Kaloko Makai follow a mixed-use, compact development theme and are responding to the need for a broad spectrum of affordability in housing, with a wide range of housing alternatives in transit efficient and pedestrian-oriented, neighborhoods.

2.3.1.1 New West Hawaiʻi Regional Acute Care Hospital/Medical Center at Kaloko Makai

The *Kona CDP* as well as residents interviewed for the Social Impact Assessment prepared for this Second Draft EIS (Appendix O) identified the need for a new, centrally-located acute care hospital in North Kona. The *Kona CDP* states that the new hospital should be located on Keohokālole Highway (Mid-Level Road) for optimum accessibility by automobile or transit.

Given the level of existing development in the Kona region and the proposed growth called for in the Kona CDP, the appropriate location is in the growing region between Kailua-Kona and the Kona Airport.

Kaloko Makai is strategically located to incorporate the new hospital into its master plan and is actively pursuing a hospital developer/operator for the new facility. The Kaloko Makai development seeks to have a hospital developed within the project on a 40-acre site along Ane Keohokālole Highway. The site will also have access to Queen Kaʻahumanu Highway via Hina Lani Street and interconnecting roads (possibly also through adjoining Kohanaiki Business Park).

In the event a hospital developer and operator is not arranged for the 40-acre site noted in the project site plan, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). The means there will be a slight reduction in densities in some of the existing residential and commercial properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Whether a hospital developer/operator comes forward or not, the Kaloko Makai TOD will remain as a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the

"neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included then some of the proposed space will address regional medical needs, as well as other commercial

Table 2-6
Estimated Allocation by Land Use Type and Phase

Land Use Type	Estimated Area (Acres)	Units	Retail/Commercial (SF)
Phase 1			
Urban Center (T5, high density)	92.9	1,153	395,000
General Urban (T4, med. density)	55.9	504	35,000
Sub-Urban (T3, low density)	19	95	--
Schools	18	--	--
Lodge and Business Center	5	--	--
Natural Zone (Open Space, Landscape Buffers)	21.9	--	--
Parks	35	--	--
Wastewater Treatment Plant	21	--	--
Special District	25	--	--
Hospital	40	--	--
Roadways	45	--	--
Dryland Forest	150	--	--
Phase 1 Total	523.7	1,752	430,000 SF
Phase 2			
Urban Center (T5, high density)	58.6	917	80,000
General Urban (T4, med. density)	95.2	802	50,000
Sub-Urban (T3, low density)	38.4	231	--
Schools	12	--	--
Special District	25	--	--
Natural Zone (Open Space, Landscape Buffers)	16.1	--	--
Parks	10	--	--
Roadways	27.2		
Phase 2 Total	282.5	1,950	130,000 SF
Phase 3			
Urban Center (T5, high density)	0	0	
General Urban (T4, med. density)	59.8	638	40,000
Sub-Urban (T3, low density)	143.8	660	--
Infrastructure Facilities (Desalinization Plant, Fire Station, Water Tanks)	9.2	--	--
Schools	12	--	--
Natural Zone (Open Space, Landscape Buffers)	48.8	--	--
Parks	11.2	--	--
Special District	25	--	--
Roadways	23	--	--
Phase 3 Total	332.8	1,298	40,000 SF
Total	1,139	5,000	600,000 SF

This page intentionally left blank.

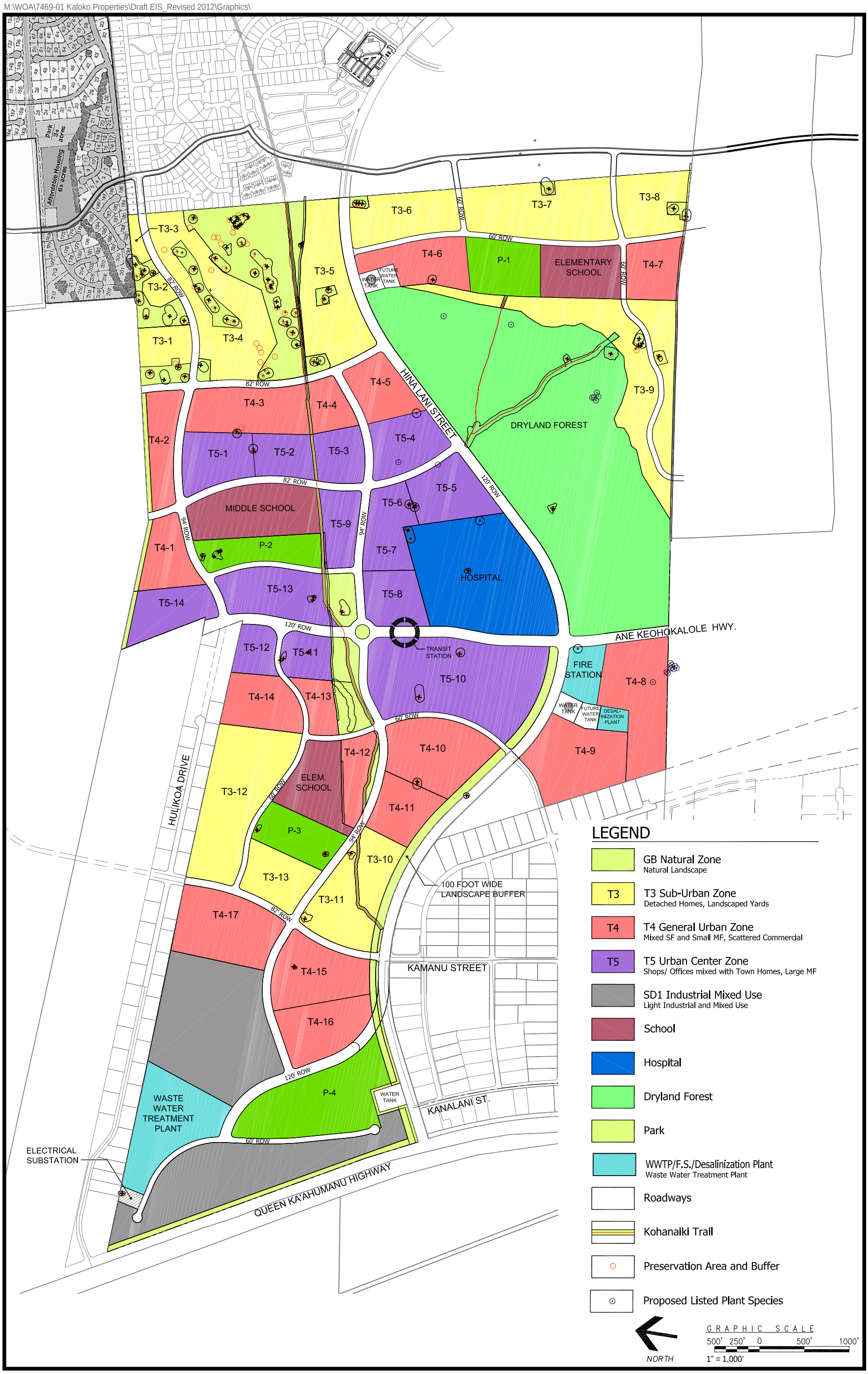


FIGURE 2-11

Kaloko Makai Overall Land Use Plan

Kaloko Makai

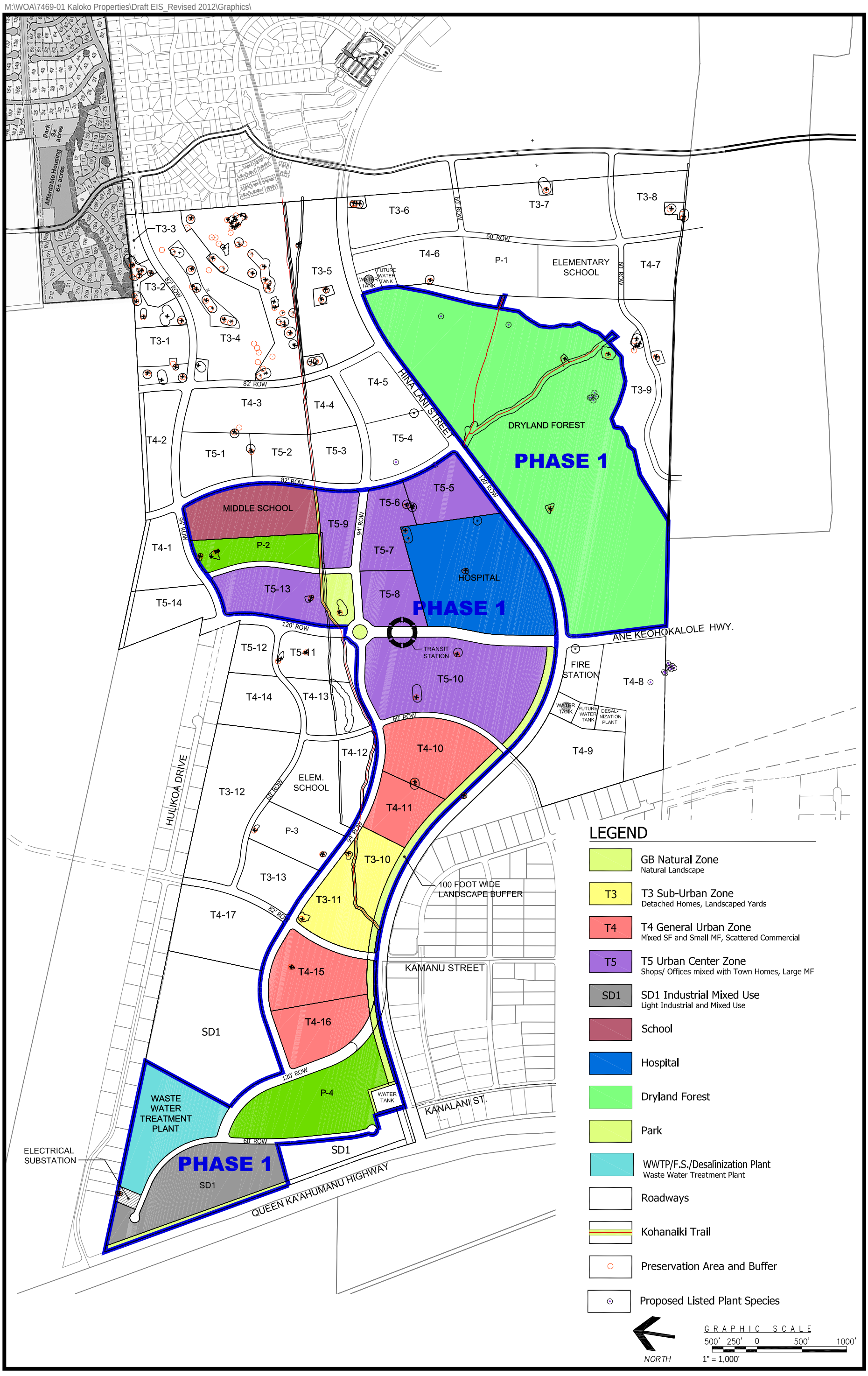


FIGURE 2-12

Kaloko Makai Land Use Plan Phase 1

Kaloko Makai

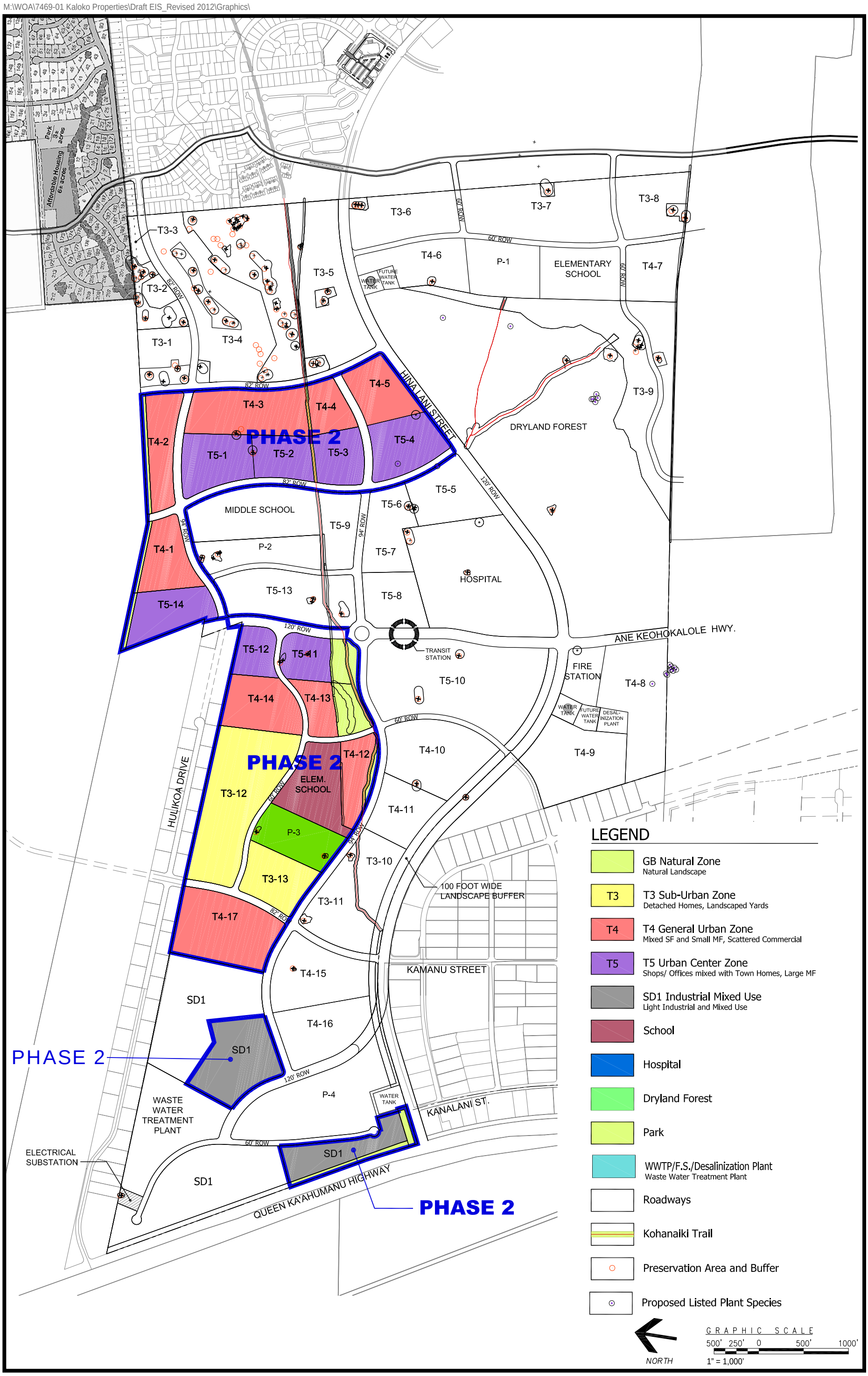


FIGURE 2-13
Kaloko Makai Land Use Plan Phase 2
Kaloko Makai

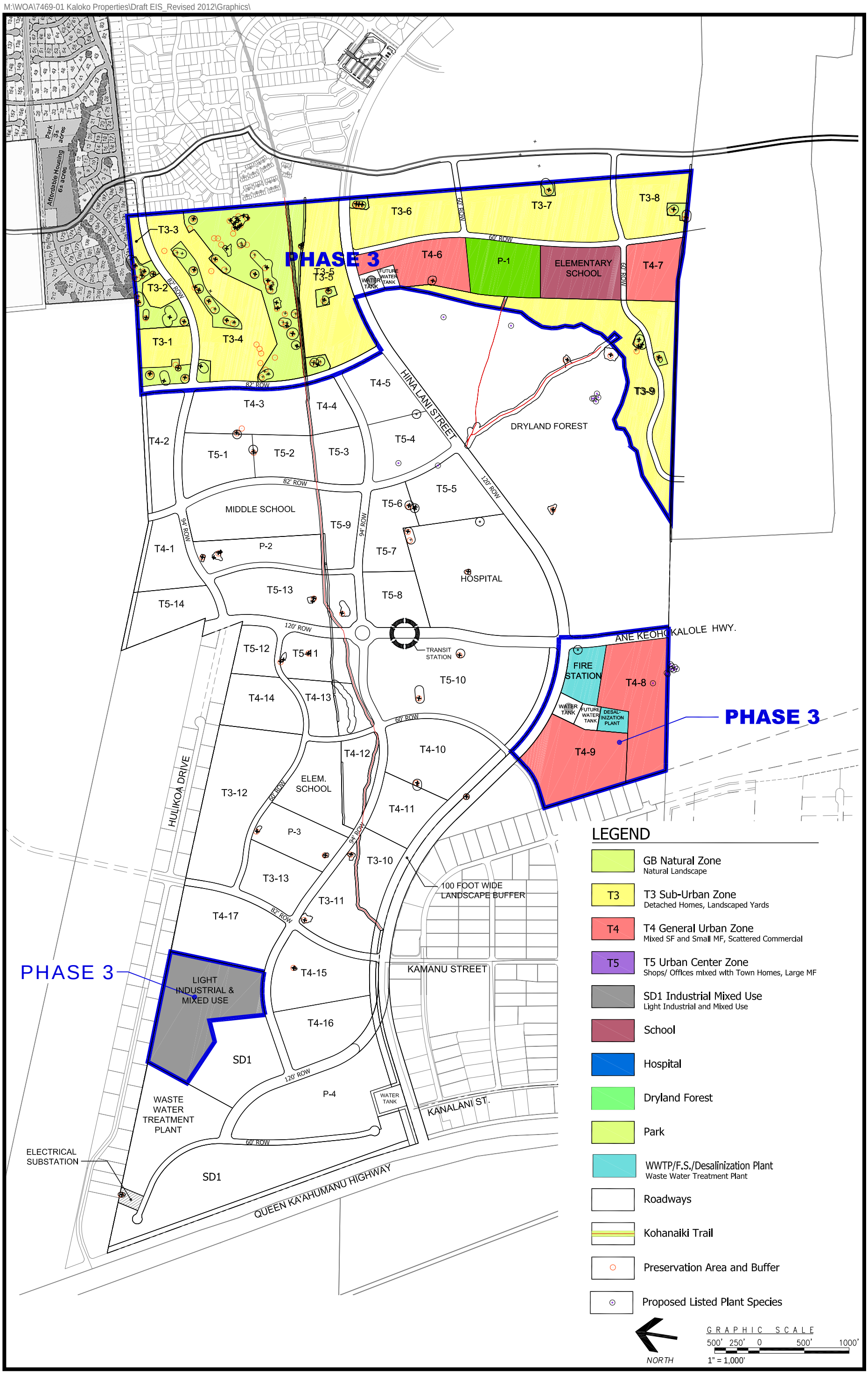


FIGURE 2-14
Kaloko Makai Land Use Plan Phase 3
Kaloko Makai

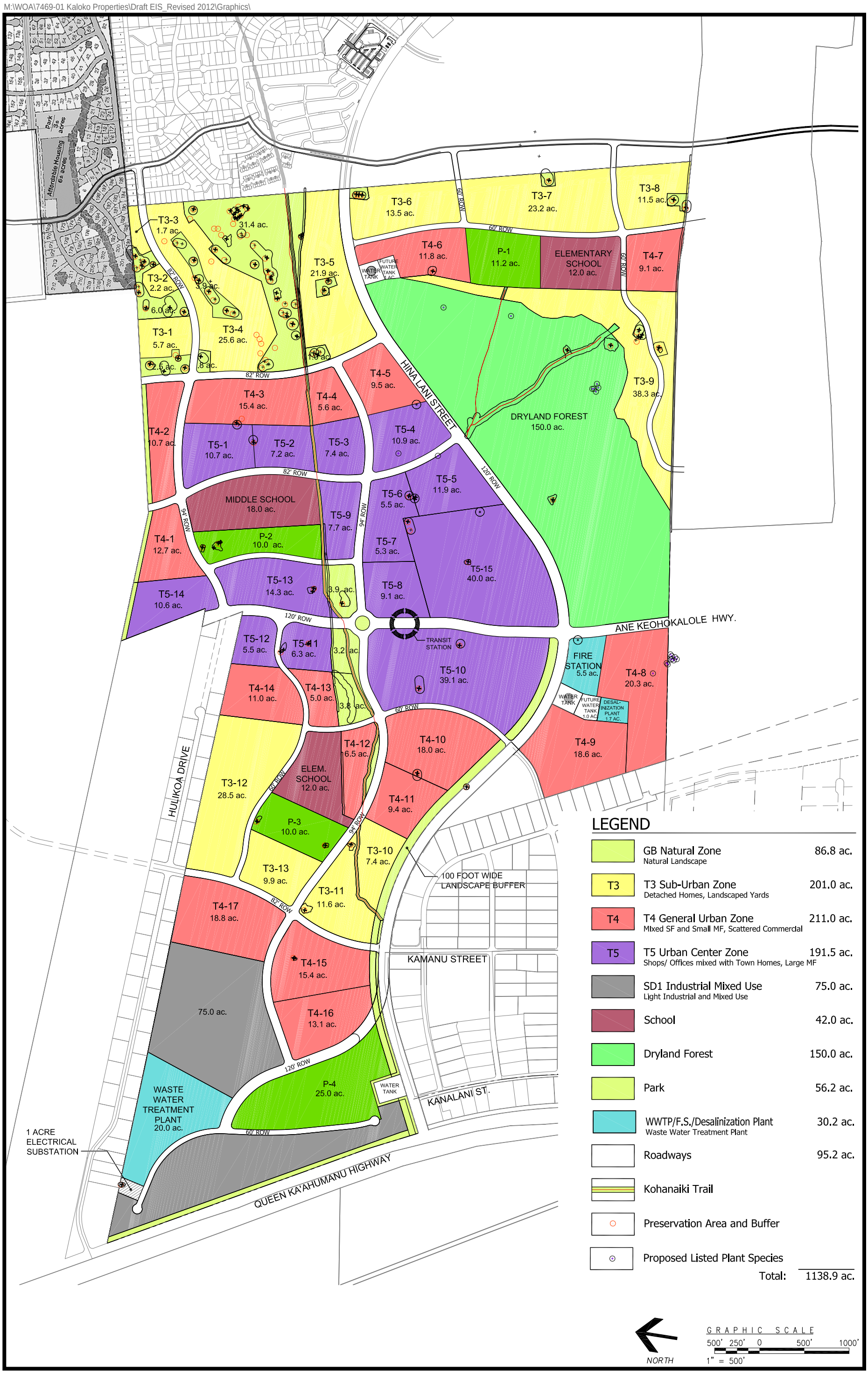


FIGURE 2-15

Kaloko Makai Overall Land Use Plan Without Hospital

Kaloko Makai

demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

A new regional hospital for Kona is projected to need approximately 100-150 total beds (with 150 targeted - which will include between 50-70 beds for medical surgery) to serve the growing West Hawaiʻi population.

The urban core area of Kaloko Makai will be support medical facilities (i.e. doctors' offices and other medical support), as well as offices, commercial, retail, mixed-use and residential to service the immediate and surrounding community. These uses are consistent with and implement the recently adopted Kona CDP.

As previously mentioned, Kaloko Makai will set aside approximately 40-acres of land, which Kaloko Makai is prepared to transfer at no cost to a hospital developer/operator. This proposal does not suggest Kaloko Makai will construct, pay for and operate a full hospital facility. Cost of construction of a new hospital is approximately $2.5- to $3-million per bed (construction and equipment); so, the estimated overall cost for a new regional hospital is approximately $300- to $500-million.

The new hospital construction at Kaloko Makai will very likely be done in phases with the possibility of developing an urgent care/out-patient emergency center first, then phasing, over time, into a full hospital/medical center facility with associated medical services, including long-term care. Ultimate build-out and operation of a hospital will likely involve a public-private partnership.

Phase-in to Hospital/Medical Center Facility

It is expected that a hospital developer/operator will initiate and pay for the planning and certificate of need permitting process for the new hospital. This planning and permitting is expected to take approximately 2 to 5-years, at a cost of approximately $10-$20-million.

Initial Clinic and Urgent Care Facility

Initially, within the first phase of the Kaloko Makai project, Kaloko Makai will seek to incorporate a physicians' clinic and "urgent care" facility with diagnostics, possibly CT Scan and X-ray, and a mini-lab. While Kaloko Makai will set aside approximately 40-acres of land for the facility, it will be constructed and operated by others.

The goal is to incorporate a Clinic and Urgent Care facility, with approximately 8,000 to 10,000-square feet, allowing for approximately 5,000-square feet for the urgent care needs and additional 1,000-square feet per doctor in the clinic. The overall cost is estimated to be approximately $8- to $10-million. This stand-alone facility will serve as the initial medical service facility for the project and can provide services to the growing community as the permitting and construction go on for the larger acute care hospital/medical center.

Kaloko Makai will seek initial medical services that will include Family Practice, Pediatricians and Primary Care, in addition to out-patient emergency and surgical services. The facility will likely be

associated with a physician group clinic such as the Ali`i Health physicians group or other similar type of association of physicians.

Based on the anticipated population within the Kaloko Makai project (approximately 12,000 to 15,000-people,) the initial clinic will need about 2-3 family physicians but will be flexible in design to grow as the need increases. As the surrounding project grows and neighboring developments come on-line, additional doctors and services could be added.

Potential Hospital Developers

Several entities have been pursued to develop the hospital facility. Possible developers could include Hawaii Health Systems Corporation (HHSC,) Hawaii Pacific Health (Straub), Queens Health Systems, Kaiser Permanente, Adventist Health (Castle Medical Center,) Kuakini Health System, Quorum Health Resources (North Hawaii Community Hospital), etc.

Since the existing hospital in Kona (Kona Community Hospital) is under the direction and control of HHSC, Kaloko Makai representatives have been in regular discussions with management of that facility and leadership within HHSC. Kaloko Makai initiated discussion with HHSC because development and operation of a new hospital will affect the Kona Community Hospital. The intent is to work with HHSC and Kona Community Hospital in a collaborative, rather than competitive, approach for the new Hospital. Kaloko Makai will continue dialog with Kona Community Hospital and HHSC leadership and others on the future planning for the new regional hospital/medical center at Kaloko Makai.

Part of these discussions led to a May 23, 2011 letter from Stanford Carr to Bruce Anderson, President and CEO of HHSC where land was offered to HHSC for a new hospital. In part, the letter states, "This letter is to confirm that SCD - TSA Kaloko Makai LLC is willing to convey to the State, HHSC or other appropriate entity, at no cost, 40-acres of land within the Kaloko Makai project for a new regional acute care Hospital."

The letter from Stanford Carr to Bruce Anderson, offering the land to HHSC, goes on to state:

> "As noted in the recently adopted Kona Community Development Plan (Kona CDP,) Kona needs a new hospital to replace its existing outdated and out-of-place facility. The Kona CDP states that the new hospital should be located on the Ane Keohokālole Highway (mid-level road) for optimum accessibility by automobile or transit in this future growth area."
>
> "Given Kaloko Makai's placement on Ane Keohokālole (the region's primary trunk transit corridor,) designation as a Transit Oriented Development (TOD) in the Kona CDP (with a rebuttable presumption of land use conformity,) available land for Hospital use, as well as available surrounding land that is planned for commercial office and related uses that can support a Hospital medical complex, the Kaloko Makai site is an excellent choice for a new Kona acute care Hospital."
>
> "As was discussed with our representatives, the Kaloko Makai project layout positions the Hospital complex on Ane Keohokālole Highway. In addition, our proposed layout surrounds

> this site with supporting commercial uses. We have discussed these uses with the Hawai'i County Planning Department and others within the Kona Design Center and have received favorable comments regarding our project layout and proposed uses."

In response to this letter, HHSC CEO Bruce Anderson stated in a July 20, 2011 letter to Stanford Carr:

> "On behalf of the Hawai'i Health Systems Corporation Board of Directors, I want to express our appreciation and assure you that we are taking your offer seriously and are excited about the prospect of a future new facility at Kaloko Makai."
>
> "The need for a new facility is recognized in the West Hawai'i Region HHSC Strategic plan. The suggested start date for planning such a facility in this plan is 2012. The proposed site is also consistent with the Kona Community Development Plan. Therefore, pursuant to your offer, the HHSC West Hawaii Regional System Board has directed its Strategic Planning Committee to evaluate your offer and the proposed site for a new hospital."
>
> "We agree with you that a new regional hospital at Kaloko Makai would likely replace some of the services that are presently provided at Kona Community Hospital. It is envisioned that the existing facility will remain open, transitioning from providing mostly acute care to long-term care, as well as providing other medical services to the South Kona community."
>
> "We appreciate the time your staff has given us in describing the project and the proposed hospital site and we look forward to continued discussions on this exciting opportunity."

Kaloko Makai representatives have met with and presented information on the Kaloko Makai project to the HHSC West Hawai'i Regional Board and the West Hawai'i Regional Board Strategic Planning Committee. Those discussions are on-going.

During the Draft EIS process, Kona Community Hospital, HHSC submitted a letter, dated September 6, 2011, determining a hospital within the Kaloko Makai development is appropriate. In addition, in that letter, Kona Community Hospital, HHSC stated, "Relative to this, please use this letter as confirmation of our request to relocate the hospital site within the Kaloko Makai project to the north-mauka corner of the Hina Lani Street/Ane Keohokālole Highway intersection. We believe this is the appropriate location for the hospital and we are hopeful that it does not complicate nor negatively impact the project planning for Kaloko Makai." (see Appendix S).

Per the request, Kaloko Makai adjusted its site plan to accommodate the request by Kona Community Hospital, HHSC and moved the hospital location to the north-mauka corner. Kaloko Makai will continue dialog with Kona Community Hospital and HHSC leadership and others on the future planning for the new regional hospital/medical center at Kaloko Makai.

2.3.1.2 Lodge and Business Center

The 120-unit Lodge and Business center will encompass approximately 5-acres of land. The Lodge and Business Center will be located at the TOD village core and cater to the business market. It's

location within the core provides convenient walking access to the uses and activities, including the transit station.

The Kaloko Makai Lodge and Business Center will provide accommodations, restaurant services and business services in conjunction with the general business/leisure demands generated by the uses in the Kaloko Makai TOD and the surrounding community. In addition, families and friends of patients, as well as visiting physicians and others associated with the Hospital, will have easy and convenient access to lodging near the Hospital. This can include out-of-town visitors, as well as local residents who want to be immediately near their loved ones in the hospital.

Likewise, the recently selected Kealakehe Judiciary site will periodically draw attorneys, parties to cases, friends and family, and others associated with the activities of the Judiciary Complex who do not live in the immediate vicinity of the complex. Whether the hospital is located in Kaloko Makai project area or not, hospital uses are anticipated in the region and the Kaloko Makai Lodge and Business Center will serve its needs.

The Business Center could provide "an office away from home", with a range of services and amenities such as:

- Conference or meeting rooms
- Copying, scanning and digital printing services
- High-speed internet and Wi-Fi services
- Equipment rentals
- Videoconferencing
- Courier delivery services; full range of ground and express shipping service
- Notary service

With the higher density and extensive commercial uses in the Kaloko Makai TOD, the Lodge and Business Center will serve the immediate and surrounding business and leisure needs.

2.3.1.3 Commercial

Kaloko Makai proposes up to 600,000 square feet of gross leasable area of various commercial uses at Kaloko Makai, including retail and office. This will include spaces in shopping centers, retail and office uses, and mixed-use developments. The first finished commercial building products are assumed to be available for use within 10 years of approved SLUBA.

2.3.1.4 Light Industrial

The Kaloko Makai plan designates 75 acres of light industrial and/or business park land uses in the Special District located at its makai end fronting Queen Ka'ahumanu Highway.

Approximately 25 acres of these lands have been identified by the State Department of Transportation (DOT) for an eventual highway interchange at the entrance to the Project. Thus, industrial/business activity on those lands will be interim uses and only 50 gross acres

(approximately 40 net usable acres after allowing for circulation and infrastructure) are seen as long-term light industrial land uses.

2.3.1.5 Schools

Kaloko Makai is setting aside approximately 42 acres for two elementary schools and one middle school, (typical school playgrounds are included in the school sites). In addition to the school sites, the project includes approximately 10-acres of additional recreational space adjoining each of the Kaloko Makai School sites. This additional area will be available for civic, community recreation, meeting and other uses.

2.3.1.6 Parks and Open Space/Buffers

Approximately 56 acres of park space is planned, including the 30-acres of park space adjoining each of the Kaloko Makai school sites and a 25-acre park.

In addition to park space, there will be approximately 86 acres of natural zones (open space and landscape buffers) consisting of the preservation of the Kohanaiki Trail (Road to the Sea) with 10 foot buffers on either side of the alignment, Green Belt along a portion of Hina Lani Street, Queen Kaʻahumanu Highway, and portion of northern boundary of project site. Other significant archaeological features are found in the northwest section of the property. In order to preserve and protect these features, the area will be left as open space, with pockets of low-density residential interspersed in the area. Buffers will also be established for archaeological sites, burials and endangered plants.

2.3.1.7 Kaloko Dryland Forest

The Kaloko region is home to one of the largest remaining areas of Dryland Forest in the Hawaiian Islands. The Kaloko Dryland Forest is unique in that it has not been heavily impacted by ungulates, and therefore, has minimal impact from alien plant species. The Dryland Forest crosses over several ownership boundaries) of an `a`ā lava flow that is much younger than the surrounding pāhoehoe flow.

As part of the project proposal, 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

2.3.1.8 Kohanaiki Trail

Kohanaiki Trail ("Road to the Sea" Trail) is a long mauka/makai running trail originating in the Kohanaiki Homesteads. Generally, the trail parallels the nearby Kaloko/Kohanaiki ahupuaʻa wall, on the Kohanaiki side.

The trail entirely traverses pāhoehoe and is generally well defined throughout the eastern portion of the parcel, except near the makai parcel boundary where extensive bulldozing and grading has nearly destroyed the ahupuaʻa wall and eliminated any definitive sign of the trail.

The trail is very consistent with the route identified on Emerson's mapping in 1888 and 1889. The present archaeological review for the Kaloko Makai project suggests that the specific route shown on an earlier map, Emerson's RM 1280, is highly schematic. Cultural Surveys prepared a sketch of a hypothesis of the alignment of the Kohanaiki Trail informed by the archaeology observed by them on the ground, a detailed consideration of historic maps (including Emerson) and archaeological data created by others (Donham (1986), Renger (1971), and Cordy et. al (1991)) makai of the Queen Kaʻahumanu Highway (and in consideration of modern aerial photographs).

Where the Trail intersects with Hina Lani Drive, Kaloko Makai will realign the remaining lower portion of the Trail from that point to run parallel with and adjoining the Hina Lani Street right-of-way down to Queen Kaʻahumanu Highway. Since the integrity of the historic trail is lost at that point due to the prior construction for Hina Lani, the adjoining industrial subdivision and the water tank, Kaloko Makai will realign the trail and have it run down the southern boundary of the property (fronting Hina Lani,) from the point of intersection with Hina Lani down to Queen Kaʻahumanu Highway. This alignment gives the users of the trail easy access to cross Queen Kaʻahumanu or Hina Lani at the bottom, as there are crosswalks with crossing signals at that point.

Kaloko Makai will incorporate the Kohanaiki Trail as an integral component of the project. The trail and buffers will be approximately 30-feet wide. Kaloko Makai will also incorporate two trails that run through the Dryland Forest.

2.3.1.9 Core Infrastructure

The following will address the core infrastructure components in the Kaloko Makai project, the Circulation and Roadways, Potable Water and Wastewater Treatment.

2.3.1.9.1 Circulation and Roadways

Kaloko Makai will incorporate a system of interconnected roads that will provide residents alternative transportation routes within the project. The internal circulation pattern will provide safe and convenient choices for drivers, bicyclists and pedestrians. Neighborhoods will be interconnected to popular destinations and neighborhood cores (such as the transit station, hospital, shopping, schools and parks,) as well as the surrounding secondary areas. There will be several interconnections with neighboring properties.

Queen Kaʻahumanu, which runs parallel to the coast, is the main arterial roadway between North Kona and South Kohala. The highway is a two-lane, two-way highway with shoulders. The existing highway right-of-way ranges from 80-feet (from Palani Road to the Honokōhau Boat Harbor) to 300-feet (from the Harbor to Kona International Airport).

Present improvement projects are expanding Queen Kaʻahumanu to a four-lane divided highway from Honokōhau Harbor north to the Kona International Airport. Very long-range DOT plans note that Queen Kaʻahumanu could be expanded to 6 or more lanes and revert back to limited access status. In those long-range plans, the present signalized intersection at Hina Lani Street is proposed

to be realigned as a grade separated interchange (no specific plans or budgets are in place, or anticipated in the foreseeable future for this subsequent expansion on the highway).

Kaloko Makai does not propose any additional intersection with Queen Kaʻahumanu Highway. Internal road systems in the makai portion of the Kaloko Makai project are aligned to accommodate interchange and frontage road requirements for the future expansion of Queen Kaʻahumanu Highway. This area will have interim industrial uses. If and when DOT requires the land for the interchange, arrangements can be made for transfer of the land at that time.

Mauka-makai roads through the project will connect to Kaloko Heights and allow for alternative travel over the existing Hina Lani Street. A new mauka-makai corridor will bisect the Kaloko Makai project and intersect with Ane Keohokālole Highway. A transit station will be constructed near this intersection, allowing for easy and convenience access to the transit station from throughout the project.

Ane Keohokālole Highway has been constructed from Palani Road to Hina Lani Street and serves as a north-south highway through the Kona Urban Area. It will be the primary trunk transit route for multi-modal transportation for future regional development in this region of North Kona.

As part of the Project, Ane Keohokālole Highway will be extended from Hina Lani Street to Hulikoa Drive. A full signalized intersection is also proposed at the Ane Keohokālole Highway and Hina Lani intersection.

As noted in the Kona CDP (Policy LU-2.6: TOD/TND Public Infrastructure and Facilities) to encourage the development of TODs and TNDs, public financing sources shall pay 100% for major proposed trunk transit route and a transit station (or transit station component if the transit station is part of a private mixed-use project) within the Urban Core. Likewise, the Kona CDP states: “In recognition of the regional benefits of major roads and transit stations, these types of improvements within TODs shall be funded with general revenue funding sources” (Kona CDP, Page 4-34).

Presently there is no interconnection available to Hulikoa Drive; however, an access easement to service a water tank at the top of the road/subdivision may ultimately be widened and dedicated to accommodate a full intersection and access for Hulikoa Street and Ane Keohokālole Highway.

Kaloko Makai will work with the County and adjoining landowner and developer of the Kohanaiki Business park to seek and implement an interconnection of Ane Keohokālole Highway with Hulikoa Street.

Kamanu Street serves the Kaloko Industrial Park Phases I – IV across the street from Kaloko Makai. Several area planning documents (K-to-K Plan and Kona CDP) call for "Main Street" in this area, with an extension of the existing Kamanu Street (to be renamed Main Street) through Kaloko Makai and its adjoining properties as it heads north.

Pursuant to zoning change ordinance (Ord. 02-114), TSA, owner of Kaloko Industrial Park Phases III and IV of the expanding Kaloko Industrial Park, implemented intersection improvements at Kamanu

Street and Hina Lani Street, including a dedicated left turn deceleration, storage and refuge lane on Hina Lani and a dedicated northbound median left turn lane on Kamanu Street.

Kaloko Makai will extend Kamanu Street ("Main Street") from Hina Lani Street to Hulikoa Drive. This extension will provide connection to future projects north of Kaloko Makai. Kamanu Street will be an 82-foot right-of-way with two-lanes in two-directions.

Other roadway improvements near or adjacent to Kaloko Makai are proposed as part of other projects and are further discussed in Chapter 4.

Kaloko Makai proposes several other intersections with Hina Lani Street: two additional intersections are proposed makai of the Ane Keohokālole Highway and three intersections are proposed mauka of Ane Keohokālole Highway.

In addition to the full intersection at Hina Lani Street and Kamanu Street, Kaloko Makai proposes a proposed "T" intersection that primarily serves the Makai Elementary School and adjacent park. This intersection is not proposed to be signalized at this time; however, mauka-bound traffic making a turn into Kaloko Makai will have an exclusive left turn lane on Hina Lani Street. Makai-bound traffic making a right turn into the TOD will have an exclusive right turn deceleration lane. As this is an unsignalized intersection, with no protected left turn signal phasing, mauka-bound vehicles turning left from Hina Lani Street into Kaloko Makai must yield to the oncoming traffic and wait for a suitable gap to complete the left turn maneuver safely.

Above Ane Keohokālole Highway, there are two similar "T" intersections with Hina Lani Street, one primarily serves the Middle School and adjacent park, and the other serves as an alternate route into and around the TOD. These intersections are not proposed to be signalized at this time; however, mauka-bound traffic making a turn into Kaloko Makai will have an exclusive left turn lane on Hina Lani Street. Makai-bound traffic making a right turn into the TOD will have an exclusive right turn deceleration lane. As these are unsignalized intersections, with no protected left turn signal phasing, mauka-bound vehicles turning left from Hina Lani Street into Kaloko Makai must yield to the oncoming traffic and wait for a suitable gap to complete the left turn maneuver safely.

There is a slight difference for the intersection that primarily serves the Middle School. The intersection with Hina Lani Street will be in the immediate vicinity of the two trails that cross the Dryland Forest, leading to the Mauka Elementary School/Park TND. A pedestrian cross signal and cross walk are proposed at this intersection for safer, easier crossing by pedestrians who are traveling between the Kaloko Makai TOD and TND. In the event a mauka-bound automobile is waiting in the exclusive left turn lane at the time of the signal allowing pedestrians to cross, it will be able to take advantage of the stopped makai-bound traffic and make the left turn at that time.

A final proposed intersection on Hina Lani Street is in the vicinity of the mauka water tank site. This intersection serves to link the Mauka Elementary School and adjacent park with the rest of the project. This intersection may be signalized. If signalized, this intersection will give others going to/from the TOD an alternative signalized intersection and will have exclusive left turning lanes for makai-bound traffic.

2.3.1.9.2 Drinking Water

Drinking water use for Kaloko Makai will be limited to consumption, general household and commercial use and irrigation of landscaping within individual lots. The drinking water demand for Kaloko Makai at full build-out is estimated to be approximately 2.18-mgd (average daily demand) and 3.28-mgd (maximum daily demand.)

As an overarching philosophy in all source alternatives, Kaloko Makai is committed to water conservation strategies to reduce consumption, conserve resources and minimize water use. The goal is to reduce the total water use through a combination of water saving equipment and strategies.

Per the Kona CDP, Policy PUB–4.1: Water for TODs - "To encourage and direct development to the TODs, a priority shall be to provide an appropriately sized water transmission line within the Keohokālole Highway Corridor, and to flexibly enable water allocation policies to support the Kona CDP land use policy to concentrate growth within the TODs, in lieu of sprawl."

The Kona CDP's action policies (Action PUB–4.1a and PUB–4.1b) call for updates to DWS's master plan for Kona and DWS's Rules to support future growth in the TODs and to support the Kona CDP land use policies.

Potable water supply alternatives have been developed specifically to eliminate any impact on the basal groundwater that flows beneath Kaloko-Honokōhau National Park (KAHO) and discharges along the shoreline. These include:

1. Alternative 1: On-site Wells at 710-foot elevation on the mauka portion of the project;
2. Alternative 2: On-site Wells at 710-foot elevation with reverse osmosis (RO) treatment;
3. Alternative 3: On-site Wells at 363-foot elevation with Desalinization of Saline Groundwater

Alternative 1 is the preferred alternative – on-site wells at 710-Foot Elevation on the mauka portion of the Project Site. The possibility of developing potable quality wells at 710-foot elevation is suggested by the discoveries of two deep monitor wells (State Nos. 3858-01 and 3959-01), both of which encountered fresh groundwater under artesian pressure at depth below saline groundwater. The phenomenon is discussed in detail later in Section 3.5 and Appendix C. A deep exploratory borehole at 710-foot elevation on the mauka end of the project site will be undertaken to determine if fresh groundwater can be found at that depth and to determine the feasibility of its development. If successful, approximately three production wells would be developed, each of 1,120 GPM capacity and driven by 350 horsepower motors. These wells would be integrated into the DWS system, with two-thirds of their capacity allocated to supply the Kaloko Makai project.

2.3.1.9.3 Wastewater Treatment

The Kona CDP states, "(a)ny new subdivision within 1 mile of shoreline within the Kona Urban Area shall either hookup to the public sewer system, or provide a private treatment system, and/or install dry sewers. Private wastewater collection systems within the 1 mile zone shall be designed and

constructed to County standards to enable potential connection to County sewer system. The County shall ensure that TODs can be served by the public sewer system in a timely manner" (Kona CDP, page 4-111).

The Kona CDP states that a new County wastewater treatment plant shall be located generally on and mauka of Queen Kaʻahumanu Highway in ʻOʻoma II (noted on the Official Public Facilities and Services Map-Waste Management) and designed to the extent feasible to utilize a natural treatment system that can double as an open space feature. While the Kona CDP does not define what a "Natural Wastewater System" is, a common description for this type of facility includes a wetland feature (typically referenced as a constructed wetland).

In addition, the Kona CDP notes that to the extent feasible, Kona's proposed natural system wastewater treatment facility shall be co-located with a non-edible crop, such as a bio-fuel crop, to use the R-1 wastewater effluent, and also co-located with Kona's green waste composting site to compost the sludge from the wastewater treatment facility for use on bio-fuel crop.

Representatives from the County Department of Environmental Management noted that there are no plans for construction of this decentralized WWTP in the immediate future (Dora Beck and Lyle Hirota personal communication, July 7, 2011).

The Kona Airport Manager responded to inquiries concerning this location and indicated that the FAA would probably consider constructed wetlands and wastewater treatment facilities wildlife attractant hazards. For all airports, the FAA recommends a distance of 5-statute miles between the farthest edge of the airport's operations area and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach, departure and circling airspace. Therefore, DOT-Airports would be expected to object to or discourage the creation of potential attractants in this location (Chauncey Wong-Yuen personal communication, date unknown).

If Kaloko Makai cannot hook up to a public wastewater system, Kaloko Makai will construct and operate a private wastewater treatment plant (WWTP) within the project site. The on-site wastewater treatment plant will be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat the wastewater to provide recycled (R-1) quality water for reuse general irrigation within Kaloko Makai (below the UIC line) and thus lessen demand for potable water for irrigation needs.

The projected wastewater generation demand for Kaloko Makai is 2.37 million gallons per day (mgd) average dry weather flow. The WWTP will be designed to reduce the concentrations of Total Nitrogen to <5 mg/l, and Total Phosphorous to <2 mg/. Installation of the Private WWTP shall be subject to conditions of approval by the DOH, including any lower concentrations of TN and/or TP in the effluent, and HAR Chapter 11-62. The amount of recycled water produced will be essentially the same as the amount received for processing, or 2.37 mgd.

This reuse of treated wastewater is consistent with the Kona CDP which has an action designating the area below Ane Keohokālole as a reclaimed wastewater zone (Action TRAN–3.3a: Designates the

reclaimed wastewater zone (Wastewater Re-use Area) on Figure 4-10c Official Public Facilities and Services Map).

2.3.2 Use of Public Funds; Use of Public Lands

SCD - TSA Kaloko Makai, LLC is the recorded fee owner of the project site. Use of State and/or County lands could include, but not be limited to roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings. The Applicant has offered to provide land area for the development of a regional hospital. However, Applicant will not be developing a regional hospital. It is anticipated that if a regional hospital is developed, it will be developed through a public-private partnership. Therefore, this action does not involve the use of public funds.

Applicant or its successors will be responsible to fund site work and the construction of on-site and off-site project-related infrastructure including roadways, potable water wells, reservoirs, transmission lines, wastewater transmission lines, and other utilities.

Infrastructure development to support Kaloko Makai will require connections and structural improvements within adjoining public rights-of-way, such as for water and other utilities connections, as well as roadway improvements. Roadway improvements may include a future interchange at a realigned Hina Lani Street and Queen Kaʻahumanu Highway on a site reserved at the request of the Hawaiʻi DOT. Such an interchange, when it is designed, will require subsequent assessment of compliance with Chapter 343, HRS (Hawaiʻi EIS Law).

2.3.3 Transit Oriented Development Village and Neighborhoods in Kaloko Makai

2.3.3.1 Background

As previously mentioned, Kaloko Makai has been designed to meet the guidelines, goals and policies of the Kona CDP and the Village Design Guidelines (see Section 2.2.2.5 and 5.2.3 for further discussion).

The Official Kona Land Use Map identifies general locations of TOD villages, spacing, and type of TOD villages. In addition to TOD villages, TNDs can be designated outside of TOD and within the Kona UA.

The components of a TOD/TND include Urban Core, Secondary Core and Greenbelt. A TOD/TND contains a higher density urban core surrounded by a lower density secondary area. A greenbelt surrounds and defines the outer edge of the secondary area. To control the scale and intensity of development within the urban core of a TOD/TND, there shall be two types of urban cores:

- Regional Centers are intended for mixed use and higher density residential, retail, commercial, employment, and/or regional one-of-a kind facilities, such as major civic, medical, education and entertainment facilities. Regional centers shall be designed around a Commercial Center, which is the focus for the Village and designed to encourage pedestrian activity.

- Neighborhood Villages are intended for predominately residential, public/civic uses, or small-scale neighborhood-oriented commercial uses. The Core's commercial uses are of a small scale and are intended to serve the needs of the Village residents. Neighborhood Village Core Areas shall be designed around a Neighborhood Center. Land uses include recreational space, small-scale public/civic uses, neighborhood oriented retail uses, and mixed-use.

TODs/TNDs may be surrounded by more auto-oriented, lower-density areas called "Secondary Areas." The Secondary Areas are within a half-mile of the TOD/TND urban core. These Secondary Areas take advantage of the services within the Urban Core through an interconnected street system with easy access to transit by foot, bike or car. Secondary Areas will be primarily comprised of standard single-family and multi-family neighborhoods. These areas may also provide more land-intensive uses that serve TOD/TND residents, such as schools and community parks. Because of their proximity to the Urban Core, Secondary Areas are ideal for bicycle travel.

The Greenbelt is an undeveloped area surrounding the Secondary Area. The Greenbelt is a strategic planning tool to prevent urban sprawl by keeping land permanently open. The purpose of the Greenbelt is to prevent urban sprawl of the TODs/TNDs, prevent neighboring towns from merging into one another, and to preserve the setting and the character of the TODs/TNDs. The Greenbelt may also serve multi-purpose uses, such as for drainage (e.g., flow ways or retention basins), sensitive resource preserves or wildfire protection buffers.

TODs and TNDs are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile).

TODs and TNDs are further organized by Transect Zones. Transect Zones organize the density, complexity, and intensity of the land use within the TOD/TND. The operating principle is that there is an urban core with a main center focus such as a transit station and plaza. The Transect Zones that correspond to the urban core, secondary area and greenbelt referred to in the Kona CDP and Village Design Guidelines are as follows (also noted are the allowable residential densities and building heights in each transect zone):

1. Urban Core
   A. T-5 Urban Center (Maximum density - 30 units per acre)
      i. Mix of residential units, such as townhouses, and apartments mixed with commercial, offices and retail
      ii. Typical Building Height: 2- to 5-Story with some variation (all, excluding attics and raised basements)
   B. T-4 General Urban (Maximum density - 12 units per acre)
      i. Neighborhood commercial uses with single-family and multi-family residential
      ii. Typical Building Height: 2- to 3-Story with a few taller Mixed Use buildings

2. Secondary Area
   A. T-3 Suburban (Maximum density - 6 units per acre)
      i. Single-family units, with ancillary community and public uses, and neighborhood and convenience-type commercial uses
      ii. Typical Building Height is 1- to 2-Story with some 3-Story

3. Greenbelt
   A. GB1, GB2 (Maximum density .25 units per acre)
      i. Greenbelt is an undeveloped area and may also serve multi-purpose uses, such as for drainage (e.g., flow ways or retention basins), sensitive resource preserves or wildfire protection buffers
4. Mixed-Use Industrial
   A. SD1 (Maximum density - 12 units per acre)

The development of compact, mixed-use villages integrates housing, employment, shopping and recreation opportunities. Villages are designed around transit stations/stops which will reduce the need for daily trips and financially support the expanded transit system.

Village Design Guidelines will apply to the development of master plans for TODs and TNDs, as well as subsequent projects implementing the master plans. The intent of the Village Design Guidelines is to do the following:

1. Promote transit-oriented and pedestrian-oriented development, to increase transit use, to manage traffic congestion,
2. Encourage mixed-use, compact development that is pedestrian in scale and sensitive to environmental characteristics of the land, and facilitates the efficient use of public services;
3. Have residences, shopping, employment, and recreational uses located within close proximity with each other and efficiently organized to provide for the daily needs of the residents;
4. Provide for a range of housing types and affordability within pedestrian-oriented, human-scale neighborhoods;
5. Incorporate natural features, open space, and cultural features;
6. Provide efficient circulation systems for pedestrians, non-motorized vehicles, and motorists that serve to functionally and physically integrate the various land use activities; and
7. Promote strong neighborhood identity and focus.

The Kaloko Makai site is designated as one of the Neighborhood TODs on the Official Kona Land Use Map in the Kona CDP. As previously discussed, Kaloko Makai also proposes to incorporate a regional hospital into the development. Whether a hospital developer/operator comes forward or not, the Kaloko Makai TOD will remain as a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the "neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included, then some of the proposed space will address regional medical needs, as well as other commercial demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

The assessment of impacts in this Second Draft EIS is based on a Neighborhood TOD at Kaloko Makai, whether or not a hospital is developed.

Due to the scale of the Kaloko Makai land area, the project is broken down into a Neighborhood TOD centered on the Ane Keohokālole Highway, a TND mauka of the Kaloko Makai Dryland Forest Preserve (the TND connects via roads and trails to the TOD) and Special District Mixed-use Industrial area makai of the TOD.

2.3.3.2 Overall Kaloko Makai TOD

Generally speaking, the Kaloko Makai TOD (centered on Ane Keohokālole Highway) is a compact mixed-use village made up of three neighborhoods: the core of the village focuses on the hospital and related medical facilities. Should the hospital not be located within Kaloko Makai, this village core will contain higher density residential and commercial uses. The two other neighborhoods within the Kaloko Makai TOD are residential-oriented villages that center on schools and adjoining community parks (Middle School mauka of Ane Keohokālole Highway and Elementary School makai of the highway).

The Kona CDP calls for Urban Villages to be located a minimum of one mile apart, between transit stations, along Ane Keohokālole Highway trunk route in order to preserve the transit efficiency of this route. Kaloko Makai TOD is identified to have a transit station on official maps in the Kona CDP.

Consistent with the Kona CDP, Kaloko Makai will incorporate a transit station near the center of the Kaloko Makai TOD on Ane Keohokālole Highway. To enhance efficiency of the transit station and allowing the ease of flow of the transit buses, component parts of the transit station will be constructed on either side of Ane Keohokālole Highway (across from each other.) Placement near the Kohanaiki Trail and new mauka-makai road will enhance accessibility of residents within Kaloko Makai.

The mauka component of the transit station will serve north-bound transit on Ane Keohokālole Highway; it will be situated between the Middle School Neighborhood and Hospital Neighborhood in the TOD between the Kohanaiki Trail and the new mauka-makai road through the Kaloko Makai project.

The makai component of the transit station will serve south-bound transit on Ane Keohokālole Highway; it will be situated in the Makai Elementary School Neighborhood in the TOD between the Kohanaiki Trail and the new mauka-makai road through the Kaloko Makai project.

A pedestrian crossing or crosswalk will be incorporated into the intersection of the new mauka-makai road and Ane Keohokālole Highway as a designated point to assist pedestrians wishing to cross.

The transit station will be a structure where buses stop to pick up and drop off passengers. It is larger than a typical bus stop. A Park and Ride facility will be incorporated into the vicinity of the transit station; this will include storage for bicycles. Since Kaloko Makai is not a designated transit

hub (a hub includes a major park and ride facility for commuters (primarily resort workers) the Park and Ride will be a reduced scale.

The transit station will be designed to accommodate safe and easy access for the various methods people will use to use the station including, walking, biking, driving and parking, kiss and ride, and other transit.

Since this is a core central place for residents within Kaloko Makai, as well as those travelling to and through the community, public open spaces will be incorporated into the design, including parks, squares and plazas, streets and sidewalks.

2.3.3.2.1 Hospital Neighborhood

The proposed hospital neighborhood is a compact mixed-use hospital-focused neighborhood that will include a nearby transit station, hospital medical center and adjoining commercial-oriented uses addressing the hospital needs (doctor offices, suppliers, support activities and housing for hospital staff, doctors and others.)

Land Uses in the Hospital Neighborhood in the TOD:

- Regional Hospital
- Lodge and Business Center
- Squares and Plazas
- Multi-family Residential (range of densities)
- Professional Offices (primarily medical) serving the neighboring hospital
- General Commercial Area with Retail and Office

Internal road systems, as well as a mauka-makai pedestrian link on the historic Kohanaiki Trail (the trail also serves as a central greenway through the Kaloko Makai project) will provide connections between the three neighborhoods.

The hospital, which is the focus for the TOD Village, serves as a catalyst for complementary mixed-use and higher-density residential, commercial (office and retail) and employment opportunities (medical-related, as well as other) near the hospital. Likewise, it is expected to also attract physicians, nurses, suppliers and staff to live near the medical facility. A transit station will be integrated within these land uses.

It is envisioned that the hospital facility will be developed and constructed in a “campus” layout, with open space for passive uses and a state-of-the-art facility utilizing breakthrough technology, enhanced research facilities and an intelligent design to maximize efficiency and sensitivity in patient care.

Forty-acres of land will be set aside for a regional hospital. A hospital developer/operator is being pursued. As noted in the Kona CDP, the location of Kaloko Makai is optimal and convenient for a regional hospital.

In the event a hospital developer and operator is not arranged for the 40-acre site noted in the project site plan, then the property will be used as a T-5 transect and the Phase 1 residential units and commercial square footage will be reallocated throughout the area identified as Phase 1. This means there will be a slight reduction in densities in some of the existing residential and commercial properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Whether a hospital developer/operator comes forward or not, the Kaloko Makai TOD will remain as a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the "neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included, then some of the proposed space will address regional medical needs, as well as other commercial demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

2.3.3.2.2 Middle School Neighborhood

The Middle School neighborhood is a compact mixed-use neighborhood, characterized within a higher-density urban core roughly equivalent to a 5-minute walking radius (1/4 mile.)

Land Uses in the Middle School Neighborhood:

- Middle School
- Community Park
- Transit Station Serving North-bound Travel
- Squares and Plazas
- Multi-family Residential (range of densities between 7- and 17-units per acre)
- Single-family Residential (range of densities between 4- and 6-units per acre)
- Professional Offices (primarily legal) serving the recently selected Kealakehe Judiciary site
- Commercial Area with Retail and Office

Internal road systems, as well as a mauka-makai pedestrian link on the historic Kohanaiki Trail (the trail also serves as a central greenway through the Kaloko Makai project) will provide connections between the three neighborhoods.

The core of this neighborhood is the Middle School and adjoining park. This neighborhood adjoins the hospital neighborhood and is mauka of Ane Keohokālole Highway. The historic Kohanaiki Trail runs mauka-makai through the Kaloko Makai project and adjoins and connects the school and park with other areas within the Kaloko Makai Development.

2.3.3.2.3 Makai Elementary School Neighborhood

The Makai Elementary School Neighborhood is a compact mixed-use neighborhood, characterized within a higher-density urban core roughly equivalent to a 5-minute walking radius (1/4 mile.)

Land Uses in the Makai Elementary School Neighborhood:

- Elementary School
- Community Park
- Transit Station Serving South-bound Travel
- Squares and Plazas
- Urgent Care Facility
- Multi-family Residential (range of densities between 7- and 17-units per acre)
- Single-family Residential (range of densities between 4- and 6-units per acre)
- Commercial Area with Retail and Office

Internal road systems, as well as a mauka-makai pedestrian link on the historic Kohanaiki Trail (the trail also serves as a central greenway through the Kaloko Makai project) will provide connections between the three neighborhoods and connects the school and park with other areas within the Kaloko Makai Development.

This neighborhood includes residential, commercial and mixed-use. These are interconnected with internal road systems, as well as a *mauka-makai* pedestrian link on the historic Kohanaiki Trail.
The core of this neighborhood is the Elementary School and associated park. This neighborhood is makai of Ane Keohokālole Highway.

2.3.3.3 Mauka Elementary School TND

The Mauka Elementary School TND is a compact mixed-use neighborhood, characterized within a higher-density urban core roughly equivalent to a 5-minute walking radius (1/4 mile.)

Land Uses in the Mauka Elementary School TND:

- Elementary School
- Community Park
- Square
- Multi-family Residential (approximate density 7- and 8-units per acre)
- Single-family Residential (approximate density 3- and 4-units per acre)
- General Commercial Area with Limited Retail and Office

Internal road systems, as well as a mauka-makai pedestrian link through two historic trails through the Dryland Forest to the historic Kohanaiki Trail and Hina Lani Street will provide connections between the three neighborhoods.

Through an internal circulation network, this mauka TND also interconnects with the adjoining Kaloko Heights project, and the neighboring property to the south.

2.3.3.4 Special District Mixed-Use Industrial

Special districts are defined in the Kona CDP as, “Special District designations shall be assigned to areas that, by their intrinsic size, function, or configuration, cannot conform to the requirements of any transect zone or combination of zones” (Kona CDP, page 12 of the Village Design Guidelines).

Land Uses in the Special District Mixed-Use Industrial:

- Light Industrial and/or Business Park
- District-scale Park
- Playground
- Plazas
- Multi-family Residential (range of densities between 7- and 12-units per acre)

The Kona CDP Action Committee has deliberated on the calibration of the Village Design Guidelines and has adopted criteria for an SD1 Mixed Use Industrial special district. Uses permitted in this district include Light Industrial, Retail, Office, Residential (limited use,) and Lodging (by warrant) (amended Table 12 and Table 13 of the Action Committee's recalibrated Village Design Guidelines).

Kaloko Makai proposes an SD1 Mixed-Use Industrial special district below the Kaloko Makai TOD that fronts Queen Kaʻahumanu Highway and Hina Lani Street. The primary use in the Kaloko Makai special district is light industrial; other uses include open space, park, retail/office and limited residential. A recreation area, which also serves as a greenbelt buffer area in this section of the project, is a district-scale park that will include playfields, multi-purpose building, courts (basketball, tennis, volleyball), tot lot, etc.

2.3.3.5 Secondary Areas

The Kona CDP defines secondary areas as, "The area extending approximately ¼ mile from the outer edge of the village core of the TOD. Lower density housing and other auto-oriented uses are located here. The secondary areas take advantage of the services within the core area through an interconnected street system with easy access to transit by foot, bike, or car. Secondary areas will be primarily comprised of standard single-family and multi-family neighborhoods" (Kona CDP, page 7-3).

Land Uses in the Secondary Areas:

- Dryland Forest Preserve
- Fire Station/Police Substation
- Greenbelt
- Playground
- Wastewater Treatment Plant
- Multi-family Residential
- Single-family Residential (range of densities between 3- and 4-units per acre)
- General Commercial Area with Limited Retail and Office

Due to the size and shape of the Kaloko Makai property, a couple secondary areas are formed around the TOD Village: one is above the Hospital and the Middle School Neighborhoods; and the other is on the south side of Hina Lani Street, makai of Ane Keohokālole Highway.

The Kaloko Makai secondary areas are lower density residential (mostly single-family, with some multi-family) and some support commercial uses.

2.3.3.6 Open Space

Numerous active and passive recreational areas are incorporated into the Kaloko Makai project. Neighborhood and District-scale parks provide opportunities within the residential-oriented TODs.

The Kaloko Makai master plan integrates the natural features of the area, including the preservation of a historic Kohanaiki Trail as an interconnecting neighborhood pedestrian way, which starts outside of the project area and traverses through the Kaloko Heights project, through Kaloko Makai, down to Queen Kaʻahumanu Highway. The historic trail runs in the east-west (mauka-makai) direction through the project area.

Other significant archaeological features are found in the northwest section of the property. In order to preserve and protect these features, the area will be left in a natural state, with pockets of low-density residential interspersed in the area. This open space also helps to serve as a mauka greenbelt (GB1) to the Kaloko Makai TOD.

The Kaloko Makai master plan also integrates a 150-acre preservation area for a native Dryland Forest located on the southern portion of the project site. This open space will also serve as a southern greenbelt (GB1) to the Kaloko Makai TOD.

From Ane Keohokālole Highway down to Queen Kaʻahumanu Highway, Kaloko Makai will set aside a 100-foot buffer that fronts Hina Lani Street. This open space also helps to serve as a greenbelt (GB1) to the Kaloko Makai TOD.

Significant archaeological and cultural sites, which include historic trails, will be integrated into the master plan. Archaeological and cultural sites will be protected and maintained with appropriate treatment and buffers from adjacent uses, as necessary.

2.4 DEVELOPMENT TIMETABLE AND PRELIMINARY COSTS

Development of the project is anticipated to commence with the construction of infrastructure improvements immediately following the necessary land use approvals and permits, and be substantially completed to service the first residential homes within 10 years of the LUC's SLUBA approval. Kaloko Makai will be implemented in three phases and substantially completed in approximately 30-years from the LUC's SLUBA approval. Construction of residential units and commercial uses will be on a phased basis according to market demand.

Phase 1, made up of approximately 1,752 residential units (471 single family and 1,281 multi-family), approximately 430,000 sq ft of commercial space, hospital site, the Lodge and Business Center, commercial and mixed-use industrial, DOE school, Dryland Forest and WWTP will generally encompass most of the Middle School Neighborhood, the southern portion of the Makai Elementary School Neighborhood and the southern portion of the Special District Mixed-use Industrial (see Figure 2-12). Associated infrastructure will also be included in this phase. Phase 1 is anticipated to begin upon completion of all necessary land use entitlements and be completed within 10 years from the LUC's SLUBA approval.

Phase 2, made up of approximately 1,950 residential units (829 single family and 1,121 multi-family, to include long term care units), approximately 130,000 sq. ft. of commercial and mixed-use and DOE school, will generally encompass the remaining northern portion of the Makai Elementary School Neighborhood, a portion of the mauka Middle School Neighborhood, and a portion of the Special District Mix-use Industrial (see Figure 2-13). Associated infrastructure will also be included in this phase.

Phase 3, made up of approximately 1,298 residential units (1,054 single family, and 244 multi-family) and 40,000 sq ft of commercial and a DOE school, will generally encompass the Mauka Elementary School TND, the remaining mauka-north portion of the Middle School Neighborhood, the area makai of Ane Keohokālole Highway, south of Hina Lani Street and the remaining light industrial/mixed use below Kamanu Street (see Figure 2-14).

Applicant preliminarily estimates that the development of the Kaloko Makai project will cost approximately $492 million for infrastructure, and $1.385 billion for construction and vertical improvements (which include tenant improvements at commercial and light industrial areas) over the approximately 30 year development timeframe. Preliminary cost projections estimate that the costs for the construction and development of the hospital will be in the range of $300 to 500 million. All projected costs will be spent over the project's development timeline, but the anticipated breakout is approximately $707 million in Phase 1, $842 million in Phase 2 and $480 million in Phase 3.

2.5 ENVIRONMENTALLY RESPONSIBLE PLANNING AND DESIGN

In the design and construction of Kaloko Makai, SCD – TSA Kaloko Makai, LLC will implement feasible measures to promote energy conservation and environmental stewardship, such as the standards and guidelines promulgated by the US Green Building Council, the United States Environmental Protection Agency (EPA) ENERGY STAR Program or other similar programs.

2.5.1 OEQC's Sustainable Building Design Guidelines

The Environmental Council, as part of a "Planner's Checklist," adopted Guidelines for Sustainable Building Design in Hawai`i (October 13, 1999.) These guidelines do not constitute rules or law. They have been refined by OEQC staff and peer review to provide a checklist of items that will help the design team create projects that will have a minimal impact on Hawai`i's environment and make wise use of our natural resources. The following is from the OEQC guidelines.

A sustainable building is built to minimize energy use, expense, waste and impact on the environment. It seeks to improve the region's sustainability by meeting the needs of Hawai`i's residents and visitors today without compromising the needs of future generations. Compared to conventional projects, a resource-efficient building project will:

1. Use less energy for operation and maintenance
2. Contain less *embodied* energy (e.g. locally produced building products often contain less *embodied* energy than imported products because they require less energy-consuming transportation.)

3. Protect the environment by preserving/conserving water and other natural resources and by minimizing impact on the site and ecosystems
4. Minimize health risks to those who construct, maintain and occupy the building
5. Minimize construction waste
6. Recycle and reuse generated construction wastes
7. Use resource-efficient building materials (e.g. materials with recycled content and low embodied energy, and materials that are recyclable, renewable, environmentally benign, non-toxic, low VOC (Volatile Organic Compound) emitting, durable, and that give high life cycle value for the cost.)
8. Provide the highest quality product practical at competitive (affordable) first and life cycle costs.

In the design and construction of Kaloko Makai, SCD – TSA Kaloko Makai, LLC will seek to implement feasible measures to conform to these general guidelines.

2.5.2 Leadership in Energy and Environmental Design (LEED)

The US Green Building Council's Leadership in Energy and Environmental Design (LEED) program is a voluntary green building certification system**,** providing third-party verification that a building or community was designed and built using strategies aimed at improving performance across all the metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

The LEED for Neighborhood Development Rating System (2009) integrates the principles of smart growth, urbanism and green building into the first national system for neighborhood design.

Where appropriate, SCD – TSA Kaloko Makai, LLC will utilize LEED concepts in the development of Kaloko Makai.

2.5.3 Energy Star Program

ENERGY STAR is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy. In 1992, the US Environmental Protection Agency (EPA) introduced ENERGY STAR as a voluntary labeling program designed to identify and promote energy-efficient products to reduce greenhouse gas emissions. Computers and monitors were the first labeled products. Through 1995, EPA expanded the label to additional office equipment products and residential heating and cooling equipment. In 1996, EPA partnered with the US Department of Energy for particular product categories. The ENERGY STAR label is now on major appliances, office equipment, lighting, home electronics, and more. EPA has also extended the label to cover new homes and commercial and industrial buildings.

When designing Kaloko Makai, SCD – TSA Kaloko Makai, LLC will also consider ENERGY STAR concepts in the development of the project.

2.5.4 Sustainability Issues

A Sustainability Plan was prepared and included herein as Appendix Q. The Sustainability Plan is a comprehensive set of goals, strategies and actions focused on improving environmental quality, economic strength and social benefit within the Kaloko Makai project, as well as the broader community. Kaloko Makai will be a sustainable community and will incorporate the following:

Sustainability Programs and Plans: Kaloko Makai will incorporate the core principles of the various sustainability programs and plans.

Natural and Cultural Resources: Kaloko Makai will work to preserve the approximately 150-acre native Dryland Forest, Kohanaiki Trail ("Road to the Sea" Trail) and identified Native Hawaiian Burials and archaeological sites.

Land Use: Kaloko Makai is consistent with local land use plans including the County of Hawai'i General Plan and the Kona Community Development Plan.

Design Features: Kaloko Makai will include sustainable design features including strategies to reduce solar heat gain through roofs, walls and windows; using site planning and landscaping to improve natural ventilation; daylighting design; and energy efficient light fixtures.

Transportation: Kaloko Makai will incorporate provisions of a pedestrian and transit-friendly community; multi-modal interconnected roads; and complete streets design.

Economic Opportunities: Kaloko Makai proposes commercial and industrial uses which will provide a variety of job opportunities; construction and construction-related employment will have direct beneficial impact on the local economy during construction.

Open Space and Parks: Kaloko Makai proposes open space and open greenway areas encompassing the project.

Water Management: Kaloko Makai will install water efficient fixtures, appliances and high efficiency toilets to reduce indoor water use.

Energy Management: To the extent feasible, Kaloko Makai will incorporate energy conservation and efficiency measures; solar energy for water heating; encourage photovoltaic systems and other renewable energy sources.

Health: Kaloko Makai's layout and design will create an opportunity for both residents and the community to have a positive effect on their health through walkable and bikable transportation options. The setting aside of land for a new hospital will increase health services to the community.

Education: Kaloko Makai will coordinate with the DOE to ensure that the facility assessment policy is addressed. Kaloko Makai proposes land for two elementary schools and one middle school within the project.

Housing: Kaloko Makai offers increased housing choices, including affordable housing to meet future demands.

Social: Kaloko Makai promotes social sustainability through socially-focused actions that will support quality of life, sense of place and community livability for all residents and the community.

This page intentionally left blank.

3. DESCRIPTION OF THE NATURAL ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

This section describes the natural environment, potential impacts and mitigation measures associated with the Kaloko Makai development project.

3.1. CLIMATE

The Kona region experiences a mild climate year-round. The average annual temperature is 75° (Fahrenheit), with an average high of 83°, and an average low of 67°. Median annual rainfall is approximately 25", with areas along the coast experiencing less than 10 inches of rainfall annually.

The area is largely sheltered from the predominant northeasterly tradewinds by the landmasses of Mauna Loa, Mauna Kea and Hualālai, resulting in light, variable winds. The prevailing winds are southerly and westerly.

During the day, a pressure gradient between the warmer land and cooler ocean waters causes warm air to move inland by light sea breezes. In the evening, the convection cells reverse direction as the land cools and night breezes blow out toward the warmer ocean.

Typical wind velocities range between 3 to 14 knots (4 to 16 miles per hour). Relative humidity is generally stable year-round, with the daily average ranging from 71 to 77 percent.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No significant impact to the region's climate is anticipated, however, replacing the sparsely vegetated area with an urban landscape will alter the microclimate of the site. The proposed project will help offset the loss of vegetation by providing irrigated parks, open space, landscaped areas and the approximately 150-acre Kaloko Makai Dryland Forest Preserve, but will result in a significant change in land cover, replacing vegetation with impervious surfaces.

The 150-acres Kaloko Makai Dryland Forest Preserve contains the best habitat for reproduction of native species and is one of the last remaining Dryland Forest ecosystems on the island. Approximately 150-acres will be set aside and preserved as a Dryland Forest preserve in perpetuity, thus ensuring the continuation of this Dryland Forest ecosystem. The preservation of these approximately 150-acres is the single most important step in preserving the Dryland Forest ecosystem at Kaloko Makai. Through safeguarding this ecosystem, Kaloko Makai is ensuring that the Kaloko Makai Dryland Forest will flourish for generations to come.

3.2. GEOLOGY AND TOPOGRAPHY

The project site is located on the lower western slope of Hualālai, a dormant shield-type volcano. Hualālai Volcano last erupted in 1801 along its northwest rift zone, which represents the major geologic structure in the area.

The western slopes of Hualālai Volcano consist predominantly of alkalic olivine basalt flows that poured out of the northwest rift zone. Basalt flows are typically thin-bedded, dip 10 to 15 percent, and average 4 or 5 feet in thickness on the upper slopes. These flows, however, probably average 10 feet in thickness on the more gentle (2 percent) slopes near the coast. The flows consist of both pāhoehoe and `a`ā types and belong to the prehistoric member (Holocene age) of the Hualālai volcanic series.

The project site occupies an area of slope, ranging from 5 to 8 percent. The lowest elevation along the makai boundary of the site is approximately 100 feet above mean sea level (MSL). Along the mauka boundary, the site reaches an elevation of about 710 feet above MSL. The site has a generally irregular surface with localized mounds and depressions throughout, as is characteristic of non-eroded lava flows.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Construction of the proposed development will involve grading, excavating and trenching of presently undeveloped areas within the project site. The project will require alteration of existing landforms to create more efficient land development areas. Appropriate engineering, design and construction measures will be utilized to minimize potential soil erosion during construction.

Mass grading of the development areas will comply with the County of Hawai‘i’s grading ordinance requirements and will require a National Pollutant Discharge Elimination System (NPDES) permit from the State Department of Health (DOH) for storm water discharges associated with construction activities, including Best Management Practices (BMPs) to minimize off-site impacts.

3.3. SOILS

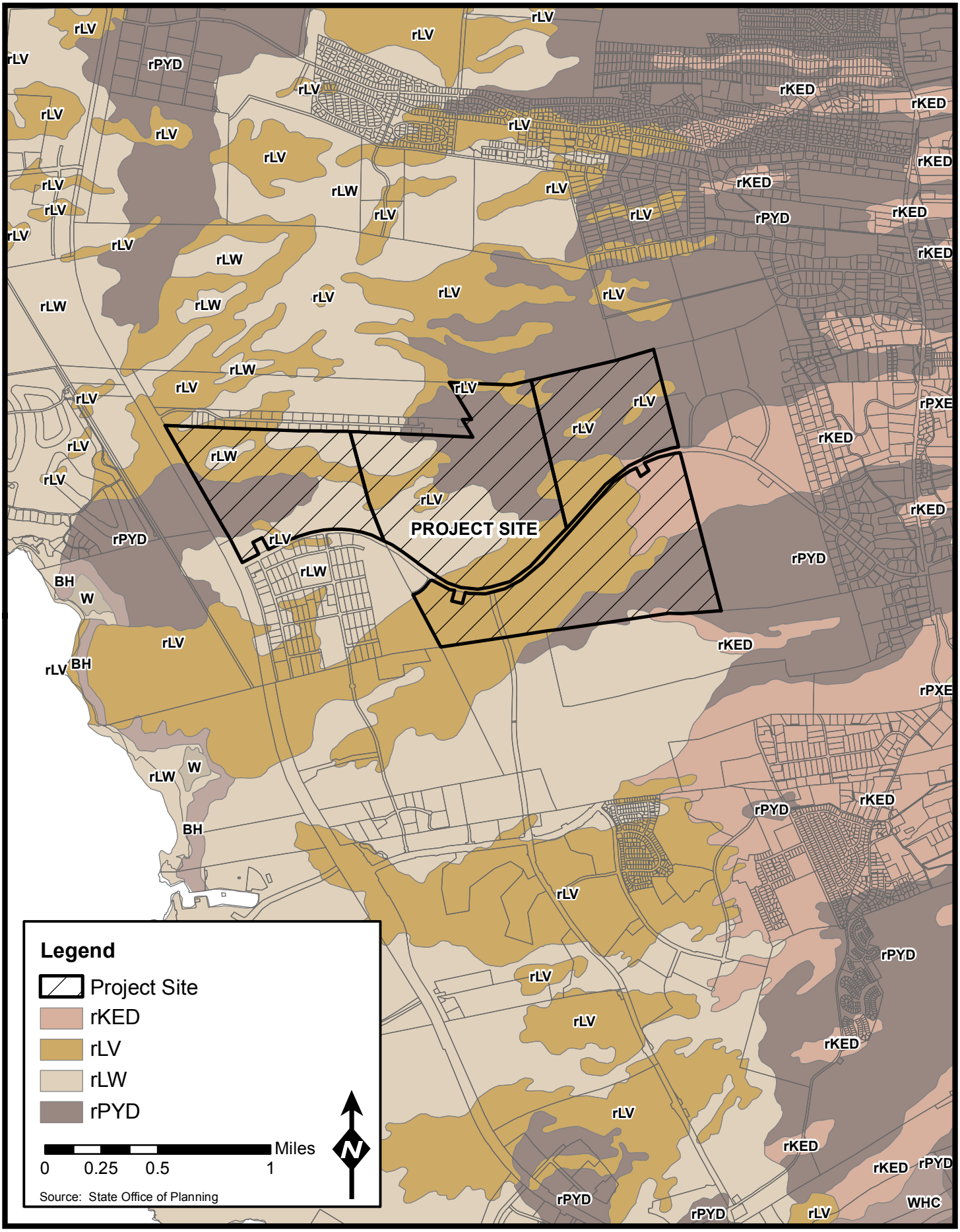
Three soil studies describe the soil structure of the area. They are the USDA Soil Conservation Service Soil Survey, the Land Study Bureau’s Detailed Land Classification and the State Department of Agriculture’s Agricultural Lands of Importance to the State of Hawai‘i.

3.3.1. USDA Soil Conservation Service Soil Survey

The U.S. Department of Agriculture Natural Resources Conservation Service’s (NRCS) *Soil Survey of the Island of Hawai‘i, State of Hawai‘i*, classifies the soil in the project site as pāhoehoe lava flows (rLW), ‘a‘ā lava flows (rLV), Kaimu extremely stone peat (rKED), and Punalu‘u extremely rocky peat (rPYD). Descriptions of the soil classifications are as follows (see Figure 3-1):

Lava Flows, pāhoehoe (rLW) – Lava flows are considered “miscellaneous land types.” Pāhoehoe lava has no soil cover and is virtually devoid of vegetation, except for mosses and lichens. Pāhoehoe lava, which occurs over approximately 21 percent of the site, is characterized by a billowy, glassy surface that is relatively smooth, although the surface may be rough and broken in some areas, with hummocks and pressure domes.

,



WILSON OKAMOTO CORPORATION

FIGURE 3-1
Soils Map
Kaloko Makai

The Soil Conservation Service's Land Capability Grouping is a system of grouping soils primarily based on their capability to produce common cultivated crops and pasture plants without deteriorating over an extended time frame. The system groups soil from I, the highest level to VIII the lowest level. The soil capability class rating for pāhoehoe lava is Class VIII, indicating that the soils have severe limitations that make them unsuited for cultivation and commercial plants, and restrict their non-urban use largely to pasture, woodland, wildlife, water supply, and aesthetic purposes.

Lava Flows, ʻaʻā (rLV) – Lava flows are considered "miscellaneous land types." ʻAʻā lava has little soil cover and is virtually devoid of vegetation, except for within the Kaloko Makai Dryland Forest where ecological succession has lead to the development of a Dryland Forest ecosystem upon the ʻaʻā lava flow. Approximately 37 percent of the site consists of aʻā lava, which is characterized by clinkery, hard, glassy pieces piled in tumbling heaps.

The soil capability class rating for ʻaʻā lava is Class VIII, indicating that the soils have severe limitations that make them unsuited for cultivation and commercial plants, and restrict their non-urban use largely to pasture, woodland, wildlife, water supply, and aesthetic purposes.

Kaimu, extremely stone peat (rKED) - Approximately 6 percent of the project site consists of Kaimū soils (Kaimū extremely stony peat, 6 to 20 percent slope.) These soils are comprised of very dark brown extremely stony peat about 3 inches thick. It is underlain by fragmental ʻaʻā lava. This soil is neutral in reaction.

This soil is not suitable for cultivation. These soils are rated Class VIIs, non-irrigated. The sub-classification "s" indicates that the soils are extremely rocky or stony.

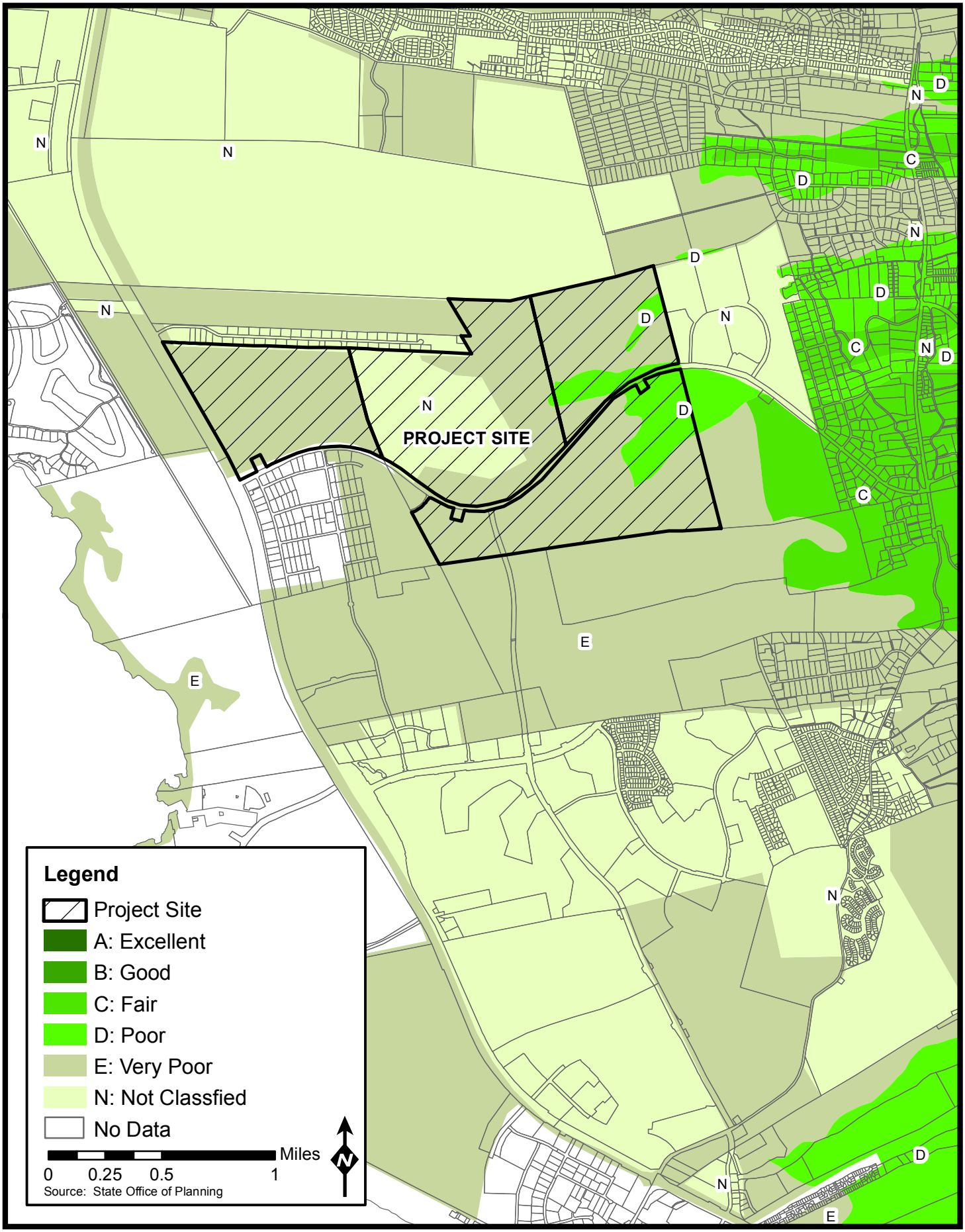
Punaluʻu, extremely rocky peat (rPYD) - Approximately 36 percent of the project site consists of Punaluʻu soils (Punaluʻu extremely rocky peat, 6 to 20 percent slope.) These soils are comprised of rock outcrops over 40 to 50 percent of the surface, and medium-acid peat about 4 inches thick underlain by pāhoehoe lava bedrock.

The site consists of lands classified as very poorly suited for agricultural productivity. These soils are rated Class VIIs soils, non-irrigated. Use of these soils is typically restricted to non-agricultural uses such as pasture or range land. The sub-classification "s" indicates that the soils are extremely rocky or stony.

3.3.2. LSB Detailed Land Classification

The *Detailed Land Classification - Island of Hawaiʻi* prepared by the University of Hawaiʻi Land Study Bureau (LSB), evaluates the quality or productive capacity of certain lands on the Island for selected crops and overall suitability in agricultural use. A five-class productivity rating system was established with "A" representing the highest productivity and "E" the lowest.

According to the LSB, the Petition Area is very poorly suited for agricultural productivity. Approximately 73 percent of the project area is rated E, the lowest productivity rating, approximately 9 percent is rated D, and the remaining is unclassified (see Figure 3-2).



WILSON OKAMOTO CORPORATION

FIGURE 3-2
Land Study Bureau Map
Kaloko Makai

3.3.3. Agricultural Land of Importance to the State of Hawai‘i

The Agricultural Lands of Importance in the State of Hawai‘i (ALISH) map, prepared by the State Department of Agriculture, classifies lands into three categories:

1) Prime Agricultural Land, which is land best suited for the production of crops because of its ability to sustain high yields with relatively little input and with the least damage to the environment. It includes soils with the best physical, chemical and climatic properties for mechanized field crops;
2) Unique Agricultural Land, which is land other than Prime agricultural land used for the production of unique high-value crops (coffee, taro, watercress, etc); and
3) Other Important Agricultural Land, which is comprised of State or local important lands for production, not prime or unique; needing irrigation or requiring commercial production management.

None of the land within the Petition Area is identified as "Prime" or "Unique" Agricultural Lands under the ALISH system. Approximately 6 percent of the project site is designated “Other”, and the remainder of the project site is not classified in the ALISH system, thus, not considered important agricultural lands (see Figure 3-3).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The soil class ratings for the property of Class VIIs and Class VIII mean that the soils are not suitable for cultivation and use is generally restricted to non-agricultural use. Additionally, the project area is rated D, E and unclassified by the LSB Detailed Land Classification.

With only 6 percent of the project site designated “Other” and the remainder of the project site not classified in the ALISH system, Kaloko Makai will not have an impact on agriculturally significant lands and will not reduce the inventory of agricultural significant lands. There are no significant existing or planned agricultural activities on the State Agricultural District lands adjoining or in close proximity to Kaloko Makai.

Construction of the proposed development will involve grading, excavation and trenching of presently undeveloped areas within the project site. The project will require alteration of existing landforms to create more efficient land development areas.

Appropriate engineering, design and construction measures will be undertaken to minimize potential erosion of soils during construction.

Mitigation measures will be instituted following site-specific assessments, incorporating structural and non-structural BMPs such as minimizing soil exposure and implementing erosion control measures such as silt fences and sediment basins. Following construction, erosion is anticipated to decrease since the soils will have been graded, built over, paved over or landscaped. Landscaping in turn will provide erosion control.

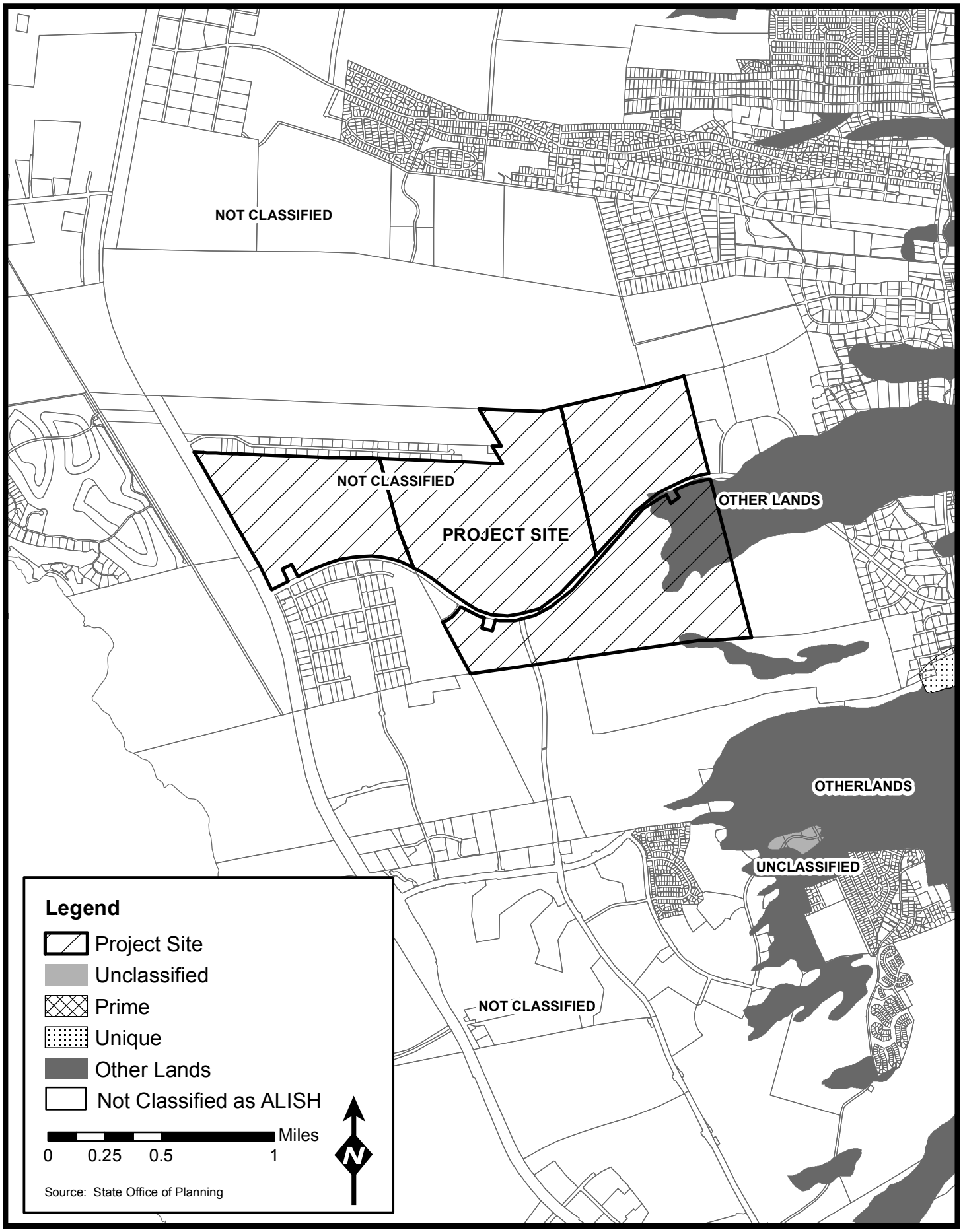


FIGURE 3-3
Agricultural Lands of Importance in the State of Hawaii
Kaloko Makai

WILSON OKAMOTO CORPORATION

Mass grading of the development areas will be in compliance with the County of Hawai'i's grading ordinance requirements and will require NPDES permit from the State DOH for storm water discharges associated with construction activities, including BMPs to minimize off-site impacts.

3.4. NATURAL HAZARDS

3.4.1. Flooding

The FIRM identifies the project site as lying within Zone X, areas determined to be outside the 0.2% annual chance flood plain (Community Panel 1551660684C and 1551660703C revised April 2, 2004, panels not printed) (see Figure 3-4).

POTENTIAL IMPACTS AND MITIGATION MEASURES

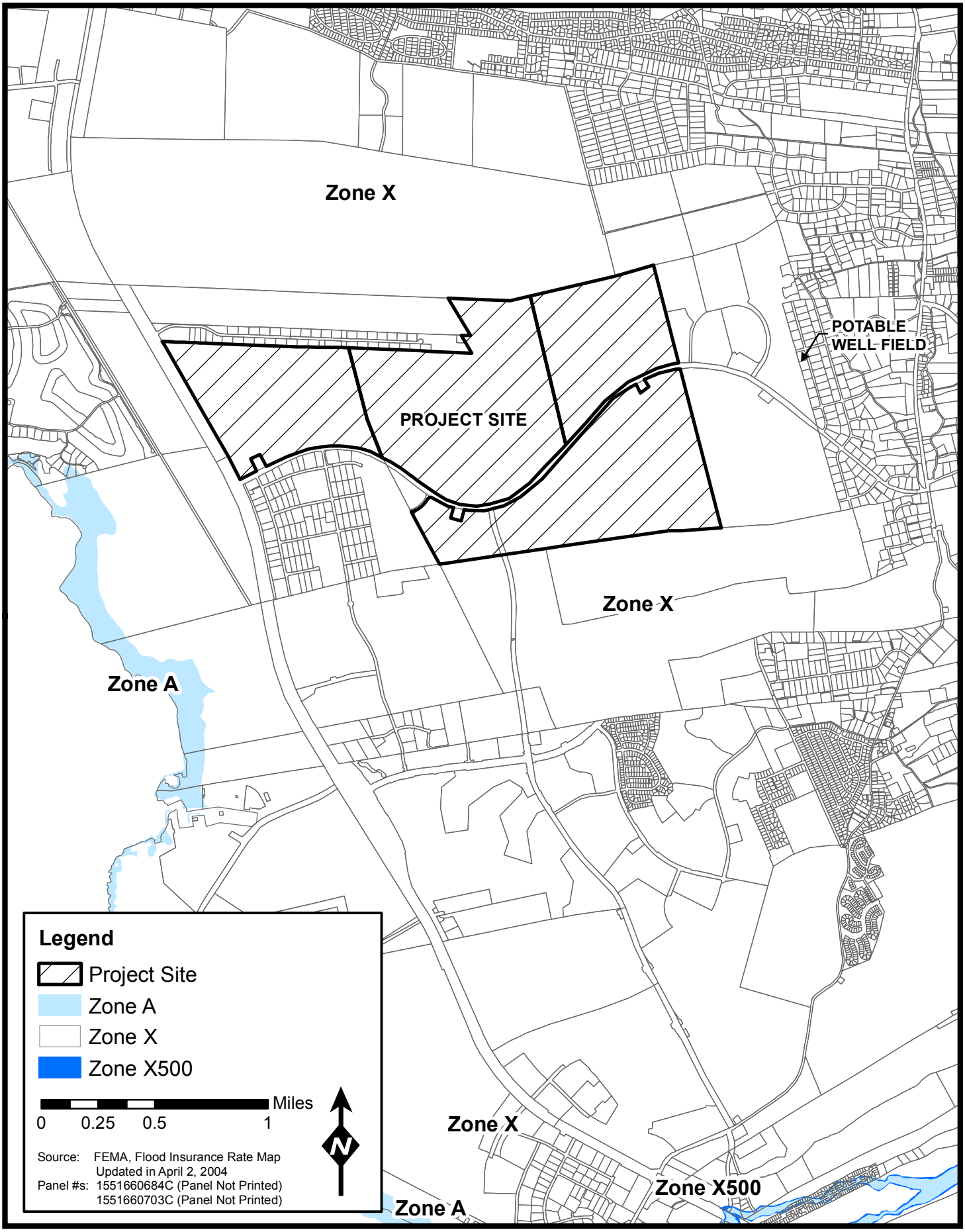
The site is also not subject to a disproportionately greater likelihood of floods resulting from heavy rainstorms due to the highly porous nature of the existing lava substrate, which dominates its landscape.

Construction of the proposed project is not anticipated to result in flooding of the project site or lower elevation properties.

Kaloko Makai will be consistent with the Kona CDP Policy PUB–4.7: Urban Stormwater Management, by developing a Stormwater Management Program and Stormwater Management Guidelines that will regulate development and establish standards for public projects. The evolution of this program shall consider the following:

(a) a connected hierarchical overflow system where overflows from 10-year storm facilities (e.g., drywells) are directed to higher-capacity flood management systems, so that the total system can safely accommodate a 100-year storm;
(b) use of natural drainageways and retention areas to the extent possible to maximize infiltration (groundwater recharge), filtration, and settling;
(c) multi-purpose use of the higher-capacity (e.g., 25-year, 50-year, 100-year) flood management facilities for recreation or other uses since these areas will flood infrequently;
(d) engineered "natural" flow ways to direct the sheetflow runoff into more defined drainageways;
(e) onsite retention measures, such as rainwater harvesting methods;
(f) street standards that minimize runoff and transport of sediment and contaminants;
(g) watershed management system perspective;
(h) Based on the Stormwater Management Program, existing and proposed Stormwater management flow ways and facilities shall be shown on the Official Public Facilities and Services Map, especially those maintained by the County.

No maps were found in the Kona CDP that indicate any flood ways or facilities anywhere near the Kaloko Makai project.



WILSON OKAMOTO CORPORATION

FIGURE 3-4
Flood Zone Map
Kaloko Makai

3.4.2. Tsunami

The Island and County of Hawaiʻi has experienced four tsunamis since 1940. Because of its elevation and distance from the shore, the project site is not subject to tsunami inundation and is not within the Hawaiʻi County Civil Defense Agency's designated tsunami evacuation zone.

Kaloko Makai is located outside of the tsunami evacuation zone (Hawaii County Civil Defense Tsunami Evacuation Zone Maps, accessed website June 18, 2013, http://records.co.hawaii.hi.us/Weblink8/Browse.aspx?startid=24604&dbid=1)

Emergency shelters are located at Kealakehe High, Elementary and Intermediate Schools.

The County has 68 sirens and 12 simulators in operation around the island. Simulators provide a signal to manned stations where personnel are utilized to disperse the warning. Sirens have an effective average range of one-half mile (County of Hawaii Multi-Hazard Mitigation Plan, August 16, 2010).

POTENTIAL IMPACTS AND MITIGATION MEASURES

As the project site is not subject to tsunami inundation and is not within designated tsunami evacuation zones, schools built within Kaloko Makai can serve as shelters for those evacuating from lower elevations.

Further, the project's proximity to Queen Kaʻahumanu Highway, an identified evacuation route, makes the project site accessible for those evacuating from the coast.

3.4.3. Hurricane

The island of Hawaiʻi is exposed to hurricanes as result of its unique, varied topographic features and orientation. The island's landscape is dominated by five mountains, facilitating complex hurricane wind acceleration patterns. According to the *County of Hawaiʻi Multi-Hazard Mitigation Plan* (February 2005), eight hurricanes have affected the Hawaiian Islands and 12 others have posed a threat, since 1950.

Besides hurricanes, high winds from winter storms also can cause damage. The National Weather Service (NWS) defines a high wind event as sustained winds or frequent gusts of 40 miles per hour (mpg) or greater. For the County of Hawaiʻi, 28 events were identified during the period of January 1992 through October 2002 (County of Hawaiʻi, 2005).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The International Building Code (IBC), 2006 Edition prepared by the International Code Council has been adopted and referenced in the Hawaiʻi County Code. All structures will be constructed in compliance with requirements of the IBC and other County, State and Federal standards.

3.4.4. Volcanic

The U. S. Geological Survey determines volcanic hazard maps. The zones are ranked from 1 through 9 based on the probability of coverage by lava flows, with Zone 1 being the highest hazard and Zone 9 being the lowest.

The Project is located in Zone 4. The lava flow hazard for Zone 4 is attributed to Hualālai, one of three volcanoes that have been active in historic times on the Island of Hawaiʻi. About 5 percent of the area within Zone 4 was covered by lava since 1800, and less than 15 percent of the area was covered by lava in the last 750 years. In this zone, the frequency of eruptions is lower than Kilauea and Mauna Loa, but flows typically cover large areas.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Hawaiʻi County Code relating to the International Building Code (IBC) does not address lava flows, however measures to address potential risks, such as developing emergency evacuation procedures, will be devised by the homeowners association, individual retail and commercial businesses within the project area.

3.4.5. Earthquake

The Island of Hawaiʻi is susceptible to seismic activities originating in fault zones under and adjacent to it. Two fault zones have been identified in the Kona region, the Kealakekua and Kaloko faults, both located in South Kona.

The IBC proposed rating system is based on a scale of 1 to 4, with a rating of 4 having the highest risk associated with seismic activity. The Hawaiʻi County Building Code requires that all new structures be designed to resist forces to seismic Zone 4 standards.

The IBC recommends that the Island of Hawaiʻi meet the IBC standards for Seismic Zone 4, as well.

Structures designed under this code must resist seismic design loads based on the seismic importance factor, seismic use group, mapped structural response accelerations, Ss and S1, seismic design category, and other factors corresponding to the specific location and characteristics of the building under consideration.

POTENTIAL IMPACTS AND MITIGATION MEASURES

In accordance with the Hawaiʻi County Code, all permanent structures will be designed to resist forces to seismic Zone 4 standards.

3.4.6. Wildfires

A majority of the subject property is dominated by Leucaena Scrub, Christmas Berry Scrub, Koa Haole and various grasses. This type of vegetation can be extremely flammable and susceptible to wildfire. Additionally the Kaloko Makai Dryland Forest is comprised of flammable vegetation.

Because Hawaiian plants were subjected to fire during their evolution only in areas of volcanic activity and from occasional lightning strikes, they are not adapted to recurring fire regimes and are unable to recover well following a fire.

Alien plants are often better adapted to fire than native plant species and some fire-adapted grasses have become widespread in Hawaiʻi. Native shrubland and Dryland Forests can thus be converted to land dominated by alien grasses.

The presence of such species in Hawaiian ecosystems greatly increases the intensity, extent, and frequency of fire, especially during drier months or drought.

Fires may result from natural causes or they may be accidentally or purposely set by humans.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The Kaloko Makai development will reduce the probability of wildfires on site by replacing vegetation with buildings, structures and appropriate landscaping. Landscaping will incorporate native species and appropriate vegetation for the area.

Since the Kaloko Makai Dryland Forest Preserve will border housing developments, building setbacks will be developed to keep housing an appropriate distance from the Dryland Forest Preserve. Appropriate landscaping will also be employed within the housing developments to act as a barrier if fire was to occur.

Additionally, appropriate signage will be developed to encourage public cooperation and discourage trespassing, vandalism and arson.

Fire fighting resources available near the Kaloko Makai Dryland Forest Preserve will be identified and information will be provided to fire stations to assist them in protecting the Dryland Forest Preserve from fire. Kaloko Makai will also investigate water sources, which may be used to suppress fires if they were to occur within the Dryland Forest Preserve.

To further support firefighting efforts, Kaloko Makai may install a helicopter dip tank within the Kaloko Makai Dryland Forest Preserve in the previously graded portion of land within the Preserve.

Kaloko Makai will also contain complete fire prevention measures including access roads in accordance with Uniform Fire Code (UFC) Section 10.207, water supply for fire suppression in accordance with UFC Section 10.301(c), and buildings under construction in compliance with the provisions of UFC Article 87.

3.5. GROUNDWATER RESOURCES AND NEARSHORE MARINE ENVIRONMENT

3.5.1. Groundwater Resources

Tom Nance Water Resources Engineering (TNWRE) prepared an *Assessment of the Potential Impact of the Proposed Kaloko Makai Project on Water Resources* (July 2013). A summary of the report is provided below and the report in its entirety is included in Appendix C.

The project site overlies the Keauhou Groundwater Aquifer System within the Hualālai aquifer sector (see Figure 3-5). Groundwater in North Kona occurs in two different modes: ground water occurs as a thin basal lens and as high-level groundwater. Location of wells within or near Kaloko Makai Project Site is shown in Figure 3-6.

Basal Groundwater: From the shoreline inland to the near vicinity of Māmalahoa Highway, groundwater occurs in a thin and brackish basal lens that floats on saline groundwater beneath it, and is in hydraulic contact with seawater at the shoreline.

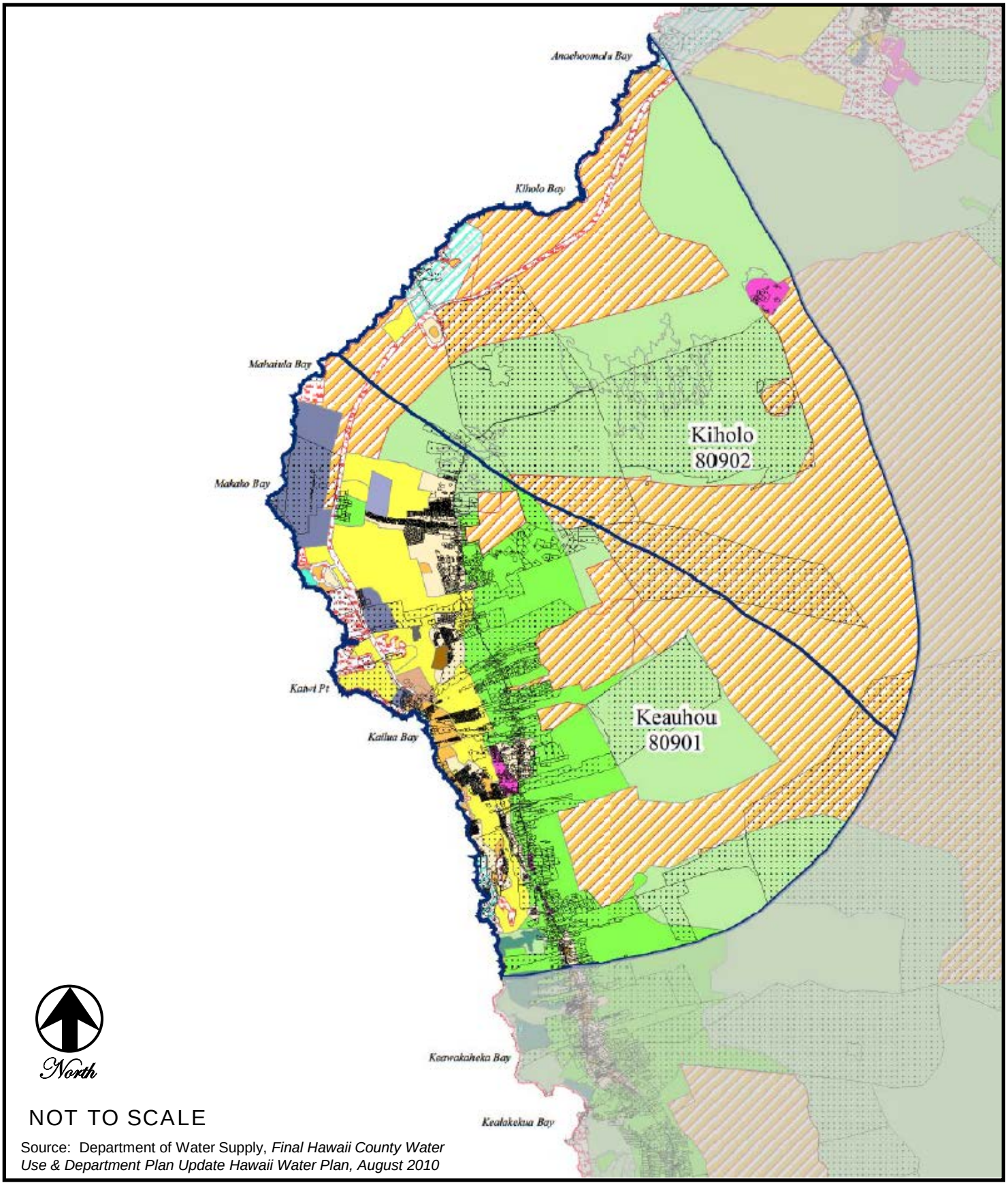
In the Keahole to Kailua area of North Kona, which includes the Project Site, the basal groundwater levels near the shoreline are about one foot above sea level and slowly increase moving inland to between two and three feet above sea level at the mauka end of the Project Site. The thin basal lens is influenced by ocean tides, an indication of the substantial permeability of the volcanic ash in which the groundwater resides.

Figure 3-7 illustrates a salinity and temperature profile through the water column of on-site Well 4160-02. The profile shows two irregular characteristics of the underlying basal groundwater given the extent of the potentially contributing upland watershed:

- The 65.8° F temperature at the top of basal lens is four to six degrees colder than in upgradient wells which tap the high level groundwater.
- The salinity is substantially higher than would otherwise be expected.

These characteristics are found in all basal wells from Keahole Point to as far south as the old Kona Airport.

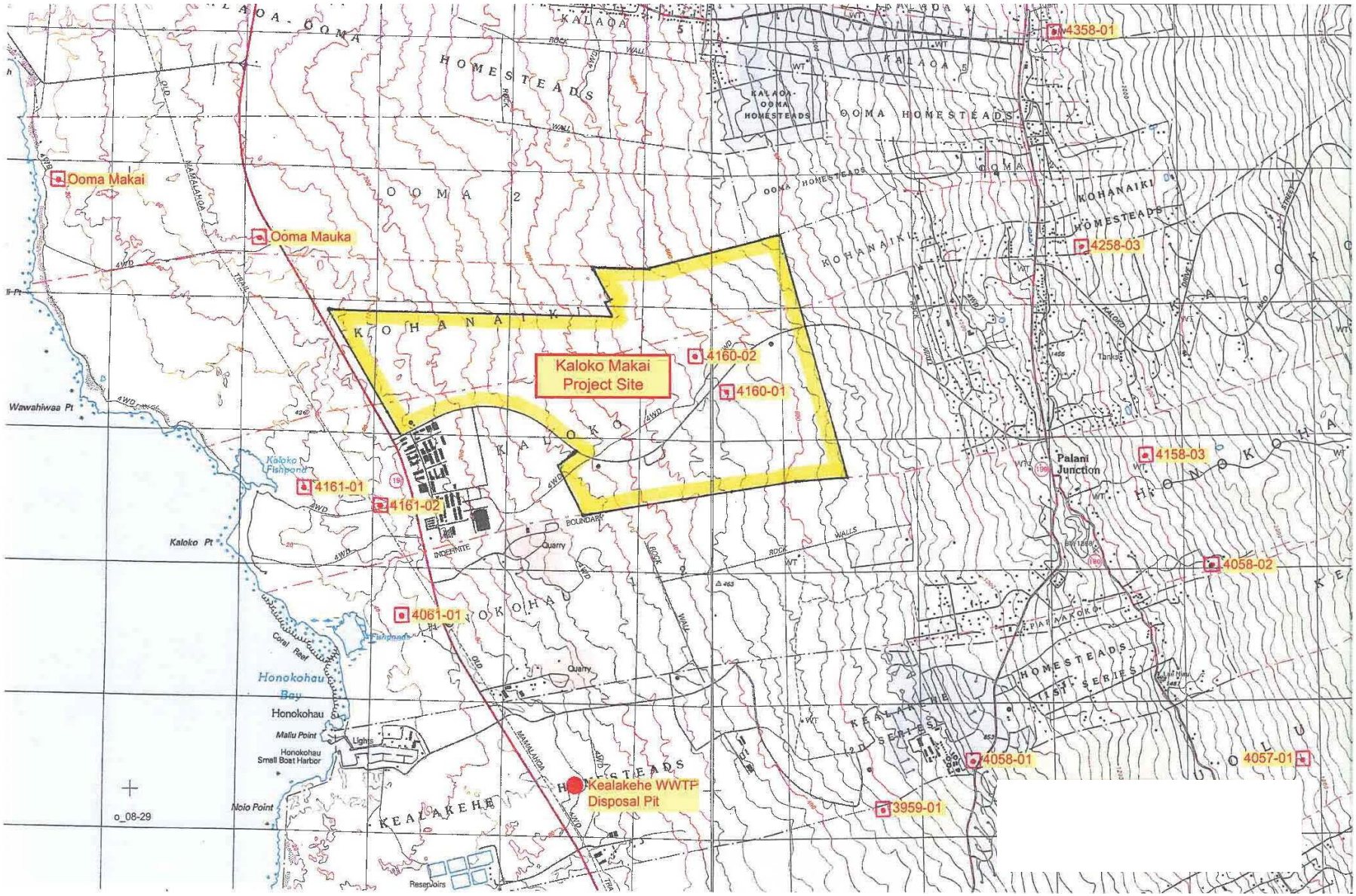
Flowrate Through Basal Aquifer: The most recent and reliable computations of groundwater recharge for Hawai‘i Island are presented in Engott, 2011. Kaloko Makai is part of the Keauhou Aquifer System. Engott computed a recharge of 152 million gallons per day (mgd). Reducing this by 14 mgd, the current groundwater pumpage from the aquifer system, leaves an average groundwater flow rate of about 9 mgd per coastal mile across the aquifer’s shoreline width. If all the rainfall recharge into the high-level aquifer were to discharge into the down gradient basal lens, the flowrate would create a robust basal groundwater body which could be developed for irrigation use and possibly drinking water supply.



Source: Department of Water Supply, *Final Hawaii County Water Use & Department Plan Update Hawaii Water Plan, August 2010*

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 3-5
Hualalai Aquifer
Kaloko Makai

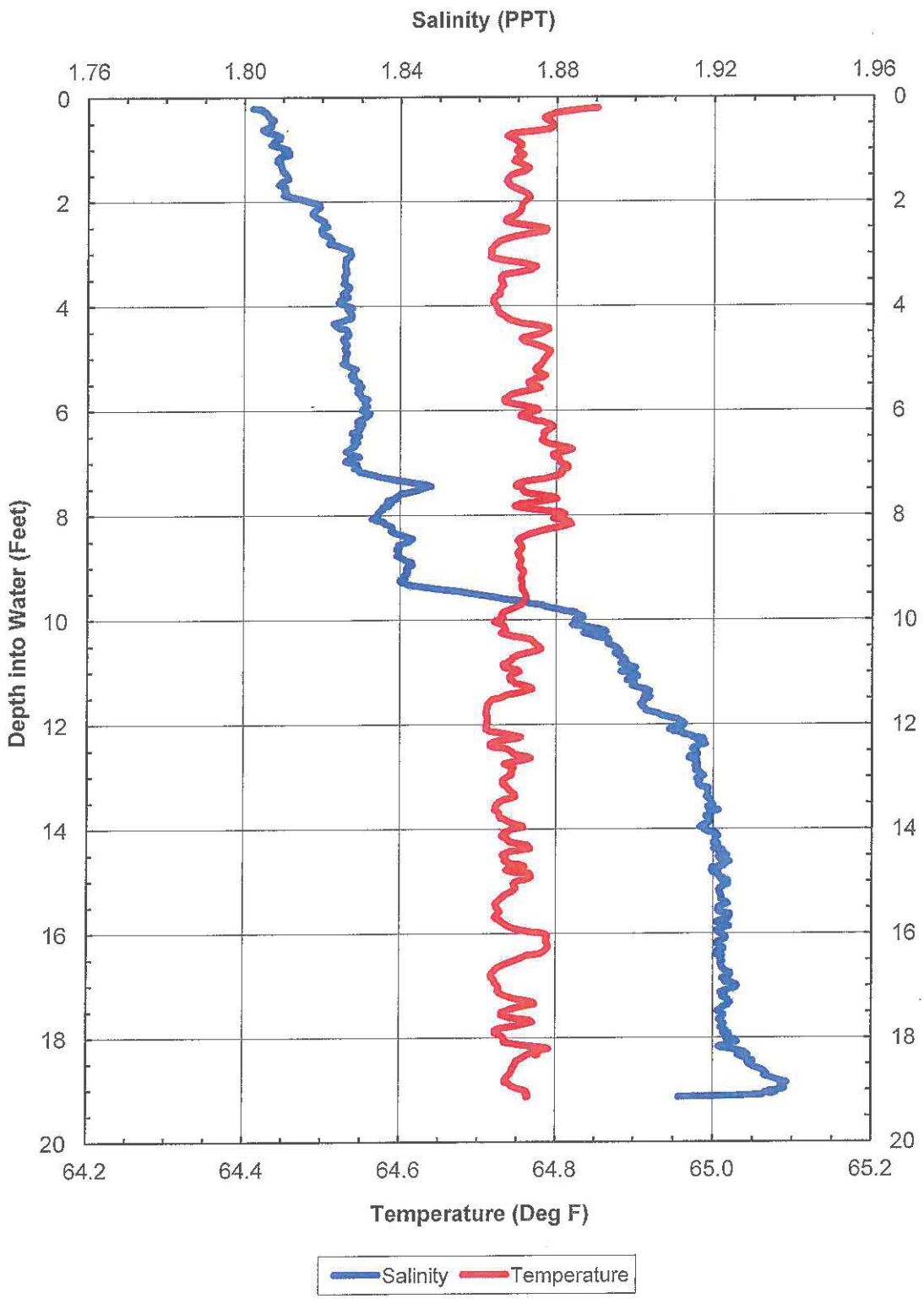


Source: Tom Nance Water Resource Engineering, December 2012

FIGURE 3-6

Location of Wells Within or Near Kaloko Makai Project Site

Kaloko Makai



Source: Tom Nance Water Resource Engineering, December 2012

FIGURE 3-7

Salinity and Temperature Profile Through the Water Column of Well 4160-02 (September 14, 2012)

Kaloko Makai

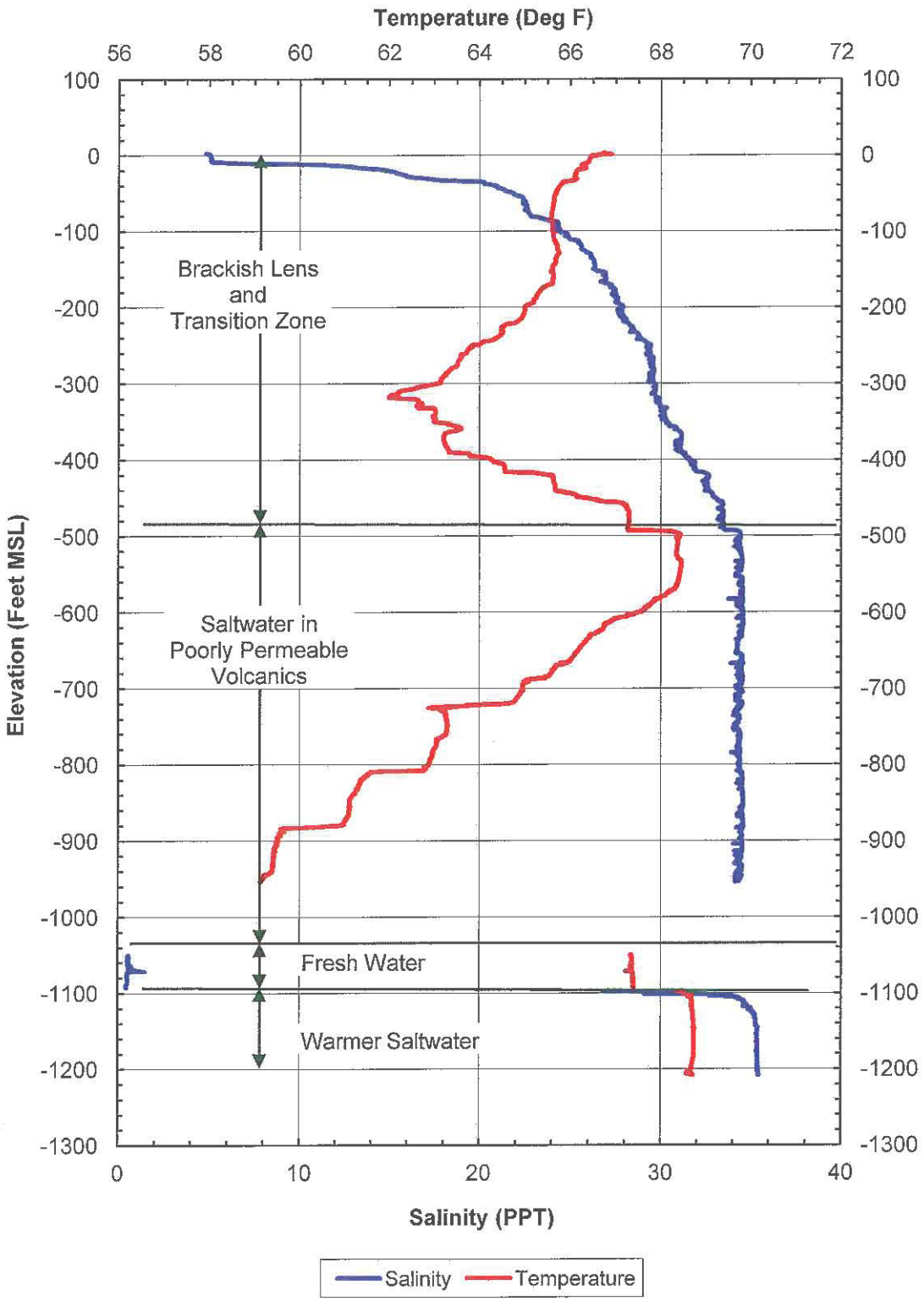
This is decidedly not the case for the basal lens between the Old Kona Airport and Keāhole Point. Indications are that the actual basal flowrate is less than one-third of what might be expected if all of the discharge from the high-level groundwater was into the inland margin of the basal lens.

High-level Groundwater Occurrence: High-level groundwater occurrence in North Kona was first discovered in 1990 with a well drilled in Keauhou at 1,620-foot elevation above Mamālahoa Highway. Since then, more than 20 high-level wells have been developed from Kalaoa in the north to Kealakekua in the south. With a few exceptions, all of these wells have been located above Mamālahoa Highway.

Data collected from the State's Keōpū Monitor Well (No. 3858-01) and Kamakana Monitor Well (No. 3959-01) (see Figure 3-8) provide insight into the possible geologic feature creating high level groundwater occurrence tapped by wells above Mamālahoa Highway and the resulting anomalous flowrate, salinity, and temperature in basal lens.

Both wells were drilled through the basal lens, continued through the underlying saline groundwater, and then encountered fresh and confined groundwater at depth. Prior to drilling the Keōpū Well, encountering fresh water at depth was unexpected. During drilling of the Kamakana Monitor Well, salinity and temperature of the water in the borehole were closely monitored, enabling the different groundwater regimes penetrated by the borehole to be accurately documented. These are described below and illustrated in Figure 3-8.

- Initially, a thin, relatively saline (5 parts per thousand (ppt)) and cool (66° F.) basal lens was encountered. The water level was typically about 2.5 feet (mean sea level (msl)) according to the available surveyed elevation. However, the mid-point of the transition zone of this basal lens is between 35 and 40 feet into water, suggesting that the water level may actually be less than two feet.
- Below the brackish basal lens is a thick transition zone which extends to a depth of 490 feet below sea level. In this transition zone, the water temperature steadily declines to 62° F at 320 feet below sea level and then the temperature trend reverses, increasing to 67° F at 490 feet below sea level.
- Below this thick transition zone, extending from 490 to more than 1,020 feet below sea level, the salinity is essentially that of seawater and the temperature steadily declines with depth to about 59° F.
- At 1,060 feet below sea level, fresh water was encountered. It was about eight degrees warmer than the saline groundwater immediately above it and had a piezometric head subsequently determined to be about 32 feet above sea level. The fresh water rushed up the borehole, mixing with the saltwater above for the first 150 feet, moving up the borehole for the next 720 feet with little or no mixing, and then mixing into the transition zone above that (Figure 3-9).
- The freshwater zone turned out to be less than 40 feet thick. At 1,100 feet below sea level, warmer (70° F.) and slightly hypersaline (35.4 ppt) groundwater was encountered. Drilling continued for another 120 feet with no salinity or temperature change.



Source: Tom Nance Water Resource Engineering, December 2012

FIGURE 3-8
Composite Profile Through the Water Column of the Kamakana Borehole (Profiles of 4/12/10, 6/5/10, and 8/18/10)
Kaloko Makai

In addition, the monitoring also showed that the freshwater zone had a substantial response to ocean tidal variations. Comparative tidal lags and amplitudes for the respective periods of recording are shown in Table 3-1.

Table 3-1
Tidal Lags and Amplitudes

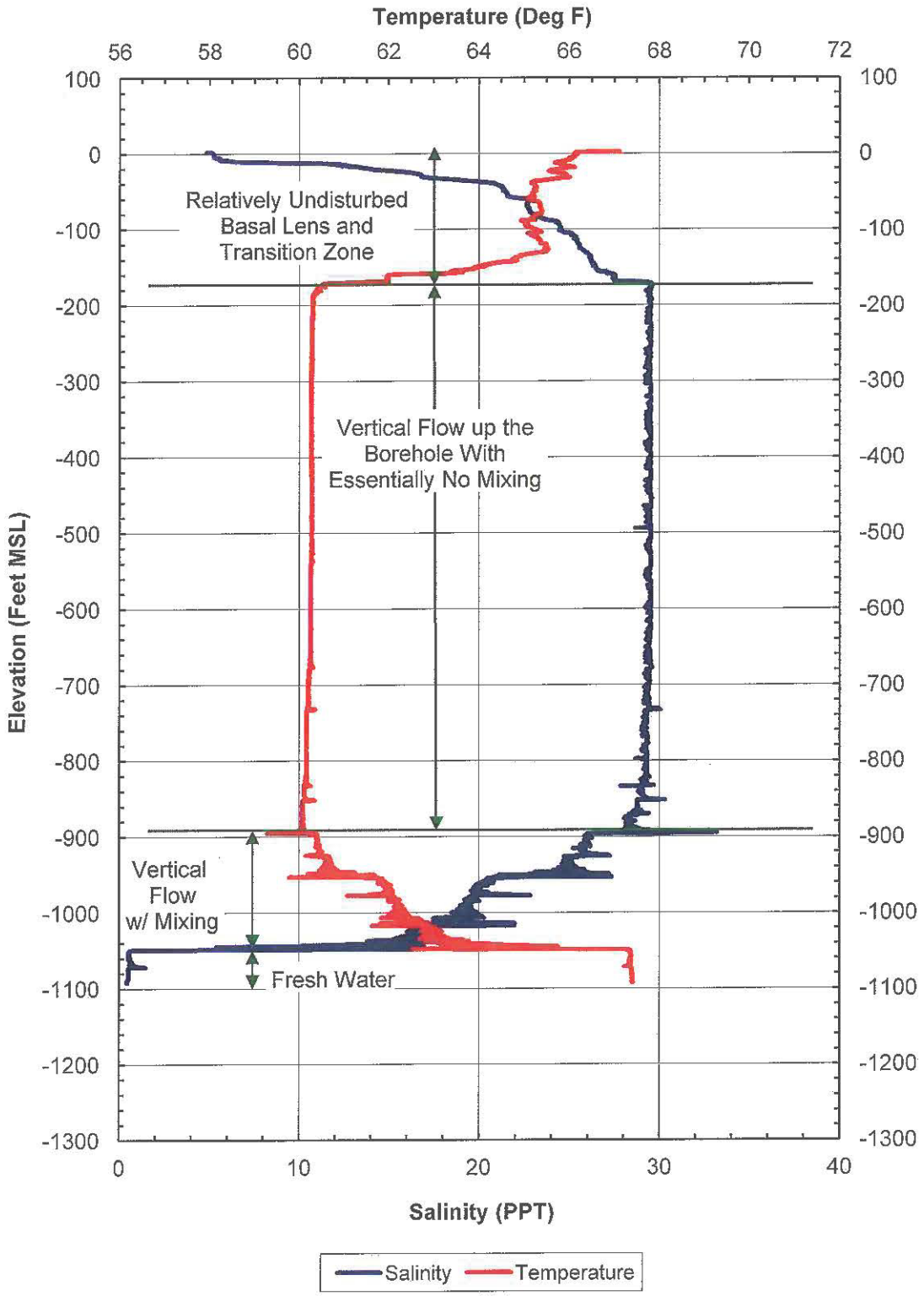
Groundwater Zone	Tidal Lag (Hours)	Tidal Amplitude (% of Ocean Tide)
Fresh Water Zone	1.0	48
Brackish Basal Lens	3.0	25
Source: TNWRE, July 2013 (Appendix C)		

Results of the two deep monitor wells provide insight on the relationship between high level and basal groundwater. Conclusions summarized below:

- The feature confining the fresh water at depth is a thick sequence of poorly permeable lava flows, in the aggregate hundreds of feet thick.
- That poorly permeable lava flows are the mechanism creating high level groundwater in Kona is also supported by the results of two high level wells located above Mamālahoa Highway (Hualālai State No. 4258-03 and Keōpū State No. 3957-05). During the construction and testing of these wells, water levels rose and yields increased by drilling deeper.
- The confined fresh groundwater at depth, with an apparent hydraulic connection to seawater at depth offshore, suggest that at least some of the inland high level groundwater may discharge at depth offshore rather than flow into the basal lens at is inland margin.
- With limited amounts of warmer, high level groundwater flowing into the inland margin of the basal lens, the source of the colder temperatures in the basal lens is seawater at depth moving inland in a saltwater circulation pattern beneath the basal lens.

Rainfall-Runoff Generation and Disposal: According to the *2011 Rainfall Atlas of Hawai'i* (Giambelluca and Others, 2011), average annual rainfall across the project site varies from 15 - 25 inches per year. The land surface at the project site consists of unweathered and very permeable lavas with sparse deposits of ash soils and no defined drainageways. Essentially no rainfall runoff leaves the site in its present conditions, even during intense storm events. It is either lost to evaporation or percolates to the underlying groundwater.

Ground Water Quality: Samples from wells, anchialine ponds, and other locations within and near the Kaloko Makai project site were taken for water quality analysis. Samples taken from high-level groundwater wells had low salinity levels and nutrient concentrations were reflective of natural, rather than man-made input (see Appendix C, Table 2). Samples from basal wells had higher salinities and varying nutrient concentrations. Samples were also taken from the upper end of Honokōhau Harbor and the discharge of the R-2 quality wastewater effluent from Kealakehe Wastewater Treatment Plant (WWTP).



Source: Tom Nance Water Resource Engineering, December 2012

FIGURE 3-9
Profile Through the Water Column of the Kamakana Borehole After Fresh Water was Encountered (May 12, 2010)
Kaloko Makai

Kealakehe WWTP discharges approximately 1.3 mgd of effluent into a pit approximately 3,700 feet inland from Honokōhau Harbor on the mauka side of Queen Kaʻahumanu Highway. Nutrient removal from the WWTP effluent as it moves to and discharges into the upper end of Honokōhau Harbor is summarized below.

The inland excavation of the harbor acts as a point sink for groundwater discharge including the addition of the WWTP effluent into the groundwater. Travel from the pit disposal to the upper end of the Honokōhau Harbor consists of a 60-foot drop through the vadose zone and 3,700 feet of travel with groundwater to the upper end of the Harbor. The samples taken on November 9, and 21, 2011 at the upper end of the Harbor are a mix of: 1) the WWTP treated effluent that has underground natural nutrient removal, 2) the ambient groundwater, and 3) seawater.

Nutrient removal is calculated using several steps and the details are provided in TNWRE's report (see Appendix C). Based on these calculations, rates of removal of nitrogen are 89 to 92 percent; for phosphorous, the removal rates are 93 to 98 percent.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The two primary project improvements potentially impacting groundwater resources are the alternatives for developing drinking water sources and the system for reclaiming wastewater generated by the Kaloko Makai development. These project improvements and their potential impacts are discussed below.

The following assumptions has been incorporated in estimating the project's impact on basal water.

Projected Drinking and Non-Drinking Water Demand: Drinking water use for Kaloko Makai will be limited to consumption, general household and commercial use, and irrigation of landscaping within individual single family residential lots. The average drinking water demand for Kaloko Makai at full build-out is estimated to be approximately 2.18 mgd. Table 3-2 summarizes the estimated water demand for Kaloko Makai.

Kaloko Makai will utilize non-drinking recycled water (R-1) from its on-site wastewater treatment plant for general irrigation of common landscaping features, including district-scale park, neighborhood parks, open spaces (as necessary), and the schools. At full build out, the projected irrigation use of R-1 recycled water is 0.57 mgd.

Water Source Alternatives: The drinking water system's well pumping capacity must provide the maximum day use (defined as 1.5 times the average use) in a 24-hour pumping day. If the wells are dedicated to and incorporated into the County Department of Water Supply (DWS) system, one-third of the well capacity would be allocated to DWS and two-thirds would be allocated to the developer. Three alternative drinking water sources are being considered (see Appendix C):

1. On-site Wells at 710-foot Elevation Within the Project Site (PREFERRED ALTERNATIVE)
2. On-site Wells at 710-foot Elevation with Reverse Osmosis (RO) Treatment
3. On-Site Wells at 363-foot Elevation with Desalinization of Saline Groundwater

Table 3-2
Drinking Water and Non-Drinking Water Demand
Average Daily Use

	Units	Landscape Units	Scale	gpd/Scale	Drinking Water (gpd)	Non-Drinking Water (gpd)
Phase 1						
SF Residential	471		units	SF <400/0>	188,400	-
MF Residential	1,281	387	units	MF <276/124>	353,556	47,988
Commercial	430,000		SF	430 Commercial ft2 <83/37>	35,690	15,910
Light Industrial	25	5	acres	<2000/2000> / acre	50,000	10,000
School	18	9	acres	<2400/1600> / acre	43,200	14,400
Parks	35	26.25	acres	<600/3400> / acre	21,000	89,250
Hospital	40	10	acres	200 units <400/0> <0/1600> / acre	80,000	16,000
Lodge	200		units	200 units <400/0>	80,000	-
WWTP	20	2	acres	Arbitrary	2,000	-
Electrical Substation	1	0.1	acre	Arbitrary	2,000	-
				Total Phase 1	**855,846**	**193,548**
Phase 2						
SF Residential	932		units	SF <400/0>	372,800	-
MF Residential	1,156	354	units	MF <276/124>	319,056	43,896
Commercial	145,000		SF	145 Commercial ft2 <83/37>	12,035	5,365
Light Industrial	25	5	acres	<2000/2000> / acre	50,000	10,000
School	12	6	acres	<2400/1600> / acre	28,800	9,600
Parks	10	7.5	acres	<600/3400> / acre	6,000	25,500
				Total Phase 2	**788,691**	**94,361**
Phase 3						
SF Residential	1,054		units	SF <400/0>	421,600	-
MF Residential	244	26	units	MF <276/124>	67,344	3,224
Commercial	40,000		SF	40 Commercial ft2 <83/37>	3,320	1,480
Light Industrial	25	5	acres	<2000/2000> / acre	50,000	10,000
School	12	6	acres	<2400/1600> / acre	28,800	-
Parks	11.2	8.4	acres	<600/3400> / acre	6,720	-
Fire Station	5.5	0.55	acres	<1800/1200> / acre	9,900	-

Table 3-2 (continued)
Drinking and Non-Drinking Water Demand
Average Daily Use

	Units	Landscape Units	Scale	gpd/Scale	Drinking (gpd)	Non-Drinking Water (gpd)
Phase 3						
Desalination Plant	1.7	0.17	acres	Arbitrary	2,000	-
				Total Phase 3	**589,684**	**14,704**
Project Total (Average Demand)					**2,234,221**	**302,613**
Max Day Demand (gpd) (Average Demand x 1.5)					3,351,332	453,920
Peak Hour Demand (gpd) (Average Demand x 5)					11,171,105	1,513,065

Source: Wilson Okamoto Corporation, July 2013 (see Attachment P)
Note: the "Phase" estimates are based on "Average" daily use; there is a factor applied under "Project Total" to compute "Maximum" demand.
Assumptions based on Hawai'i County, Water System Standards, Domestic Consumption Guidelines (Hawai'i County WUDP):
Residential - 400 gpd per unit (all unit types: SF, MF low-rise or MF high-rise)
Commercial - 130 gpd per 1,000 sq. ft.
Light Industrial - 4,000 gpd per acre (or 17,000 gpd per acre)
Hospital - 4,000 gpd per acre
Hotel - 400 gpd per unit (or 17,000 gpd per acre)
Schools - 4,000 gpd per acre or 60 gpd per student
Parks - 4,000 gpd per acre
(TOD Greenbelts and Dryland Forest not irrigated)
(Parks, Plazas, Squares, Roadways, etc irrigated with R-1 treated wastewater)
(Park 4 will use drinking water)

Alternative 1 – On-site Wells at 710-foot elevation Within the Project Site: The possibility of developing drinking water quality wells at 710-foot elevation is suggested by the discoveries of two deep monitor wells (State Nos. 3858-01 and 3959-01), both of which encountered fresh groundwater under artesian pressure at depth below saline groundwater and far below and hydrologically disconnected from the basal lens. A deep exploratory borehole at 710-foot elevation within the project site will be undertaken to determine if fresh groundwater can be found at depth at this site and to determine the feasibility of its development.

If successful, three production wells would be developed, each of 1,150 gallons per minute (gpm) capacity and driven by 350 horsepower motors. These wells would be integrated into the DWS system, with two-thirds of their capacity allocated to supply the Kaloko Makai project.

The project would consist of the following elements:

- Exploratory, then three production wells each with a 1,150-gpm, including line shaft pumps and appurtenances
- Pump control building
- Fencing
- Access road improvements
- Three, 1- to 2-mg concrete reservoir sizes (as required by DWS)
- Utilization of a transmission line along the access road to connect to an existing water main on Hina Lani Street

Cost of construction would be borne by Kaloko Makai. The facilities may be dedicated to DWS and an agreement negotiated with the County DWS for use of the water.

Alternative 2 – On-site Wells a 710-foot Elevation with Reverse Osmosis (RO) Treatment: In the event that artesian groundwater is found below saline groundwater but its salinity at projected draft rates would not meet drinking water standards, the alternative of RO treatment of this water would be considered. This treatment process would produce a wastewater stream, referred to as a concentrate, that would be disposed of injection wells at the project's WWTP. Due to the required RO treatment, DWS may not accept the wells and RO treatment plant for dedication. In that case, the capacity of the wells, as feedwater sources for RO treatment, would be sized to provide the project's maximum day use in a 24-hour pumping day assuming 65 percent product recovery in the RO process.

As a private system, provision of standby well pumping capacity would be required. These criteria translate to four 1,150 gpm well pumps, with one as a standby. At full build-out, the disposal of concentrate would be 1.15 mgd as a year round average.

The project would consist of the following elements:

- Exploratory, then four production wells each with a 1,150-gpm, including pumps and appurtenances
- Pump control building
- Fencing
- RO treatment plant
- Access road improvements
- Three, 1- to 2-mg concrete reservoir (as required by DWS).

Cost of construction would be borne by Kaloko Makai. The system would be privately owned and operated.

Alternative 3 - Desalinization of On-site Saline Groundwater**:** In the event that the first two alternatives described above are not feasible, desalinization of on-site saline groundwater would be undertaken. The raw water supply wells and desalinization plant would be located next to or below DWS's existing 363-foot tank along Hina Lani Drive. The raw water supply wells would draw saline groundwater from beneath the basal lens. Tentatively, the depth from which this supply would be withdrawn would be between 250 and 350 feet below sea level, requiring total well depths on the order of 710 feet. The expectable production of drinking water from this saline feedwater supply is 40 to 45 percent, meaning that 2.5

gallons of saline groundwater would be required for every gallon of fresh product water produced. As a private system with redundant capacity, this would translate to four 750 gpm treatment trains with each treatment train supplied by 1,900 gpm raw water supply well.

To reduce the RO power requirements, pressure transfer devices would be installed to recover energy from the RO concentrate stream. The concentrate itself would be hypersaline (salinity on the order of 50 ppt compared to seawater at 35 ppt). Its disposal, amounting to 4.9 mgd at full build-out, would be in three deep wells located at the project's on-site WWTP.

The desalination plant would be situated near the existing 363-foot water tank and feed lines from the wells to the treatment facility and would follow along Hina Lani Street. The on-site desalination facility will include storage, transmission and distribution system proposed for Kaloko Makai. The desalination plant would treat the water through a RO process. Prior to RO, the feedwater from the wells is pre-filtered to remove particulates that can negatively affect the RO membranes. This pre-treatment will reduce damage and wear to RO membranes, which increase the RO process performance and life span of the system.

After pre-treatment, water is sent through the RO membranes at high pressure which removes dissolved solids. The water is then conditioned for pH adjustment and disinfection. The water can then be used as drinking water.

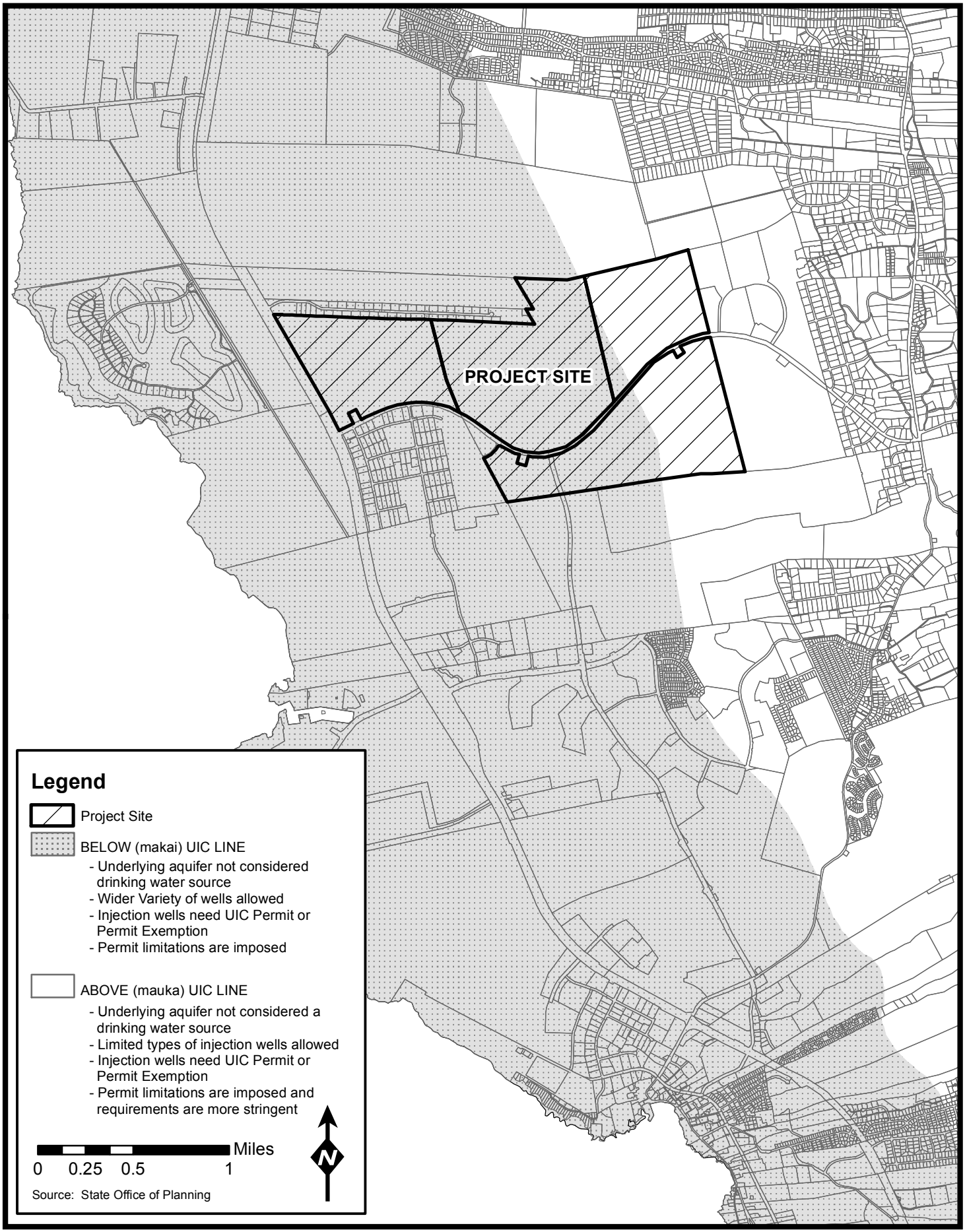
The wastewater of the RO process is a concentrated brine; it will be discharged in on-site deep disposal wells, at depths to avoid recirculation to the supply wells.

Since the concentrate would have a greater density than the surrounding saline groundwater, it will flow seaward without rising above the surrounding saline groundwater and will not rise to the basal lens. It will then be discharged into the ocean offshore at a substantial depth and distance from the shoreline.

The saline concentrate discharge wells will be situated below the Underground Injection Control (UIC) line. Figure 3-10 is the map of the region noting the UIC line.

In addition to drinking water and brine concentrate, the desalination process will also produce small amounts of reject water from the pre-treatment process, water from membrane cleaning and membrane cleaning solution. These by-products will be properly treated and processed at the on-site wastewater treatment facility or disposed of in the same deep wells used for the concentrated brine solution.

Cost of construction would be borne by Kaloko Makai. The system would be privately owned and operated.



WILSON OKAMOTO CORPORATION

FIGURE 3-10

Underground Injection Control Area, Island of Hawai'i

Kaloko Makai

The proposed desalination system will be subject to regulation as a public water system and will meet conditions of the State DOH, including HAR Chapter 11-20, 11-21, and 11-25. The desalination water system will have no impact on drinking water or brackish groundwater. Likewise, it will not affect nearshore waters. This includes groundwater used by neighboring projects or anchialine pools and fishponds in the area, including nearby Kaloko-Honokōhau National Park.

In summary, two of the three drinking water source alternatives would drill wells at the mauka end of the project site. If successful, wells for these two alternatives would tap fresh or slightly brackish artesian groundwater which exists at depth below the basal lens and saline groundwater. One or the other of these options would only be pursued if it can be demonstrated, initially by testing in the exploratory borehole and subsequently by testing in the finished production wells, that pumping this water will have no impact on the basal lens above. Rather it would simply be tapping groundwater that flows beneath the basal lens and does not leak into it.

The third alternative, desalination of saline groundwater would utilize on-site wells designed to draw water from a substantial distance below the basal lens where the salinity would be 30 ppt or greater. Extensive testing would be undertaken in the development of these wells to affirmatively demonstrate that such pumping can be done without adversely impacting the overlying basal lens.

None of the alternative drinking water sources would utilize water from the brackish basal lens beneath the project site. Of the two alternatives that would draw from high-level groundwater, none would impact basal groundwater in the project's mauka-makai corridor or elsewhere in North Kona. However, these alternatives would result in a 1:1 reduction of fresh groundwater ultimately discharged into the marine environment offshore.

As an overarching philosophy in all source alternatives, Kaloko Makai is committed to water conservation strategies to reduce consumption, conserve resources and minimize water use. The goal is to reduce the total water use through a combination of water saving equipment and strategies.

A number of measures may be implemented to facilitate end-user conservation, including water restrictions during drier periods, public education and more efficient landscaping practices. Consumption could be significantly reduced through end-user conservation.

In providing sources of drinking water for Kaloko Makai, the Project will comply with all laws and regulations. As necessary, Kaloko Makai will undertake additional research to assess the potential impacts and appropriate mitigation measures of the selected systems.

Relationship of Basal to High Level Groundwater: It is assumed that no high-level groundwater leaks into the basal lens beneath the project site, in other words that flow in the basal lens is entirely due to local recharge on the area between Mamālahoa Highway and the shoreline. That flowrate is estimated to be 1.7 mgd per coastal mile. Across the 1.2 mile width of the project site, the basal flowrate is estimated to be 2.0 mgd. It should be noted that if some or most of the high-level groundwater is flowing into the basal lens, the project's relative impact on this greater basal flowrate would be less than calculated herein.

Ambient Quality of the Underlying Basal Groundwater: The salinity and nutrient levels in samples taken from on-site Well 4160-02 are assumed to represent the ambient quality of the underlying basal groundwater. These averages are: salinity of 1.75 ppt; total nitrogen of 80 micromolar (µM) or 1.12 milligrams/liter (mg/l); and total phosphorous of 5.5 µM or 0.17 mg/l.

R-1 Quality Wastewater for Landscape Irrigation: Landscape irrigation will be supplied by both the drinking water and non-drinking water systems, the former occurring primarily in single family residential areas which will not be supplied by the non-drinking water system. The use of drinking water for this purpose at full build out is estimated to be 0.46 mgd, calculated as an average of 4,000 gpd/acre on 115 acres throughout the project site (see Appendix C). Irrigation using R-1 effluent as the source of supply would be about 0.57 mgd. That means the excess of R-1 for disposal in injection wells at the project's WWTP site would be about 0.90 mgd.

For the calculations herein regarding the percolation of excess applied irrigation water to the underlying basal lens, three assumptions are made:

(1) 12 percent of the water applied for irrigation will be in excess of landscaping requirements and percolate to the basal groundwater below.
(2) TN and TP in the R-1 effluent are assumed to be 1,500 and 200 µM, respectively, based on levels of these nutrients in the effluent from the County's Kealakehe WWTP (Table 2 in Appendix C).
(3) Fertilizer levels where landscape irrigation is supplied by R-1 effluent will be far less than where the supply is the drinking water system.

Assumed fertilizer applications for landscaping are:

- In areas irrigated with drinking water, nitrogen and phosphorus in fertilizers will be applied at 3.0 and 0.5 pounds/year/1,000 sq. ft., respectively.
- In areas irrigated where R-1 effluent, nitrogen and phosphorus in fertilizers would be applied at 10 percent of the rate applied with drinking water irrigation.
- Ten percent of the applied nitrogen and two percent of the applied phosphorus will be carried in the excess applied irrigation water below the plant root zone.

There may be times when R-1 supplies are not sufficient to meet the irrigation demands of the parcels that are connected to the R-1 distribution system. For example, in the first phase of development, there will likely be not enough R-1 water to irrigate the parks and schools that are slated for construction. Therefore, addition of supplemental drinking water to the R-1 storage tank will be required to ensure the irrigation demands can be met.

It is assumed that approximately 15% of applied irrigation water will percolate down to the basal ground water. As the excess irrigation water percolates downward through the unsaturated zone to the groundwater, removal rates of nitrogen and phosphorus from the water will be significant.

As a long-term average, it appears that the value of R-1 treated wastewater effluent will exceed its on-site irrigation reuse by about 0.90 mgd. If other uses cannot be found for this water, this excess

will be disposed of in injection wells located at the project's WWTP. The wells would be designed to deliver this excess at depth below the basal lens so as not to impact the lens itself.

To accomplish this, disposal would be at and below where the receiving groundwater salinity is 30 ppt or greater. This may require the injection wells to deliver the water at depths of 300 feet or more below sea level.

On-Site Rainfall Recharge: It is assumed that 60 percent of the project site's 20 inches of average annual rainfall percolates to and becomes groundwater recharge. This amounts to an average of 1.0 mgd. Drainage features of the development will capture surface runoff and direct it to seepage basins and drywells, resulting, as a first order approximation, in no change in the amount of onsite rainfall ultimately becoming groundwater recharge. However, it is also assumed that nutrient levels in the post-development rainfall percolating to groundwater will be increased by 20 µm and 2 µm for nitrogen and phosphorous respectively.

Natural Removal of Nutrients Originating from Kaloko Makai: As previously mentioned rates of removal of nitrogen are 89 to 92 percent; for phosphorous, the removal rates are 93 to 98 percent.

Table 3-3 summarizes the aforementioned assumptions to estimate possible changes to the brackish basal lens beneath the project site as a result of the project. The resulting estimates are: a 6.2% increase in the flowrate; a 5.1 percent reduction in salinity; and nitrogen and phosphorous increases of 5.2% and 2.1%, respectively.

Table 3-3
Approximated Changes to the Basal Groundwater Flowing Beneath the Kaloko Makai Project Site

Item	Flowrate (mgd)	Salinity (ppt)	Nitrogen (lbs/day)	Phosphorous (lbs/day)
Present Groundwater Flow	2.0	1.75	18.66	2.83
Excess Applied Irrigation • As Drinking Water + Fertilizer • As R-1 Treated Wastewater + Fertilizer	 0.055 0.70	 0.15 0.30	 0.502 0.210	 0.011 0.007
Change in Local Rainfall – Recharge	No change	No change	0.280	0.041
Post Development Totals • Amount Percent Change	 2.125 +6.2	 1.651 -5.1	 19.652 +5.2	 2.889 +2.1

Source: An Assessment of the Potential Impact of the Proposed Kaloko Makai Project on Water Resources, TNWRE, July 2013.

Notes:

1. *The area irrigated with drinking water is 115 acres. The amount of water used for this purpose is 0.46 MGD.*
2. *The area irrigated with R-1 effluent is 165 acres. The amount of R-1 used for this purpose is 0.57 MGD*

Changes to Groundwater Discharge into Marine Environment

Three other aspects of the project's development, although not having an impact on the basal lens, will affect the ultimate discharge of groundwater into the marine environment. Each of these are summarized below.

Consumptive Use of Drinking Water Quality Groundwater: Two of the three drinking water source alternatives would draw from high-level groundwater at depth below the basal lens. The project's ultimate drinking water use would be 2.1 mgd as a year-round average. Wells developed for such use would actually draw 3.27 mgd, one-third of which would be used by DWS to serve other customers in its service area. If desalinization is necessary (Alternative 3), the draft would be slightly greater than 3.3 mgd.

Based on the Keauhou Aquifer recharge calculations in Engott 2011, this total draft for the Project and DWS would represent a two to three percent reduction of the total groundwater discharge into the marine environment offshore of the aquifer. It appears that some or most of this change would be occurring at substantial depth and distance offshore with no significant impact.

Disposal of Excess R-1 Effluent via On-site Injection Wells: The R-1 treated wastewater effluent generated by the project will exceed its on-site irrigation reuse by an estimated 0.90 mgd. If other uses cannot be found for this effluent, then the excess would be disposed in injection wells. The wells would be designed to deliver the excess effluent at depth below the basal lens so as not to impact the lens itself. Disposal of the R-1 effluent would be at and below where the receiving groundwater salinity is 30 ppt or greater and below poorly permeable lava flows identified in the process of drilling. This may require the injection wells to deliver the R-1 effluent at depths of 300 feet or more below sea level. However, the extraordinary disposal depth is warranted to avoid having a significant impact on basal groundwater moving through Kaloko- Honokōhau National Park or to the Park's nearshore waters. The effluent disposed of would be significantly less dense than the receiving basal groundwater. The tendency for the disposed R-1 effluent to rise up due to its lesser density would be offset by: disposal beneath one more poorly permeable lava flows; the substantial vertical to horizontal anisotropy in the lava flows, and progressive mixing of the effluent into the receiving groundwater, causing its density to increase.

Potential Disposal of RO Concentrate: Two of the three alternative drinking water sources being considered involve desalinization. In the event water for Alternative 1 does not meet DOH standards for drinking water use (i.e. too saline,) then Alternative 2 will be implemented and the groundwater will be desalinated in an on-site reverse osmosis (RO) desalination facility. This desalinization will produce a wastewater, referred to as concentrate, which at full build out would be approximately 1.15 mgd (60 to 70% product recovery). If the salinity of the feedwater supply is between 2.0 and 3.0 ppt, the salinity of the concentrate would be in the range of 5.3 to 8.2 ppt. The concentrate will be brackish, assumed to be too saline for irrigation reuse, and would therefore require disposal in one or two wells, different from the injection wells used for excess R-1 effluent disposal. The wells will be designed to deliver the RO concentrate to below the midpoint of the transition zone between brackish basal water above and saline groundwater below in order to avoid impacting the overlying basal lens. With such disposal, the RO concentrate would flow toward the shoreline, discharge beneath the basal groundwater below the National Park's anchialine ponds. It

may emerge into the National Park's nearshore waters where it would quickly be mixed to background levels.

Storm and Surface Water Runoff

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Prior to the occupancy of any residential or commercial unit within the Project, Kaloko Makai shall implement and maintain storm and surface-water runoff best management practices, subject to any applicable review and approval of the State DOH, designed to prevent violations of State water quality standards as a result of storm-water discharges originating from the Project. Such BMPs will be documented in a declaration of covenants, conditions and restrictions, that will be recorded against the property and will run with the land.

The project's proposed drainage system will be designed to minimize impacts to near shore coastal waters. Water quality treatment and detention basins will be built to prevent runoff and sedimentation from impacting groundwater resources. Innovative and more natural ways to handle drainage improvements will be sought to comply with the County drainage standards.

Pollution Prevention Plan (PPP)

Kaloko Makai shall develop a Pollution Prevention Plan (PPP) that provides BMPs, including structural BMPs, for pollution prevention that address all categories of permitted uses within the Project, and shall address environmental stewardship and the non-point sources of water pollution that can be generated from any uses allowed within the Project. It is anticipated that the PPP will be similar to the "Declaration Regarding Pollution Prevention Plan for West Hawai'i Business Park." No grading activity will take place on the property until the PPP has been prepared.

Control of contaminated surface water can be achieved through the development of a PPP designed to address all pollutants associated with the development and to identify measures that will contain and treat such pollutants in order to prevent any release into the environment, including the groundwater. There will be no anticipated adverse impact on groundwater quality from the development of this project.

3.5.2. Nearshore Marine Environment and Ponds

Marine Research Consultants, Inc. (MRC) prepared *An Assessment of Marine and Pond Environments in the Vicinity of Kaloko Makai Project* (December 2012). The assessment is summarized below and the report in its entirety is included in Appendix D.

Although not located on the coastline, the Kaloko Makai project still has the potential to affect chemical and biological process in the nearshore marine environment. As a result, it is important to provide a characterization of the nearshore marine system and ponds in order to establish a baseline that can be used in the future to evaluate changes that may occur because of the Kaloko Makai project.

The main structural feature of the shoreline downslope of Kaloko Makai is an extensive beach that extends the length of the Kaloko-Honokōhau National Historical Park. Shoreline pools formed in the basalt bench include intertidal seaweeds, encrusting red algae, and contain numerous urchins, as well as numerous juvenile reef fish.

Beyond the shoreline, the structure of the offshore environment generally conforms to the pattern that has been documented as characterizing much of the west coast of the Island of Hawai‘i. The zonation scheme consists of three predominant regions.

Beginning at the shoreline and moving seaward, the shallowest zone beyond the shoreline is a relatively flat basaltic shoreline bench, covered with scattered basaltic boulders; seaward of the platform boulder zone, bottom structure is composed predominantly of a gently sloping reef bench composed of basalt, interspersed with lava extrusions and sand channels and, as in most areas of West Hawai‘i, the most diverse coral communities on the reef are found in the mid-reef zone. Moving down the reef slope, coral settlement and growth cease at a depth of approximately 25 meters (m); beyond this depth, the bottom consists mostly of sand, with occasional basaltic outcrops.

The Kaloko-Honokōhau National Historical Park is located makai of the proposed Kaloko Makai project. Contained within the park boundaries are two large fishponds (Kaloko and ‘Aimakapā), tidal areas and wetlands. Over half of this 1,160 acre National Park is comprised of ocean waters.

3.5.2.1. Water Chemistry

Water samples were collected in February 2012 and November 2012 along transects that bisected Kaloko and ‘Aimakapā Fishponds in an inshore-off-shore direction. Ten sampling stations were established approximately equidistantly along each transect extending from the most landward shoreline of the ponds to the seaward shorelines. For the February 2012 data collection, sampling continued into the ocean from the shoreline for a distance deemed to reach open coastal waters. No ocean sampling was conducted in November 2012. Sampling of the ponds and ocean during previous surveys in 2000 and 2007 were conducted in an identical manner. In addition, in February 2012 samples were collected from three anchialine pools within the Park.

3.5.2.1.1. Physical Characteristics of ‘Aimakapā and Kaloko Ponds

Examination of the marine and pond water chemical analyses for samples collected in ‘Aimakapā and Kaloko Ponds and the adjacent ocean during four survey increments from 2000 to 2012 show several major patterns of horizontal stratification of water chemistry constituents in the ponds and the ocean (refer to Tables 1 – 5 and Figures 4 – 17 in Appendix D for sampling results). The most obvious characteristic of the data set is the major differences between patterns of water quality constituents in ‘Aimakapā /Kaloko Ponds and the ocean. The second most apparent difference in water chemistry is the variation in the patterns of distribution of water chemistry constituents between ‘Aimakapā Pond and Kaloko Pond. These variations between the two large fishponds are primarily the result of differences in physical structure of the barriers between the ponds and the ocean. ‘Aimakapā Pond is separated from the ocean by a fairly wide (~20 m) continuous sand berm which is not very permeable to exchange between the pond and the ocean. Such impermeability is apparent in the sharp, nearly vertical gradients at the shoreline of many of the water chemistry constituents (e.g., Salinity, Silica (Si), TN, TP, Total Organic Nitrogen (TON), Total Organic Phosphorous (TOP)) in ‘Aimakapā Pond.

While both ponds contain thick sediment bottoms, there is a substantial difference in the quality of the sediment. Bottom composition of ‘Aimakapā Pond consists of soft flocculent silty mud that is easily penetrable for at least one meter. Bottom composition of Kaloko Pond is a hard sand/mud mixture that is largely covered with marine algae, primarily the introduced species *Acanthophora specifera*. Sand/mud bottoms in both ponds were distinctly anaerobic beneath the surface layer as evidenced by the strong odor of H_2S when the bottom was even slightly disturbed.

3.5.2.1.2. Horizontal and Vertical Stratification

During all sampling events, salinity within ponds showed very different horizontal gradations from the ocean to the shoreward sides of the ponds. In ‘Aimakapā Pond, average salinity during the four surveys ranged from 12.45‰ in November 2012, 12.44‰ in February 2012, 12.67‰ in 2007 and 3.17‰ in 2000. The overall salinity in ‘Aimakapā averaged over all four surveys was 12.64‰, with a standard deviation of 0.43‰. These data indicate that the salinity in ‘Aimakapā is remarkable constant over the entire area of the entire pond, as well as over the 12-year interval of sampling. There is however, a slight trend of freshening over time, with the 2012 samples exhibiting the lowest salinities. The constancy of salinity through both time and space in ‘Aimakapā Pond is clearly evident (refer to Figure 4 in Appendix D).

The overall pattern of salinity in Kaloko Pond was substantially different than in ‘Aimakapā. Average salinity in the fishpond during the four increments of sampling was 22.93‰ in November 2012, 24.52‰ in February 2012, 19.59‰ in 2007 and 33.02‰ in 2000. The overall average salinity in Kaloko Pond for all surveys was 24.8‰ with a standard deviation of 6.1‰. As Kaloko Pond is “connected” to the ocean, the variability in salinity is a result of sampling at various stages of tide, and is also likely a response to the various stages of construction of the rock wall separating the pond from the ocean. All of the samplings of Kaloko Pond exhibited a pattern of increasing salinity with decreasing distance from the shoreline, indicating gradient of mixing between seawater and groundwater. The overall patterns of salinity, with the lowest values in 2007 and the highest in

2000 do not suggest any consistent pattern with respect to time as a function of groundwater input into the pond.

Examination of the marine and pond water chemical analyses for samples collected in ʻAimakapā and Kaloko Ponds and the adjacent ocean during four survey increments from 2000 to 2012 reveal slight vertical gradients in salinity in all sample sets with a surface layer of fresher water overlying a water column of saltier water. In ʻAimakapā Pond, salinity of surface samples was generally about 0.1-0.2‰ lower than bottom samples. In Kaloko Pond, the differences between surface and bottom samples was up to 2-4‰. The difference in vertical stratification between the ponds reflects the different levels of input and mixing between ocean water and groundwater, which are both lower in ʻAimakapā relative to Kaloko.

Comparing values of salinity within ʻAimakapā Pond to salinities of anchialine pools located in Kaloko-Honokōhau National Historical Park indicate that salinity in the fishpond is within the range of salinity as water in three representative pools water (8-14‰), while the salinity in Kaloko Pond is substantially higher than anchialine pools (Refer to Table 1 in Appendix D). These comparisons again point to the open circulation between Kaloko Pond and the ocean.

Typically, in nearshore surface ocean waters of West Hawaiʻi, there is a pattern of decreasing salinity with distance from shore. This gradient is indicative of low salinity groundwater entering the ocean near the shoreline and mixing with high salinity ocean water. While this was the general pattern observed on the Kaloko-Honokōhau National Historical Park transect sites in 2007 and 2012, a somewhat unusual finding is that the lowest salinities in the ocean samples were not found nearest to the shoreline off of either fishpond. Rather, the lowest salinities were measured in surface ocean samples approximately 25-50-m offshore. Consistent results suggest that groundwater flow to the ocean is primarily around the pond boundaries, rather than through the shoreline barriers that separate the ponds from the ocean.

Horizontal and vertical stratification of salinity in the ocean samples was evident at all stations during all surveys. Beyond 25-50 m from shore, with increasing distance from shore, salinity increased at all stations in both surface and bottom water. The difference in salinity between surface and bottom water samples was greater in the ocean than in either pond. These gradients indicate that mixing of groundwater entering the ocean does not completely homogenize the water column, with a surface layer of lower salinity water overlying a water column of ocean water.

As a result of the differences in permeability between the two ponds and the ocean, the patterns of dissolved nutrients vary considerably between ponds. Throughout Kaloko Pond there was little variation in nutrient concentrations. Concentrations of nitrate + nitrite nitrogen (NO_3^-), Si, orthophosphase (PO_4^{3-}) and ammonium (NH_4^+) were also consistently lower than the peak concentrations in the offshore ocean 25-50 m from the shoreline.

In ʻAimakapā Pond, the situation is substantially different. In addition, gradients of nutrients were very different between 2000 / 2007 and 2012. With the exception of NO_3^- and NH_4^+, water in ʻAimakapā Pond in 2000 had distinctly higher concentrations of nutrients compared to ocean water samples collected directly offshore of the ponds. NO_3^- in ʻAimakapā Pond is similar to Kaloko Pond, with consistently lower values in the pond relative to the ocean in 2000. In February 2012 and

November 2012 concentrations of NO_3^- at the inshore end of ʻAimakapā exhibited peak values with rapidly decreasing concentrations to the center of the pond. The magnitude of the gradients were also different between February and November 2012 surveys. The pattern of the other major inorganic nutrient, PO_4^{3-} exhibits a similar pattern, with high values at the shoreward end of the pond sharply decreasing values to the center of the pond.

These differences in gradients suggest the possibility of a qualitatively different level of groundwater input at the mauka end of ʻAimakapā Pond in 2012 relative to past surveys. While it is unlikely that the magnitude of groundwater flux has increased, it is possible that influx varies as a result of water level in the ponds. It has been shown that ʻAimakapā Pond responds to tidal fluctuations (damped relative to the ocean cycle in both magnitude and time) which push pond water inland during flood tides and draw groundwater into the ponds during ebbing tidal cycles.

During both 2012 surveys, the metabolic functioning of ʻAimakapā appears to have shifted toward a more "open" system. High input of low salinity water containing high concentrations of inorganic nutrients found in groundwater is evident along the inland shoreline of the pond. These concentrations decrease with distance seaward until the approximate center of the pond, where concentrations approach the levels found in 2000. TON and pH mirror the pattern of nutrients indicating gradients of progressive uptake and metabolic processes from the mauka edge toward the center of the pond. Hence, the recent data indicates steep gradients within ʻAimakapā Pond indicate that the entire system does not remain a completely heterotrophic system removing nutrients from the water column, while adding back end products of metabolic decomposition. Rather, the apparent increase in groundwater now results in indications that at least part of the pond is a more open system with respect to metabolic cycling reversing somewhat the progression toward an anoxic system. It may be however, that the differences between nutrient gradients in different sampling years is a response to sampling during different phases of the tidal cycle, with nutrient fluxes into the pond more pronounced during ebbing tides.

3.5.2.1.3. Conservative Mixing Analysis

A useful treatment of water chemistry data for interpreting the extent of material input from land is application of a hydrographic mixing model. In the simplest form, such a model consists of plotting the concentration of a dissolved chemical species as a function of salinity. This method of data interpretation has been adopted by the State DOH as a new protocol for evaluating compliance with water quality standards in West Hawaiʻi.

All of the concentrations of NO_3^- in ʻAimakapā and Kaloko Ponds lie far below the mixing line, suggesting that there is substantial uptake of NO_3^- within the ponds. While the actual concentrations of NO_3^- are slightly lower in Kaloko Pond compared to ʻAimakapā Pond, the difference in distance between the data points and the conservative mixing line indicate that there is substantially more uptake of NO_3^- in ʻAimakapā Pond than in Kaloko Pond.

The same processes of NO_3^- uptake occurring in the two large fishponds is not occurring in the anchialine pools. Rather, groundwater nutrients remain in essentially the same concentration while in the anchialine pool as in the submarine aquifer. Such a difference in nutrient cycling in the

smaller anchialine pools relative to the fishponds is a result of far more rapid flushing and turnover rate of water in the pools.

Phosphate phosphorus (PO_4^{3-}) is a major component of fertilizer and sewage effluent, but is usually not found to leach to groundwater to the extent of NO_3^-, owing to a high absorptive affinity of phosphorus in soils. Higher concentration at the shoreward end of ʻAimakapā Pond indicates a source of PO_4^{3-} that is not completely naturally occurring groundwater. However, the near-vertical linear array of data points indicates rapid uptake of PO_4^{3-} beyond the shoreward edge of the pond. PO_4^{3-} concentrations in Kaloko Pond also reflects mixing of groundwater and ocean water along with uptake by biotic activity within the pond, although the magnitude of uptake is less than in ʻAimakapā Pond. Data for anchialine ponds indicates that there are no external sources of PO_4^{3-} to the anchialine pools from sources other than naturally occurring groundwater.

Concentrations of NH_4^+ above mixing line are not a result of mixing of groundwater and ocean water. Rather, these concentrations are the result of either input from another source, or as is more likely the case, from *in-situ* metabolic processes within the ponds.

TON and TOP occur in very low concentrations in both open ocean water and high-level groundwater. The occurrence of TOP and TON far above the mixing lines likely reflects the metabolic cycling conversion of inorganic nutrients to organic nutrients by plant metabolism and decomposition in ʻAimakapā Pond. Owing to low circulation and flushing of the majority of ʻAimakapā Pond, and no uptake by biotic function, these organic nutrients remain in the water column. Contrary to ʻAimakapā Pond, the data points of TOP and TON versus salinity fall near the mixing lines, indicating that the level of organic decomposition and/or flushing of the pond is not occurring at the same level in Kaloko Pond. Within the anchialine pools, TON and TOP occur at very low levels, supporting the observation that rapid water exchange in the pools prevents accumulation of the products of organic metabolism.

Two major points can be made to summarize the results of the mixing analyses. First, and most importantly, there are no indications of significant input to any of the ponds of inorganic nutrients from sources other than naturally occurring groundwater. None of the data points scaling inorganic nutrients to salinity within the ponds or nearshore ocean indicate substantial nutrient subsidies to groundwater that could be a result of human activities in upland areas. The constituents that show substantial elevations in the ponds (NH_4^+, TON and TOP) are not the direct result of nutrient loading, but rather byproducts of metabolic cycling coupled with long residence time (slow water exchange) within the ponds.

The second major point that is illustrated by the nutrient data and mixing plots is that during the recent samplings in 2012 ʻAimakapā Pond exhibited a far more detectable pattern of active groundwater flux than in previous surveys. At the inland shoreline of the pond, input of low salinity, high nutrient groundwater was clearly evident during both of the 2012 surveys. Such input was not present in earlier surveys utilizing identical sampling methods. While the nutrient inputs were rapidly taken up within the shoreward half of the pond, the input of groundwater suggests a more active circulation than in the past. While the process responsible for these differences in input over a decadal period are not readily decipherable, it is clear that there is no indication of increased senescence of ʻAimakapā Pond. Rather, the measured increase in circulation indicates that the pond

may be stabilizing the trend of tending toward a system completely dominated by decomposition and infilling of sediment.

While not included in the present data presentation, past investigations of the Kaloko-Honokōhau National Historical Park area have included comparisons of the nutrient dynamics occurring in the fishponds to the effects of discharges of water from the Natural Energy Laboratory of Hawai'i (NELHA) at Keahole Point. These comparisons indicate that subsidies to groundwater of NO_3^- and PO_4^{-3} are far greater at NELHA than in the Kaloko-Honokōhau area as a result of high concentrations in deep seawater that is discharged into disposal trenches along the shoreline.

3.5.2.1.4. Pond Metabolism

The major concern regarding impacts to the pond resources at the Kaloko-Honokōhau National Historical Park from upland development is the effect that increased nutrient loading will have on pond metabolic function. The perception is that increases in nutrient concentrations to groundwater flowing from the development site to the National Park will alter the ponds in an undesirable manner. In order to estimate the magnitude of such changes, pond metabolism was estimated using measured changes in dissolved oxygen concentration in 'Aimakapā Pond over a one-week period in December 2001 – January 2002.

Review of the data logs revealed that oxygen concentrations and temperature track exceptionally well. The highest daylight temperatures correspond to the peak oxygen concentrations in mid-afternoon. The temperature and oxygen lows occur just prior to dawn. Peak oxygen concentrations of 11 mg/L at 27.5° correspond to saturation of about 140% while lows of oxygen concentration of 2.5 mg/L at 23° correspond to a saturation of about 33%. Of interest is that the daily amplitude of the peaks and lows for each day is similar with the exception of December 30, 2001, when peak temperature and oxygen were lower than the remainder of the data set. Weather conditions on this day consisted of heavy rainfall, with little direct sun. All other days were sunny.

This pattern indicates that pond metabolism is dominated by daylight photosynthesis and dark respiration according to molar relationships defined in the Redfield equation. Comparing groundwater nutrient loading to the pond with gross production/respiration within the pond indicates that only approximately 4% of the pond metabolism can be supported by "new" nutrients delivered to the pond by groundwater flux. The remaining 96% of nutrient uptake must therefore be supported by recycling of nutrients within the pond. It is likely that the actual percentage of nutrient recycling is even higher (~99%) than the estimate as it is clear from all available data that groundwater flow into the pond is substantially restricted.

3.5.2.2. Pond Sediment

Samples were collected at the seaward ends of 'Aimakapā Pond, Kaloko Pond, and one of the anchialine ponds in order to evaluate the presence of toxic compounds. In summary, none of the 28 organochlorides, 20 organophosphates, or 10 chlorinated herbicides were detected in any pond sediment.

Of the 40 semivolatile organics, the only compound above the level of detection was phenol, which was present in a sample collected from Kaloko Pond at a concentration of 0.14 mg/kg. Phenol was detected in previous surveys. Phenols are ubiquitous in the environment as they are a naturally occurring component of all foods, particularly plants, and are considered an antioxidant. They are also used in cosmetics, mouthwashes, disinfectants and in the synthesis of manufactured surfaces.

Metal analysis detected aluminum, arsenic, barium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selemium, vanadium and zinc from all three sampling stations (ʻAimakapā Pond, Kaloko Pond, and one anchialine pond).

3.5.2.3. Biological Community

As previously described, Kaloko Pond is separated from the ocean by a rampart of basaltic boulders, while ʻAimakapā Pond is separated from the ocean by a solid berm of beach sand. The main structural feature of the offshore area seaward of both ponds is a shallow basaltic ledge of pāhoehoe lava. The ledge is particularly wide fronting ʻAimakapā Pond. Adjacent to the Kaloko Pond frontage the shoreline is composed of a rocky shoreline composed primarily of outcrops of lava that extend seaward.

Because of the structure of the boulder rampart and beach berm that separate the ponds from the ocean, there is virtually no intertidal area. Beyond the boulder shoreline, the structure of the offshore environment off of Kaloko generally conforms to the pattern that has been documented as characterizing much of the west coast of the Island of Hawaii (Dollar 1975, 1982, Dollar and Tribble 1993).

The zonation scheme consists of three predominant regions:

1. Beginning at the shoreline and moving seaward, the shallowest zone beyond the shoreline is comprised of a seaward extension of the basaltic shoreline bench, consisting largely of essentially bare basalt surfaces. The most abundant coral occupying the nearshore bench is *Pocillopora meandrina*, a sturdy hemispherical coral is the dominant colonizer of the nearshore area. This species is able to flourish in areas that are physically too harsh for most other species, particularly due to wave stress. The shallow flat pavement area directly in front of the Kaloko Pond seawall appears to be an ideal habitat for *Pocillopora meandrina*. Other corals in the area consist of hemispherical heads of *Porites lobata*, and flat encrustations of *Montipora* spp.

2. Moving seaward, the flat nearshore bench area terminates in a ledge that has a roughly vertical face that extends to a depth of approximately 25 feet. Beyond the ledge, bottom topography consists of a reef platform that is typical of West Hawaiʻi. The transition area between the shallow flat pavement zone and the reef platform zone is characterized by high relief in the form of undercut ledges and basaltic boulder pinnacles. This area provides an ideal locale for colonization by attached benthos, particularly reef corals, and generally the widest assortment of species and growth forms are encountered in this region. The predominant coral in the area in *Porites lobata*, which occurs in a variety of growth forms.

3. The seaward edge of the reef platform (at a depth of about 50 feet) is marked by an increase in slope to an angle of approximately 20-30 degrees. In the deep slope zone, substratum changes from the solid continuation of the island mass to an aggregate of generally unconsolidated sand and rubble. The predominant coral cover in the slope zone is typically interconnected mats of "finger coral" (*Porites compressa*), which grow laterally over unconsolidated substrata.

The physical structure of the offshore region at ʻAimakapā is somewhat different than off Kaloko. The nearshore area consists of an extended flat basalt shelf that extends approximately 100 m from shore. The surface of the platform contains holes and fissures, and small sand-filled channels, but relatively low cover of living corals. At the seaward termination of the shelf, a reef crest consisting of a shallower ridge of limestone separates the inner bench from the outer reef, which is similar to that described above off of Kaloko Pond.

The predominant taxon of macrobenthos (bottom-dwellers) throughout the reef zones off of Kaloko Pond are Scleractinian (reef- building) corals. In total, eight species of "stony" corals, and two "soft corals" were observed throughout the region of study. Overall coral cover consisted of 40% of bottom cover, with bare basalt rock comprising 33% of bottom cover. The dominant species in all of the zones off Kaloko and ʻAimakapā Ponds was *Porites lobata* which comprised 66% of coral cover. The next most abundant species were *Porites lutea (11%), Porites compressa* (10%), and *Pocillopora meandrina (9%)*. These four species comprised 96% of all coral cover. Other species that occurred across the reef were *Montipora capitata, M. patula* and *Pavona varians*.

The mid-depth reef platform zone had the highest number of coral species at both survey sites. In the mid-depth zone, dominant species were *Porites lobata* and *Porites compressa*. *Porites lobata* occurs in various growth forms including flat encrustations and large dome-shaped colonies, which are responsible for much of the true "reef" accumulation in the mid-depth zones. Coral cover on the outer reef platform comprised approximately 40-60% of bottom cover.

The other dominant group of macroinvertebrates are the sea urchins (Class Echinoidea). The most common urchin was *Echinometra matheai*, which occurred in all reef zones. *E. matheai* are small urchins that are generally found within interstitial spaces bored into basaltic and limestone substrata. *Tripneustes gratilla*, and *Heterocentrotus mammillatus* were other species of urchins that occurred commonly throughout the reef.

Sea cucumbers (Holothurians) observed during the survey consisted of three species, *Holothuria atra*, *H. nobilis*, and *Actinopyga obesa*. Numerous sponges were also observed on the reef surface, often under ledges and in interstitial spaces.

Frondose benthic algal occurrence was extremely limited throughout the study area off of Kaloko. However, encrusting red calcareous algae (*Porolithon spp.*, *Peysonellia rubra*, *Hydrolithon spp.*) were common on the boulders and exposed rocks throughout the study area. These algae were also abundant on bared limestone surfaces, and on the nonliving parts of coral colonies.

Reef fish community structure was largely determined by the topography and composition of the benthos. The reef fish community off Kaloko and ʻAimakapā Ponds is typical of that found along

most of the Kona Coast, as described by Hobson (1974), and Walsh (1984). Fish community structure can be divided into six general categories: juveniles, planktivorous damselfishes, herbivores, rubble-dwelling fish, swarming tetrodonts, and surge-zone fish.

Pomocentridae (Damselfish) were the most abundant family of fish. Planktivorous damselfish, principally of the genera *Chromis* and *Abudefduf* were abundant in all areas surveyed. The next most abundant family was the Acanthuridae (surgeonfish), with the most common species including the yellow tang (*Zebrasoma flavescens*), the goldring surgeonfish (*Ctenochaetus strigosus*), and the brown surgeonfish (*Acanthurus nigrofuscus*). On the shallower reef terrace, adult whitebar surgeonfish (*Acanthurus leucopareius*), orangeband surgeonfish (*A. olivaceus*), and parrotfish (*Chlorurus sp.*) were also common in areas where coral rubble was abundant.

Surge zone fish consisted principally of herbivores such as rudderfish (*Kyphosus bigibbus*), surgeonfish (*Acanthurus spp.*), and unicornfish (mostly *Naso lituratus*). Saddle wrasse (*Thallassoma duperry*) and surge wrasse (*T. purpureum*) were also abundant in the surge zone. Trigger fish (Family Balistidae) and a variety of butterfly fish (Family Chaetodontidae) were also observed throughout the survey region.

Overall, fish community structure at Kaloko appeared fairly typical of the assemblages found in West Hawai‘i reef environments.

‘Aimakapā pond is separated from the ocean by a fairly wide continuous sand berm that is not very permeable to exchange between the pond and the ocean. Such impermeability is apparent in the sharp, nearly vertical gradients at the shoreline of many of the water chemistry constituents. Kaloko Pond is separated from the ocean by a man-made rock wall that was undergoing reconstruction at the time of water sampling.

Compared to the sand berm, the rock wall that separates Kaloko Pond from the ocean is very permeable, and exchange of water between the ocean and pond is enhanced by channels (“mākāhā”) constructed into the wall. It should be noted that these direct connections between the pond and ocean eliminate Kaloko Pond from the designation of “anchialine” which requires that no such connections exist. As a result of the increased water exchange between Kaloko Pond and the ocean, there are no sharp gradients of water chemistry constituents at the marine shoreline.

Anchialine pools are coastal bodies of standing waters that have no surface connections to the ocean but display both tidal fluctuations and salinity ranges characteristic of fresh and brackish waters, indicating the presence of subsurface connections to the water table and ocean.

One of the most obvious differences is between water quality in ‘Aimakapā and Kaloko Ponds. These differences in water chemistry are primarily the result of differences in physical structure of the barriers between the ponds and the ocean.

While both ponds contain thick sediment bottoms, there is a substantial difference in the quality of the sediment. Bottom composition of ‘Aimakapā Pond consists of soft flocculent silty mud that is easily penetrable for at least one meter. Bottom composition of Kaloko Pond is a hard sand/mud mixture that is largely covered with marine algae, primarily the introduced species *Acanthophora*

specifera. Sand/mud bottoms in both ponds were distinctly anaerobic beneath the surface layer as evidenced by the strong odor of H_2S when the bottom was even slightly disturbed.

3.5.2.4. Endangered Marine Species

Several species of marine animals that occur in Hawaiian waters have been declared threatened or endangered by Federal jurisdiction. The threatened green sea turtle *(Chelonia mydas)* occurs commonly along the Kona Coast, and is known to feed on selected species of macroalgae. The endangered hawksbill turtle *(Eretmochelys imbricata)* is known infrequently from waters off the Kona Coast. The area off of ʻAimakapā Pond is clearly a preferred habitat for green turtles, as at least eight individuals were observed in the nearshore zone during the survey. In addition, at least ten turtles were observed hauled out on the basalt shelf to the south of the pond during a low tidal stand when much of the basaltic bench in this area was exposed.

Populations of the endangered humpback whale *(Megaptera novaeangliae)* are known to winter in the Hawaiian Islands from December to April. The Hawaiian Monk Seal, *(Monachus schauinslandi),* is an endangered seal that is endemic to the waters off of the Hawaiian Islands. No whales or monk seals were observed during the survey.

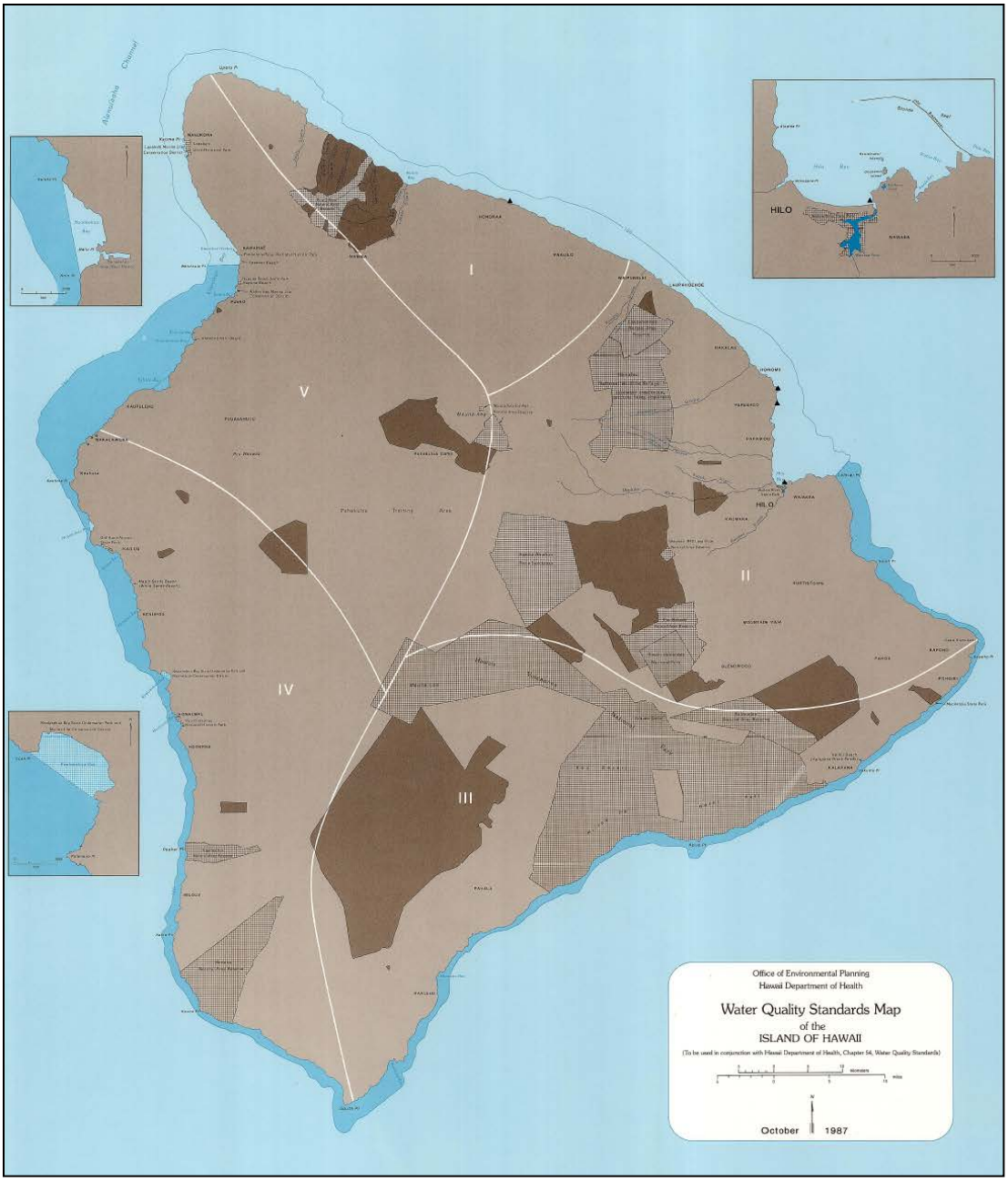
3.5.2.5. Water Quality Standards

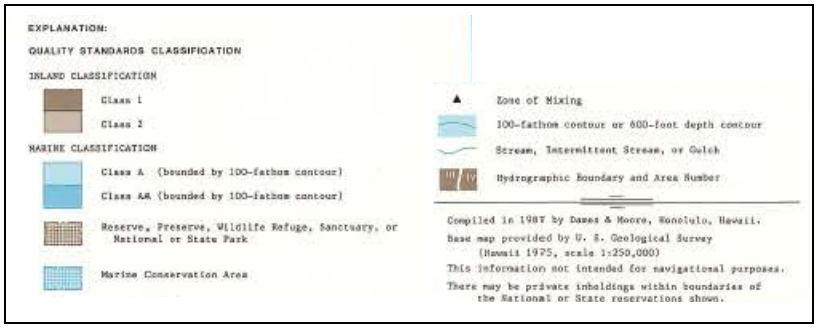
Pursuant to Hawaiʻi Administrative Rules (HAR) Title 11, Chapter 54, Water Quality Standards, the State Department of Health (DOH) classifies various water uses. Inland waters are classified under two use classes, 1 and 2; marine waters are classified under two use classes, AA and A.

As a point of reference, State DOH objective of Class "A" waters is that their use for recreational purposes and aesthetic enjoyment should be protected. The objective of Class “AA” waters that these waters remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions. To the extent practicable, the wilderness character of these areas shall be protected.

The uses to be protected in Class “AA” waters are oceanographic research, the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, compatible recreation, and aesthetic enjoyment (HAR-11-54-3(c)(1)(B)). However, the classification of any water area as Class “AA” shall not preclude other uses of waters compatible with the objectives set forth in HAR 11-54-3.

Along the Kona coast, and essentially around most of the island of Hawaiʻi (from Kawaihae heading south around South Point up to Leleiwi Point near Keaukaha,) State DOH has classified the nearshore waters as “AA” (see Figure 3-11). The coastal area below the Kaloko Makai project is classified both class “A” and “AA” (see Figure 3-12).





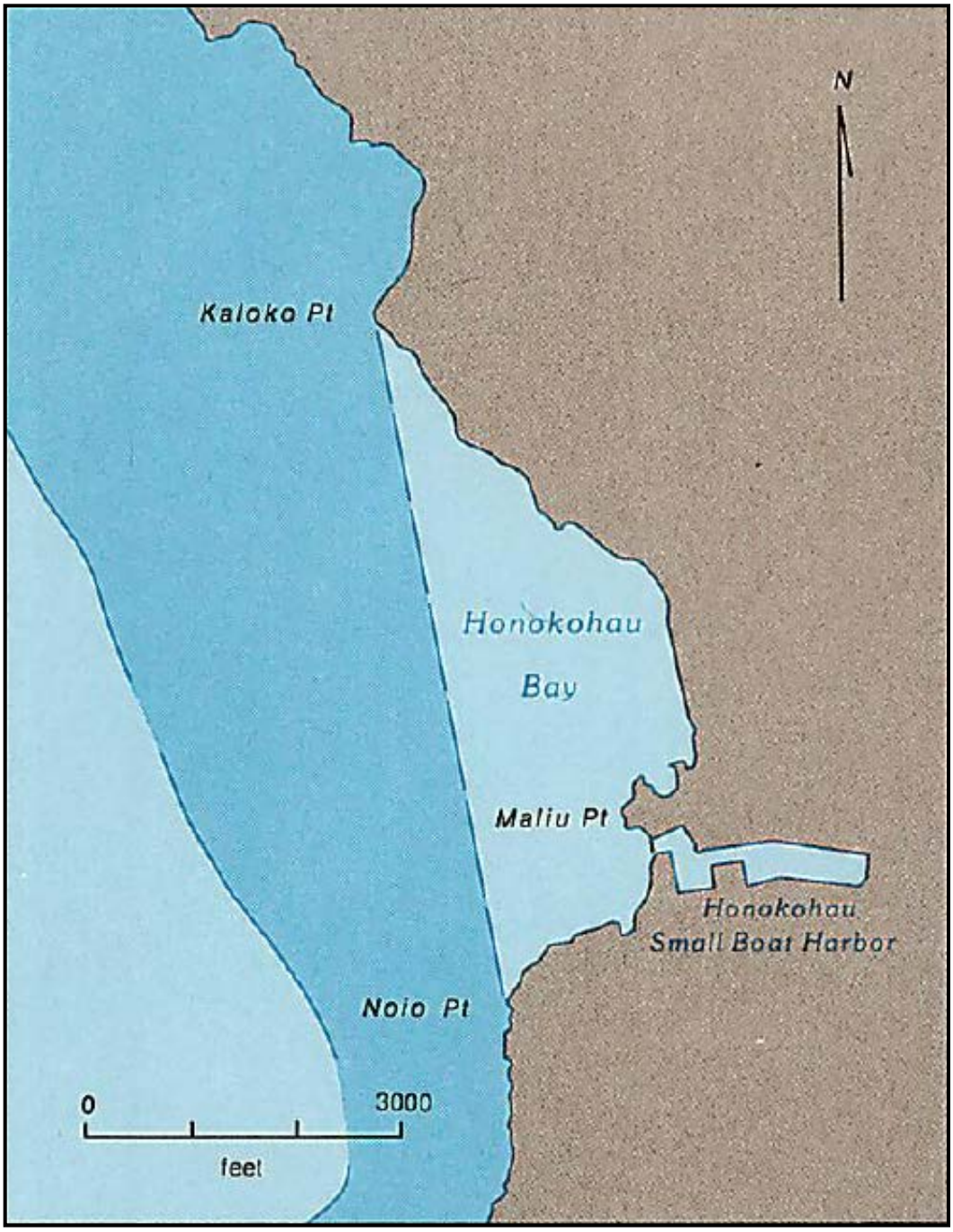
Source: State of Hawaii, Department of Health

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 3-11

Water Quality Standards Map, Island of Hawai'i

Kaloko Makai



LEGEND

- Class A
- Class AA

Source: State of Hawaii, Department of Health

FIGURE 3-12
Honokōhau Bay, Class A Waters
Kaloko Makai

POTENTIAL IMPACTS AND MITIGATION MEASURES

Ponds

It is generally accepted that the two large fishponds within the Kaloko-Honokōhau National Historical Park function in a similar manner to smaller anchialine ponds that occur on the west coast of Hawai'i. By definition anchialine ponds are surface exposures of the water table with no direct connection to the ocean that contain brackish water which is a mixture of seaward flowing groundwater and landward flowing seawater.

Anchialine ponds in early successional stages usually have sediment-free bottoms that allow for relatively rapid exchange of water. It is important to note that healthy anchialine ponds are not nutrient limited systems, and contain high concentrations of plant nutrients. The excess nutrients do not lead to algal dominated water columns; the result of balance between short residence time of water within the ponds, and production and consumption by pond biota. The excess nutrients do not lead to algal dominated water columns (at least until late stages of pond senescence), however, as a result of a balance between short residence time of water within the ponds, and production and consumption by pond biota. Rapid flux of water through the ponds, and grazing by resident populations prevent plankton buildup within the water column. In the later stages of the anchialine pond cycle, infilling by sediment reduces the rate of water exchange and the balance between production and consumption is lost. Ultimately, in the last stages of pond senescence infilling is complete and ponds become wetlands.

Surveys indicate that Kaloko Pond is not technically an anchialine pond because it contains direct connections to the ocean. Water in the pond is near oceanic in salinity, indicating that groundwater comprises a very small component of the pond makeup. Groundwater flux into the pond is overwhelmed by exchange of ocean water that is driven by wave action carrying water landward through the rock wall.

'Aimakapā Pond, on the other hand, can be considered an anchialine pond because it is sealed from direct exchange with the ocean by a sand berm of low permeability. The nearly vertical gradients in salinity between the pond and nearshore ocean provide evidence that the sand berm is essentially impermeable to water exchange (a good analogy is the use of sand bags for flood control levees).

During surveys of 'Aimakapā Pond conducted in 2000 and 2007 restricted groundwater flow into 'Aimakapā Pond was borne out by the near complete lack of both vertical and horizontal gradients within the ponds. Such lack of detectable inputs suggested that the pond is essentially a closed system which is accumulating sediment and metabolic decay products which cannot be naturally flushed from the enclosed pond basin. Continued metabolic activity will produce increasing sediment deposition that will elevate rates of nutrient release from sediment decomposition, which will in turn allow for increased phytoplankton growth. Eventually organic sediment deposition will completely dominate the pond to the point where the water column disappears, and is replaced by a marsh or wetland. Such a progression has been described as the natural "life history" of anchialine ponds.

During a survey in early 2012 conducted for the present report, evidence of groundwater input at stations within the inshore half of ʻAimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater into ʻAimakapā Pond than was previously measured. These results suggest that ʻAimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historical Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historical Park ponds.

Hence, while all data indicate that while the enclosed basin of ʻAimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment, the recent detection of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has no yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combine to result in greatly restricted flow of groundwater into ʻAimakapā Pond.

The restricted flow of freshwater through the ponds is borne out by the near complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

Sedimentation and Runoff

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

The entire floors of Kaloko and ʻAimakapā Ponds are covered with a thick layer of fine-grained flocculent sediment. The sediment layer plays an important role in the metabolic functioning of the ponds. Pond biota are adapted to this high sediment composition. Should a small amount of sediment reach the pond as a result of construction activity, it is not likely that there will be any qualitative change to sediment composition.

Within the marine environment, the nearshore area contains locally high regions of cover of calcareous sands of marine origin. Corals and other reef organisms are capable of removing sediment suspended by natural phenomena, up to threshold levels of deposition where cleaning mechanisms are overwhelmed and organisms become buried.

Because of the existence of natural sands, and the normally turbulent conditions that continually resuspend natural sediment, biotic community structure is presently adapted to extremes in sediment stress from natural conditions. Organisms that do occur in the region are therefore capable of withstanding the stress associated with large natural sediment loads. In comparison to the frequent natural sediment resuspension within the study area, any additional input from land resulting from construction activity would probably not have the potential to accumulate to the point where organisms could be buried.

Groundwater Flow and Composition

Five aspects of the project development have the potential to change the groundwater flowrate and/or chemistry:

1. Consumptive use of drinking water quality groundwater.
2. Disposal of excess R-1 treated effluent in on-site injection wells.
3. Potential disposal of RO (reverse osmosis).
4. Percolation of excess landscape irrigation.
5. Change in local rainfall-recharge.

Detailed consideration of these five factors is discussed in Section 3.5.1 and also discussed in detail in Appendix C (TNWRE, 2012).

Post-development total changes to basal groundwater flowing beneath the Kaloko Makai Project site are summarized as follows:

Percentage change in groundwater flowrate (mgd) = + 2.125
Percentage change in salinity (‰) = -5.1
Percentage change in nitrogen (lbs per day) = +5.2
Percentage change in phosphorus (lbs per day) = +2.1

Based on the results of the water chemistry analyses discussed in earlier in this section, these changes in groundwater parameters can be considered in terms of impacts to the ponds at Kaloko-Honokōhau National Historical Park. In terms of groundwater flow, it is estimated that the project will result in increased groundwater flux through the aquifer, as well as a decrease in salinity of

basal groundwater, primarily as a result of increases in irrigation rates. As the linkage between the physical and metabolic dynamics of the ponds depends on flux of fresh groundwater, the potential increase in flow rate and decrease in salinity cannot be viewed as a negative impact to the ponds. Rather, increased groundwater flux can be viewed as a positive effect as it will enhance water exchange and decrease residence time within the ponds. Potential lowering of salinity of water entering the ponds will not result in effects to pond biota in terms of exceeding an upper salinity tolerance. As noted previously, recent surveys indicate an apparent progressive increase in groundwater flux in ʻAimakapā Pond which is reflected in nutrient concentrations, and a net reduction in metabolic decay products. With projected increased flux from the proposed development, conditions in the ponds could potentially improve further in a direction away from sediment deposition and senescence.

Wastewater generated at the project site and treated in an on-site treatment plant would be reused for irrigation, with the excess disposed of in injection wells if other uses are not found. Using typical nutrient concentrations in wastewater, fertilizers and basal groundwater, as well as changes in local rainfall and recharge and removal rates associated with lateral travel with groundwater to the shoreline (TNWRE 2012) estimated that total nitrogen and total phosphorus would increase by 5.2% and 2.1%, respectively over existing conditions (see Table 3-1).

Such increases in nutrient loading of less than 6% for N and 2% for P will not result in changes to the ponds or nearshore ocean. As described above, healthy anchialine ponds are not nutrient limited, and already contain an excess of nutrients that are not utilized within the biogeochemical cycles within the ponds. So the small projected increases would be inconsequential to anchialine pools.

If all of the metabolically relevant nitrogen and phosphorus in groundwater is considered as NO_3^- and PO_4^{3-}, then the projected increases would result in basal groundwater concentrations would be 75 µM for NO_3^-, and 5.0 µM for PO_4^{3-}. Such changes are well within the natural variability of the system, and essentially represent no change to present conditions. As an example, the average concentration of NO_3^- in high groundwater at present (80 µM) exceeds the projected increase value for NO_3^- in basal groundwater that would reach the shoreline (75 µM). Other areas of West Hawaiʻi also have been shown to have concentrations of NO_3^- in basal groundwater that exceed 75 µM (Dollar and Atkinson 1992). Thus, the projected increase cannot be considered of a magnitude to present any king of potentially problematic situation. As long as there are no changes to the physical structure of healthy anchialine ponds (e.g., infilling) or changes to the balance of native biotic assemblages (e.g., introduction of alien species) the small increase in nutrient concentrations in groundwater entering the ponds would have no effect.

Nearshore Environment

It is unlikely that there would be any effects to the nearshore marine environment as a result of increases in nutrient concentrations in groundwater. Dollar and Atkinson (1992) modeled the input of nutrients to the ocean downslope from two golf courses in West Hawaii over a four-year period. Results of the studies showed that at a location where fertilizer nutrients entered an embayment (Keauhou Bay) with restricted circulation relative to open coastal shorelines, nitrates increased by about 100% and phosphate increased by about 20% over natural input. However, because the nutrients were retained within a surface layer, there was no exposure to the benthos. Circulation

within the embayment was also rapid enough to prevent phytoplankton blooms. These results indicated that even with long-term input of extremely high nutrient subsidies, there are situations where there are no negative effects to the receiving environment. Similar lack of impact would be expected at the Kaloko- Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

With respect to impacts to coral reef ecosystems, seasonal long-period swells result in turbulence at the shoreline off the entirety of Kaloko-Honokōhau National Historical Park, including the nearshore areas off of ʻAimakapā and Kaloko Ponds. Such wave turbulence is the reason coral communities are poorly developed in the nearshore area. Hence, owing to the high and consistent rates of mixing, as well as minimal input of materials from land to the ocean, it is not likely that nutrient concentrations in the waters downslope from the project site will have any effect on marine communities.

In addition, some clarification on the actual extent of potential damage to coral reefs from nutrients is also important to note. While the perception is that elevated nutrient concentrations are universally detrimental to corals and other reef organisms, the scientific literature does not bear this out as fact (see Appendix D). Studies have shown that 57 species of corals have grown in seawater with consistent nutrient concentrations about 10-fold higher than is normally found on Hawaiian reefs and corals can be seen covering sewage diffuser that are actively discharging primary treated effluent within Hilo Bay.

Endangered, Threatened and Protected Marine Species

Development of Kaloko Makai will not involve any work in the nearshore region. Kaloko Makai will not alter access to the shoreline. Development does not involve any potential for blasting or excavation that might affect behavior of whales, monk seals and other marine mammals. Similarly, there is little potential for changes in water quality resulting from construction. Thus, there is little potential for any negative factors associated with the project that may affect turtles or marine mammals. The development of the project will not result in the take of any endangered, threatened and protected marine species.

Mitigation Measures

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction BMPS will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

BMPs include storm water runoff and non-storm water sources control measures and practices that will be implemented to minimize the discharge of erosion and other pollutants from entering into

the receiving State waters. The erosion control plan for the proposed project include temporary and permanent control measures BMPs that will be implemented in accordance with Chapter 10 of the Hawai'i County Code.

Post construction BMPs to prevent erosion and storm water runoff after construction is completed includes the installation of drain inlets and shallow drywells within the project site, and landscaping and grassing of disturbed areas.

Prior to occupancy, Kaloko Makai will implement and maintain storm and surface-water runoff BMPs, subject to any applicable review and approval of the State DOH. Those BMPs will be designed to prevent violations of State DOH water quality standards as a result of storm-water discharges originating from the Project.

As previously mentioned, Kaloko Makai will develop a Pollution Prevention Plan (PPP) that provides BMPs, including structural BMPs, for pollution prevention that address all categories of permitted uses within the project, and will address environmental stewardship and the non-point sources of water pollution that can be generated from any uses allowed within the Project. There will be an emphasis on BMPs that prevent or limit pollutants arising out of the permitted uses within the Project from reaching the groundwater and ocean.

Kaloko Makai will construct and operate an on-site WWTP within the project. The WWTP will be designed to reduce the concentrations of the following compounds in the effluent of the Private WWTP to: TN to a concentration of <5 mg/l, and TP to a concentration of <2 mg/l (aerobic nitrification processes combined with anoxic/anaerobic sand filters to perform denitrification, or comparable technology). The WWTP will be subject to conditions of approval by the State DOH, including any lower concentrations of TN and/or TP in the effluent, and HAR Chapter 11-62.

Effluent disposal for the Private WWTP shall be in accordance with all applicable laws. Monitoring of the WWTP will be pursuant to the annual reporting requirements of the DOH, Wastewater Branch, and shall include a monthly summary of concentrations of TN and TP in the effluent, the volume of recycled water used, the volume of recycled water stored, the volume and location of any recycled water spills, volume of any reject wastewater, and details on the irrigated areas including water budgets, precipitation, evaporation, application rates and monitoring of best management practices.

An on-site WWTP will be self-sufficient, water efficient and environmentally sound. The Kaloko Makai facility will treat the wastewater to provide R-1 quality water for general irrigation within Kaloko Makai and thus lessen demand for drinking water for irrigation needs. This reuse of treated wastewater is consistent with the Kona CDP which has an action designating the area below Ane Keohokālole Highway as a reclaimed wastewater zone (Action TRAN–3.3a: Designates the reclaimed wastewater zone (Wastewater Re-use Area) on Figure 4-10c Official Public Facilities and Services Map.)

Kaloko Makai will develop a groundwater monitoring plan, to detect contaminants in the groundwater below the Project. The groundwater monitoring plan will include monitoring wells and a sampling and analysis plan. Parameters to be analyzed will include pH, temperature, salinity,

nitrate, ammonia, dissolved organic nitrogen (DON), total dissolved solids (TDS), TN, phosphate, dissolved organic phosphorus (DOP) and TP and any other parameters required by the DOH. The sampling frequency shall begin prior to the start grading activity, and shall be conducted quarterly for two years, or as required by the State DOH.

3.6. FLORA

At least seven botanical surveys in or adjacent to the project site have been conducted in the past twenty years. The first was carried out in conjunction with a proposed transmission line that would have crossed the property (CH2M Hill 1993). The second survey was done for the Kaloko Town Center (site of the present business district, that includes Costco), which is adjacent to the current study site (Char and Associates 1995). In 2003, the U.S. Fish and Wildlife Service (USFWS) sent a team for a reconnaissance of the site. The fourth was a botanical survey of the entire project site conducted by Isle Botanica in December 2006, for the Kaloko Makai development (see Appendix E). In March and May 2010 the USFWS surveyed 264.5-acres around and including the Kaloko Dryland Forest. In 2011, David and Guinther surveyed a portion of the Kaloko Makai property for the new Kona Courthouse site selection process. Most recently in May of 2012, David and Guinther conducted a biological survey as an update to the survey conducted by Isle Botanical in 2006 (see Appendices F and G).

The CH2M Hill botanical survey crossed the present study area, but also extended in either direction several miles, so the two areas are not exactly comparable. It listed the presence of 101-plant species in that corridor. The CH2M Hill botanical survey stated that three of the species recorded were federally listed endangered species. Five individuals of the sedge Kuk (*Cyperus fauriei* known at that time as *Mariscus fauriei*) were noted growing on a single boulder at about 115-m. elevation on the ʻaʻā flow. Two trees of ʻaiea (*Nothocestrum breviflorum)* were noted growing on the ʻaʻā flow at 110-m. elevation. Two mature individuals of maʻoloa (*Neraudia ovata)* were noted growing on the ʻaʻā lava flow at 115-m. elevation.

The checklist for the Char and Associates botanical survey on the property adjacent to the present project site listed a total of 47-species present, but none of these were federally listed.

In 2003, a USFWS survey team (USFWS 2003a & b) noted finding one live specimen of maʻoloa (*Neraudia ovata)* in the study area, and reported making "a sweep of the area looking for the other four known plants but found none of them. We suspect they may be dead." They also noted the presence of good-sized individuals of koʻokoʻolau (*Bidens micrantha* spp. *Ctenophylla)* in low numbers and one dying hala pepe (*Pleomele hawaiiensis)* as well as several other native plant species.

In 2006, a botanical survey of the project site by Isle Botanica found a total of 93-plant species in the study area (which did not include a few cultivated species planted along the roadsides). The report in its entirety is included herein as Appendix E. Twenty-five of the species encountered are native and eleven of these native species are endemic. The majority of the 93 species encountered during the survey are naturalized "alien" plants that were accidentally or intentionally introduced to Hawaiʻi, but which have now become established in the islands and can spread on their own. Only one species found during the survey, hala pepe *(Pleomele hawaiiensis*,) is a federally listed

endangered species. The other three endangered plant species, Kuk (*Cyperus fauriei*,) ʻaiea (*Nothocestrum breviflorum*,) and maʻoloa *(Neraudia ovata*,) previously reported from the Kaloko Dryland Forest were not encountered during this survey.

In March and May 2010 the USFWS surveyed 264.5-acres around and including the Kaloko Dryland Forest. The survey team found four federally listed endangered species, ʻaiea (*Nothocestrum breviflorum*), maʻoloa (*Neraudia ovata*), hala pepe (*Pleomele hawaiiensis*), and uhiuhi (*Caesalpinia kavaiensis)*. Additionally, koʻokoʻolau (*Bidens micrantha* spp. *ctenophylla)* which is a candidate species for listing, was also present.. The USFWS survey recorded one ʻaiea (*Nothocestrum breviflorum*), one maʻoloa (*Neraudia ovata*), approximately twenty-five hala pepe (*Pleomele hawaiiensis*), one uhiuhi (*Caesalpinia kavaiensis)* and over 400 koʻokoʻolau (*Bidens micrantha* spp. *ctenophylla).* Kuk *(Cyperus fauriei)*, previously reported within the Kaloko Dryland Forest was not encountered during the surveys.

In 2011, David and Guinther surveyed ten sites of roughly comparable size for the new Kona Courthouse site selection process. Total species recorded combining all ten sites in the North Kona area was 68. Of these, 17 (25%) were native, with 6 (9%) endemic.

David and Guinther conducted a follow-up study for the Kaloko Makai project in May 2012. The report is included in its entirety as Appendix G. The Biological survey's purpose was to determine if there had been any significant changes in the habitats and/or botanical resources on the property since a similar survey was conducted on the site in 2006. David and Guinther (2012) compared species lists from previous studies with their current research.

The survey team utilized wandering transects that traversed all vegetation types in the project area.

A plant checklist was compiled from field observations. Table 3-4 is a list of "native" plants observed during the survey. A complete list of plants observed is included in Appendix G.

A total of 112 different plant species were recorded as growing on the surveyed parcels. Of these, 33 species (29.5 percent) are recognized as truly native (indigenous or endemic species). A little more than half of these (~18 or 54 percent) are moderately common indigenous plants (defined as native to both Hawaiʻi and elsewhere in the Pacific Basin) and the remaining 15 (45 percent) are endemic species (plant species uniquely native to the Hawaiian Islands). Three early Polynesian introductions (kukui or *Aleurites moluccana*, noni or *Morinda cirtifoloia*, and bitter yam or *Discorea bulbifera*) have been recorded in recent surveys. These results are rather atypical for lowland surveys in the Hawaiian Islands in the high percentage of native species recorded.

Most botanical surveys in the lowlands of any of the main Hawaiian Islands typically yield less than 12 percent native species including early Polynesian introductions (and less than 1 percent if biomass of native and non-native plants is compared) (David and Guinther, 2011).

Table 3-4 Native (and early Polynesian introduced) Plants						
Family and Species	Common Name	Status	Abundance (by vegetation type)			Notes
			PS	LF	PF	
FERNS AND FERN ALLIES						
NEPHROLEPIDACEAE						
Nephrolepus exaltata hawaiiensis Wagner	sword fern	**End**	--	--	U2	
PTERIDACEAE						
Doryopteris decipiens (Hook.) J. Sm.	*kumuniu*	**End**	+ R	--	--	<2, 3>
Doryopteris decora Brack	---	**End**	--	R	--	
PSILOTACEAE						
Psilotum nudum (L.) P. Beauv.	*moa*	**Ind**	--	R	--	<2>
FLOWERING PLANTS DICOTYLEDONS						
ARALIACEAE						
Polyscias sandwicensis (A. Gray) Lowry & G. M. Plunkett	*ʻohe makai*	**End**	--	+ O	--	<1, 2, 3>
ASTERACEAE						
Bidens micrantha ctenophylla (Sherff) Nagata & Ganders	---	**End**	--	O	--	<2>
Melanthera populifolia (Sherff) Wagner & Rob	*nehe*	**End**	--	R	--	<2>
CAPPARACEAE						
Capparis sandwichiana DC	*maiapilo*	**End**	+	+ O	R	<1, 2, 3>
CONVOLVULACEA						
Ipomoea indica (J. Burm.) Merr.	*koaliʻawa*	**Ind**	+	O	--	<1, 2, 3>
EBENACEAE						
Diospyros sandwicensis (A. DC.) Fosb.	*lama*	**End**	--	+	O	<2, 3>
EPHORBIACEAE						
Aleurites moluccana (L.) Willd.	*kukui*	Pol	--	--	U1	<2>
Euphorbia celastroides Boiss.	*ʻakoko*	**End**	--	R	--	<2>
FABACEAE						
Caesalpinia kavaiensis H. Mann	*uhiuhi*	**End**	--	R	--	
Erythrina sandwicensis Degener	*wiliwili*	**End**	--	--	--	planted in
Senna gaudichaudii (Hook. & Arn.) H. Irwin & Barneby	*kolomona*	**Ind**	--	O	--	"D"
Sophora chrysophylla (Salisb.) Seem.	*mamane*	**End**	--	O	--	<2>
Tephrosia purpurea (L.) Pers.	*ʻauhuhu*	**Ind**	+	--	--	<2> <3>
GOODENIACEAE						
Scaevola sericea Vahl.	*naupaka*	**Ind**	--	R	--	<2>
LAMIACEAE						
Plectranthus parviflorus Willd.	*ʻalaʻalawainui wahine*	**Ind**	--	R	--	<2>
MALVACEAE						
Abutilon incanum (Link) Sweet	*hoary abutilon*	**Ind**	+ R	--	--	<1, 3>
Sida fallax Walp	*ʻilima*	**Ind**	+ U	U	R	<1, 2, 3>
MENISPERMACEAE						
Cocculus orbiculatus (L.) DC	*huehue*	**Ind**	+ O3	+ A	U	<1, 2, 3>
MYOPORACEAE						
Myoporum sandwicense A. Gray	*niao*	**Ind**	--	+ C	--	<1, 2, 3>
MYRTACEAE						
Metrosideros polymorpha Gaud.	*ʻōhiʻa*	**End**	--	+ U	--	<1, 2, 3>
FLOWERING PLANTS DICOTYLEDONS						
NYCTAGINACEAE						
Boerhavia repens L.	*alena*	**Ind**	--	+	--	<3>
PAPAVERACEAE						
Argemone glauca (Nutt. ex Prain) Pope	*pua kala*	**End**	R	R	--	<2, 5>
PIPERACEAE						
Peperomia leptostachya Hook. & Arn.	*ʻalaʻalawainui*	**Ind**	+ R	R	R1	<2, 3>

Table 3-4 Native (and early Polynesian introduced) Plants (continued)

Family and Species	Common Name	Status	Abundance (by vegetation type)			Notes
			PS	LF	PF	
FLOWERING PLANTS (continued)						
DICOTYLEDONS						
ROSACEAE						
Osteomeles anthyllidifolia (Sm.) Lindl.	*ʻulei*	**Ind**	--	R	--	<2>
RUBIACEAE						
Morinda citrifolia Hillbr.	*noni*	Pol	U	R	U	<1, 2, 3>
Psydrax odoratum (Forst. f.) A.C. Smith & S. Darwin	*alaheʻe*	**Ind**	+ O	+ R	A	<1, 2, 3>
SAPINDACEAE						
Dodonaea viscosa Jacq.	*ʻaʻaliʻi*	**Ind**	+ U	U	C	<2, 3>
SOLANACEAE						
Nothocestrum breviflorum A. Gray	*ʻaiea*	**End**	--	R	--	
Solanum americanum Mill.	*pōpolo*	Ind?	+ R	--	--	<1, 3>
STERCULIACEAE						
Waltheria indica L.	*ʻuhaloa*	Ind?	+ U3	+ O	--	<1, 2, 3, 4>
MONOCOTYLEDONS						
AGAVACEAE						
Pleomele hawaiiensis Deg. & Deg.	*halapepe*	**End**	--	U	--	<2>
DIOSCOREACEAE						
Dioscorea bulbifera L.	bitter yam	Pol	--	--	--	<2>
POACEAE						
Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	*pili*	**Ind**	+	--	--	<2, 3>

Source: David and Guinther, May 17, 2012 (see Appendix G)

Legend

Status = distributional status

End: Endemic; native to Hawaiʻi and found naturally nowhere else.
Ind: Indigenous; native to HawaiʻI, but not unique to the Hawaiian Islands.
Nat: naturalized; exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.

Abundance = occurrence ratings for plants on property in March 2008

R: Rare, only one or two plants seen.
U: Uncommon, several to a dozen plants observed.
O: Occasional, found regularly, but not abundant anywhere.
C: Common, considered an important part of the vegetation and observed numerous times.
A: Abundant, found in large numbers; may be locally dominant.
AA: Abundant, very abundant and dominant; defining vegetation type.

Numbers (as in R3) offset occurrence ratings (1 – several plants; 2 – many plants, 3 – abundant in a limited area) in cases where distribution across the survey area may be limited, but individuals seen are more than indicated by the occurrence rating along.

Notes:

<1> Reported at Site "A" (Kaloko Makai) in David and Guinther (2011).
<2> Recorded by Whistler (2006).
<3> Recorded by Char (1995) on an adjacent property.
<4> Ruderal, on highway verge and other highly disturbed areas.
<5> Plant lacking flowers or fruit at time of survey; identification uncertain.

The survey by Char (1995) was for only the 224-acre portion of the site below 300-feet elevation (TMK: [3] 7-3-09:017) and therefore extensive comparisons with either Whistler (2006) or the present survey would not be particularly instructive. Whistler, on the other hand, surveyed all five project parcels, so a comparison with the present survey undertaken some five years later can be made.

Whistler developed a list of 93 plant species found on the project property (see Appendix F). He observed 17 species of naturalized plants not seen in 2012 (David and Guinther) and two species of native or early Polynesian plants (pili or *Heteropogon contortus* and hoi *or bitter yam*) not seen in 2012 (David and Guinther). Thus, 74 species were observed in common between the 2006 and 2012 surveys. A majority (~12) of the naturalized species recorded by Whistler and not seen in 2012 (David and Guinther) are herbs and could easily be missed if conditions were drier in 2012 (David and Guinther) than in 2006 (Whistler). Many of the naturalized herbs are mentioned as characterizing his managed land vegetation type (that is, disturbed land). Pili grass is mentioned in association with the lowland *Leucaena* scrub and was likely overlooked in this area in 2011. Three of the species are trees (African tulip or *Spathodea campanulata*, *Macaranga tanarius*, and ʻopiuma or *Pithecellobium dulce*), but no indication is given as to where these were observed. The first two would require conditions on the wet side and thus could only occur in the uppermost, forested (PF) area.

Curiously the larger roving sailor (*Lophospermum erubescens*) described as a "common" escaped ornamental vine on the LF1 lava flow by Whistler in 2006, was not observed at all in 2012. *Lophospermum* is described in Wagner, Herbst, and Sohmer (1999) as sparingly naturalized in "dry forest, alien grassland, and shrubland on Oʻahu and Hawaiʻi." Possibly, the implication that this alien species was common (Whistler, 2006, p. 6) is at the root of the discrepancy. This species was recorded by Nishida (1993) from the LF1 area. We expect that there would be year-to-year differences in the presence of many herbaceous species, often dependent upon rainfall amounts.

Of significance in terms of native species not seen by either Whistler (2006) or the present survey are the listed plants: maʻoloa (*Neraudia ovata)* and Kuk (*Cyperus fauriei)*. Also significant are the rare natives, uhiuhi (*Caesalpinia kavaiensis*) and ʻaiea (*Nothocestrum breviflorum*), variously recorded from the area in the past, but not observed by Whistler. David and Guinther recorded single individuals of each in 2012—and, as evidenced by flagging and fencing, are clearly well-known to be present. Rare natives and their general distribution on the project site are discussed further in this section.

Hawaii Forest Industry Association (HFIA) contracted Kukui Planning Company (with guidance from USFWS) to do a rare plant survey of the Kaloko Makai Dryland Forest Preserve. The survey was completed in January 2012 (Kukui Planning Company, LLC). Koʻokoʻolau, uhiuhi, maʻaloa and halapepe were observed within the Dryland Forest. In addition to the above species a variety of common species were observed including ʻohe makai, huehue, māmane, ʻalaʻala wai nui wahine, maiapilo, naio, koali awa, ʻuhaloa, ʻūlei, ʻiliahi, ʻakoko, kolomona, ʻilima, kuluʻī, and nehe.

Vegetation Types

Whistler (2006) recognized four types of vegetation on the property: (1) managed land vegetation; (2) *Leucaena* or koa haole scrub; (3) Christmas berry scrub; and (4) dryland forest.

David and Guinther (2012) distinguished six substratum/vegetation types, which are further described below:

LF1 - ʻaʻā flow less than 3000 years old
LF2 - ʻaʻā flows between 3000 and 5000 years old
PS - mostly pāhoehoe with scrub vegetation
PF - pāhoehoe and some ʻaʻā with generally open forest or very dense scrub growth
D - highly disturbed ground
Q - old (abandoned) quarry area.

LF1 - *ʻaʻā* flow less than 3000 years old

The remnant dryland forest on LF1 is mostly one supporting *lama* (*Diospyros sandwicensis*), alaheʻe (*Psydrax odoratum*), Christmas berry, and ʻōhiʻa (*Metrosideros polymorpha*). Present, although to lesser extents; are ʻohe m*akai* (*Polyscias sandwicensis*) and hala pe*pe* (*Pleomele hawaiiensis*). Shrubs (sometimes small trees) that are relatively common are naio (*Myoporum sandwicense*), pua pilo or maiapilo (*Capparis sandwichiana*), ʻaʻaliʻi (*Dodonaea viscosa*), mamane (*Sophora chrysophylla*), and kolomona (*Senna gaudichaudii*). Very rare are uhiuhi and ʻaiea.. In the dry conditions that prevail here, the distinction between shrubs and trees is not easily made. In general, the forest is very open with low shrubs and ground-covering herbs predominate. Non-natives invasive species in this dry forest are koa haole, jacaranda (*Jacaranda mimosifolia*), and Christmas berry. The latter species seems to be particularly well suited to the habitat and consequently the most serious pest species here. The ground cover on LF1 is notably dominated by huehue (*Cocculus orbiculatus*) and koali ʻawa (*Ipomoea indica*). Fountain grass (*Pennisetum setaceaum*), lantana (*Lantana camara*), and sword fern (*Nephrolepis multiflora*) are present in scattered locations, as is koʻokoʻolau (*Bidens micrantha ctenophylla*).

LF2 - ʻaʻā flows between 3000 and 5000 years old

The somewhat older ʻaʻā flows, LF2, also support a sparse vegetation that is a mixture of native and naturalized species, but the diversity of natives is small in comparison with that on LF1 and the reasons for this are not entirely clear. Both lava flows have sparse grass cover (minimizing fire hazards) and rough terrain presumably discouraging to ungulates, such as goats.

PS - mostly pāhoehoe with scrub vegetation

The land between the lava flows (Whistler's *Leucaena* or koa haole scrub) stands out in contrast to the sparse vegetation on the ʻaʼā flows is, of course, older and mostly pāhoehoe flows. A combination of better water retention near the surface on pāhoehoe and a longer period of time for soil formation provide conditions whereby these areas support moderately dense growths of fountain grass and short koa haole as a dry shrubland. Native shrubs, especially alaheʻe and aʻaliʻi, are widely scattered within this vegetation type. At low elevations on the property, klu (*Acacia farnesiana*) appears as an occasional shrub and kiawe (*Prosopis pallida*) as a rare tree (Possibly a consequence of the long period of drought effecting this part of the Island of Hawaiʻi, nearly all of the kiawe trees observed during the 2012 survey of the project properties were deceased.) Whistler points out that because of the dense fountain grass, this scrub vegetation is subject to damaging fires, which may well have eliminated many of the native species over time.

PF - pāhoehoe and some ʻaʻā with generally open forest or very dense scrub growth

The relationship between vegetation and the nature of the substratum becomes more complex above about 600 feet on the site, and while David and Guinther (2012) designates this area as PF, it is a complex of scrub and forest vegetation types extending across the mauka or uppermost part of the property. This area is far more heterogeneous with respect to substratum age and type, and composition of the vegetation, than is the case downslope. The reasons for this are certainly related to rainfall. Rainfall records for Honokōhau Ranch nearby at 1275 feet suggest an annual rainfall of around 1230 mm (48 inches); rainfall at the old Kona Airport at 15 feet above sea level 550 mm (21.6 inches). This moisture gradient is evident in the nature of vegetation from the low end of the project area to the top end, with grasses and short stature shrubs mostly at the low end, and trees of increasing stature becoming evident above about the middle. At around the 550 to 600-foot elevation, the young lava flow is no longer clearly visible in aerial/satellite images; the forest is too dense to readily distinguish this feature from adjacent, much older surfaces. For this reason, David and Guinther (2012) lumps this vegetation under PF. However, inside a forest dominated by Christmas berry (presumably, in part, Whistler's Christmas Berry Scrub), silk oak (*Grevillea robusta*), lama, alahe'e, and 'ōhi'a trees are present. In the understory, either talinum (*Talinum triangulare*) or air plant (*Kalanchoë pinnata*) can be very abundant. In some places grasses are abundant, in other areas bare lava is present.

The following plant associations demonstrate the heterogeneity of the area designated as PF vegetation type, along the mauka border of the property:

Dense koa haole forest with an understory of dense Guinea grass (*Panicum maximum*) immediately off the north side of Hina Lani Street; somewhat open Christmas berry/koa haole forest with dense air plant understory merging gradually into dry land forest type (LF1), downslope and found east and west of Hina Lani Street; Christmas berry savanna with fountain grass (northeast corner of the property); koa haole scrub (cattle grazed land) with Guinea grass and scattered kukui (*Aleurites moluccana*) in the southeast corner of the property.

<u>D - highly disturbed ground & Q - old (abandoned) quarry area.</u>
Managed land vegetation corresponds to David and Guinther's (2012) vegetation on disturbed ground (ruderal vegetation), represented by the extensive verges along Hina Lani Street, other areas where the 'a'a flow has been graded (D), and a quarry operation (Q) in the southwest corner of the site. These places support mostly ruderal weeds and several other introduced species not observed elsewhere on the property. An exception to the near exclusively non-native aspect of disturbed areas is the presence of ko'oko'olau along the interface between the undisturbed (LF1) and disturbed parts of the quarry. Disturbed ground is readily invaded by fountain grass. 'Uhaloa (*Waltheria indica*) is a native plant that is common in disturbed places. The now abandoned quarry area represents a part of the Kaloko-Honokōhau 'a'a lava flow that has been extensively graded and material removed. A few "islets" of the original surface remain where either 'ōhi'a or maiapilo plants are growing. The site is extensively invaded by fountain grass.

Kaloko Makai Dryland Forest

The Kaloko Makai development is home to one of the largest remaining areas of Dryland Forest in the Hawaiian Islands. The Dryland Forest is located within the southern portion of the project site.

The Dryland Forest is unique in that it has not been heavily impacted by ungulates, and therefore, has minimal impact from alien plant species. The Dryland Forest covers an ʻaʻā lava flow that is much younger than the surrounding pāhoehoe flow.

Dryland forests are the most impacted ecosystems in the Hawaiian Islands. While 42% of the rain forests in the Hawaiian Islands have been lost, 90% of the Dryland Forests have been eliminated. The remaining 10% has been heavily degraded by introduced plants and ungulates.

The USFWS has long recognized the importance of the Dryland Forest on the site for its unique assemblage of native plants, and has indicated their desire to a preserve a portion of the property for its botanical value. The area has remained in such good condition because the substrate is a young lava flow that has acted as a deterrent to cattle, fire, and the spread of alien grasses (USFWS pers. comm. 2006).

Because of the rugged ʻaʻā lava, the vegetation is difficult for feral grazing animals to visit. Over much of the area the trees are separated from each other, and this, combined with the virtual absence of fountain grass, has caused the area to be spared from grazing and wildfires.

Consequently, the Dryland Forest is relatively intact, and is home to four endangered species: ʻaiea, maʻoloa, hala pepe and uhiuhi. The most common trees are the native species lama, alaheʻe, pua pilo and māmane. Other native trees ʻōhiʻa lehua, ʻohe, naio and ʻaʻaliʻi.

The only alien tree species noted in the Dryland Forest were jacaranda (*Jacaranda mimosifolia)*, the Polynesian introduction noni, Christmas berry, and koa haole. The latter two species, especially Christmas berry, sometimes form clumps and in some places dominate the edges of the Dryland Forest.

POTENTIAL IMPACTS AND MITIGATION MEASURES

As stated above, the Kaloko Makai property has been the subject of numerous botanical surveys over the years. Based on these surveys, the following four listed endangered and candidate plant species are found within the project site.

- ʻaiea (Nothocestrum breviflorum)
- hala pepe (Pleomele hawaiiensis)
- uhiuhi (Caesalpinia kavaiensis)
- maʻaloa (Neraudia ovata)
- koʻokoʻolau (*Bidens micrantha ctenophylla*) – Candidate

None of the listed endangered plants will be "taken" in the development and construction of the Kaloko Makai project.

Three individual endangered plants (two hala pepe and one ʻaiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. radius buffer around the two hala pepe and one ʻaiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

Recognizing the importance of this Dryland Forest, Kaloko Makai representatives approached the USFWS regarding the Dryland Forest and its protection.

As part of the project proposal, 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

US Fish and Wildlife Service (USFWS) Proposed Rule

On October 17, 2012, the US Fish and Wildlife Service (USFWS) published a notice in the Federal Register that noted, " Endangered and Threatened Wildlife and Plants; Listing 15 Species on Hawaiʻi Island as Endangered and Designating Critical Habitat for 3 Species; Proposed Rule".

In part, the Federal Register noted, "SUMMARY: We, the U.S. Fish and Wildlife Service (Service), propose to list 15 species on the Hawaiian island of Hawaiʻi as endangered species under the Endangered Species Act of 1973, as amended (Act), and to designate critical habitat for 1 of these species. For the remaining 14 species that we are proposing to list in this rule, we find that critical habitat is not determinable at this time. We also propose to designate critical habitat for two plant species that were listed as endangered species in 1986 and 1994. The proposed critical habitat designation totals 18,766 acres (ac) (7,597 hectares (ha)), and includes both occupied and unoccupied habitat. Approximately 55 percent of the area being proposed as critical habitat is already designated as critical habitat for 42 plants and the Blackburn's sphinx moth (Manduca blackburni). In addition, we propose a taxonomic change for one endangered plant species."

It further notes, "The Secretary may exclude an area from critical habitat if the benefits of exclusion outweigh the benefits of designation, unless the exclusion will result in the extinction of the species. We are considering excluding approximately 4,102 acres of privately owned and State lands from the critical habitat designation."

One of the proposed species to be listed, *Bidens micrantha ssp. ctenophylla* (koʻokoʻolau) is found within the Kaloko Makai project area. The Federal Register notes, "*Bidens micrantha ssp. ctenophylla* (koʻokoʻolau), a perennial herb in the sunflower family (*Asteraceae*), occurs only on the island of Hawaiʻi (Ganders and Nagata 1999, pp. 271, 273). Historically, *B. micrantha ssp. ctenophylla* was known from the North Kona district, in the lowland dry ecosystem (HBMP 2010b). Currently, this subspecies is restricted to an area of less than 10 sq mi (26 sq km) on the leeward slopes of Hualalai volcano, in the lowland dry ecosystem in six occurrences totaling fewer than 1,000 individuals. The largest occurrence is found off Hina Lani Road with over 475 individuals widely dispersed throughout the area (Zimpfer 2011, in litt.). The occurrence at Kealakehe was reported to have been abundant and common in 1992, but by 2010 had declined to low numbers (Whistler 2007, pp. 1–18; Bio 2008, in litt.; HBMP 2010b; Whistler 2008, pp. 1–11). In addition, there are three individuals in Kaloko–Honokōhau National Historical Park (NHP) (Beavers 2010, in litt.), and three occurrences are found within close proximity to each other to the northeast: five individuals in an enclosure at Puʻuwaʻawaʻa Wildlife Sanctuary (HBMP 2010b); a few scattered individuals at Kaʻupulehu; and a few individuals on private land at Palani Ranch (Whistler 2007, pp. 1–18; Whistler 2008, pp. 1–11). *Bidens micrantha ssp. ctenophylla* has also been outplanted within fenced

enclosures at Kaloko–Honokōhau NHP (49 individuals), Koaia Tree Sanctuary (1 individual), and Puʻuwaʻawaʻa (5 individuals) (Boston 2008, in litt.; HBMP 2010b)."

Per the proposed rules notice, "Effects of Critical Habitat Designation - Section 7 Consultation - Section 7(a)(2) of the Act, as amended, requires Federal agencies, including the Service, to ensure that actions they fund, authorize, or carry out are not likely to destroy or adversely modify critical habitat." "If a species is listed or critical habitat is designated, section 7(a)(2) of the Act requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of the species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency (action agency) must enter into consultation with us."

In addition to the proposed rule, the notice addresses "Exclusions" related to critical habitat designation. It further states, "Exclusions - Application of Section 4(b)(2) of the Act Section 4(b)(2) of the Act states that the Secretary must designate or make revisions to critical habitat on the basis of the best available scientific data after taking into consideration relevant impacts, including economic and national security impacts, of specifying any particular area as critical habitat. The Secretary may exclude an area from critical habitat if he determines that the benefits of such exclusion outweigh the benefits of specifying such area as part of the critical habitat, unless he determines, based on the best scientific data available, that the failure to designate such area as critical habitat will result in the extinction of the species."

Specific to the Kaloko Makai property, the Federal Register notes, "Kaloko Makai Development - The Service is considering excluding 630 ac (255 ha) of habitat associated with the Kaloko Makai Development, on the western slope of Hualalai in the land divisions of Kaloko and ʻOʻoma between the elevations of 320 and 650 ft (100 and 200 m). There are three landowners with a common interest in the Kaloko Makai Development, Kaloko Properties Corporation (Figure 5–A), SCD–TSA Kaloko Makai LLC (Figure 5–B), and TSA Corporation (Figure 5–C). Two plant species included in this rule *Bidens micrantha ssp. ctenophylla* and *Mezoneuron kavaiense* are reported from this area. The area under consideration for exclusion falls within proposed critical habitat Hawaii— Lowland Dry— Unit 34, Map 106, and is comprised of, in their entirety, the areas owned by Kaloko Properties Corporation, SCD–TSA Kaloko Makai LLC, and TSA Corporation within the proposed designation".

"This unit is occupied by the plant *Bidens micrantha ssp. ctenophylla* and contains the features essential to the lowland dry ecosystem and therefore this species. This area also contains unoccupied habitat that is essential to the conservation of *Isodendrion pyrifolium* and *Mezoneuron kavaiense*."

The Federal Register notice is clear that the proposed rule is just that, a proposal. It specifically states, "our final decision may differ from this proposal." And additionally states, "In accordance with our joint policy published in the Federal Register on July 1, 1994 (59 FR 34270), we will seek the expert opinions of at least three appropriate and independent specialists regarding this proposed rule. The purpose of such review is to ensure that our proposed listing and critical habitat designation are based on scientifically sound data, assumptions, and analyses. We have posted our proposed peer review plan on our Web site at http://www.fws/pacific/informationquality/index.htm. We will invite these peer reviewers to

comment, during the public comment period (see DATES), on the specific assumptions and conclusions regarding the proposed listing of 15 species and designation of critical habitat for 3 species. We will consider all comments and information we receive during the comment period on this proposed rule during our preparation of a final determination. Accordingly, our final decision may differ from this proposal."

As noted, the Federal Register publication discusses a proposed rule concerning critical habitat designation and listing of species. It specifically states that the final decision may differ from the proposal in the Federal Register. It also notes Kaloko Makai has been in discussion with USFWS concerning listed, as well as candidate species.

Kaloko Makai will continue to work with USFWS and others in addressing the forest, habitat and species issues. Given the uncertain timing and outcome of the USFWS proposal, at this time, Kaloko Makai will continue to monitor the proposed rule.

3.7. FAUNA

A Survey of Avian and Terrestrial Mammalian Species Report was prepared in September 2006 by David and Guinther to assess avian and mammalian resources within the project area. The report is included in its entirety as Appendix F.

David and Guinther conducted a follow-up study in May 2012. The survey of Avian and Terrestrial Mammalian species' purpose was to determine if there had been any significant changes in the habitats and/or Avian and Terrestrial Mammalian species' on the property since a similar survey was conducted on the site in 2006. The report is included in its entirety as Appendix G.

3.7.1 Avian Fauna

Thirty avian count stations were sited at approximately 300-meter intervals along four linear transects running from east-to-west through the project area. The transects and count stations were sited as close to those used during the course of the 2006 avian survey of the site as possible (David, 2006). A single six-minute avian point count was made at each of the 30 count stations. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. The counts and subsequent searches of the site, was conducted between 6:30 am and 11:00 am each morning. Time not spent counting the point count stations was used to search the remainder of the sites for species and habitats not detected during the point counts. Weather conditions were ideal, with no rain, unlimited visibility on the sites and winds of between 1 and 7 kilometers an-hour, during point count periods.

A total of 967 individual birds of 21 species, representing 12 separate families, were recorded during the station counts. Only one of the species detected during this survey, Pacific Golden-Plover (*Pluvialis fulva*) is a native species. Pacific Golden-Plover is an indigenous migratory shorebird species. One species Chicken (Red Junglefowl) [*Gallus gallus*] is a domesticated species that is not established in the wild on the Island of Hawaiʻi. The remaining 19 species detected are considered to be alien to the Hawaiian Islands (see Appendix G, Table 2).

No avian species currently protected or proposed for protection under either the federal or State of Hawaiʻi endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS, 2005a, 2005b, 2012).

Avian diversity and densities were in keeping with the habitat present on the site and were comparable to the results of the survey conducted by David on the site in 2006. Four species, House Finch (*Carpodacus mexicanus*), Zebra Dove (*Geopelia striata*), Japanese White-eye (*Zosterops japonicus*), and Common Waxbill (*Estrilda astrild*), accounted for slightly less than 44 percent of all birds recorded during the station counts. House Finch was most frequently recorded species, accounting for 18 percent of the total number of individual birds recorded during station counts. We recorded an average of 30 birds per station count. This is a relatively large number.

Although not detected during the survey it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*), or uaʻu, and the threatened Newell's Shearwater (*Puffinus auricularis newelli*), or ʻaʻo, over-fly the project area between the months of May and November.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The modification of the current habitat on the site is not expected to result in significant impacts to any avian or mammalian species. Furthermore, the development of the project site is not expected to have a significant deleterious impact on native faunal resources found within the North Kona District.

The principal potential impact that the development of this site poses to Hawaiian Petrels and Newell's Shearwaters is the increased threat that birds will be downed after becoming disoriented by external lights associated with the new development. To reduce the potential for interactions between nocturnally flying birds with external lights and man-made structures, any external lighting that may be required in conjunction with development of the project will be shielded. This mitigation would serve the dual purpose of minimizing the threat of disorientation and downing of birds, while at the same time complying with the Hawaiʻi County Code § 14 – 50 *et seq.* which requires the shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting to the astronomical observatories located on Mauna Kea.

Although there is no standing water, streams or other water features in the project area, and thus the habitat present does not support waterbirds, two listed waterbird species, the Hawaiian Coot (Fulica alai), and the Hawaiian endemic sub-species of the cosmopolitan Black-necked Stilt (Himantopus mexicanus knudseni), are resident breeding species within the Kaloko-Honokōhau National Historical Park, which is located directly across the Queen Kaʻahumanu Highway from the northwestern terminus of the project site. The development of this site does not pose direct threats to these species or their habitat, and no take of these species is anticipated as a result of the development of Kaloko Makai.

3.7.2 Terrestrial Fauna

The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the site. The mammalian survey was conducted concurrently with the avian surveys. This mimics the same survey techniques employed during the 2006 survey of the same property (David, 2006).

Visual and electronic scans, using a Broadband AnaBat II® ultrasonic bat detector, were made for bats. The endangered ʻŌpeʻapeʻa, Hawaiian hoary bat (*Lasiurus cinereus semotus*) was not detected during the survey.

All observations of mammalian species were of an incidental nature. With the exception of the endangered ʻŌpeʻapeʻa, all terrestrial mammals currently found on the Island of Hawaiʻi are alien species, and most are ubiquitous.

Eight terrestrial mammalian species were detected during the course of this survey. European house mice (*Mus musculus domesticus*), mongooses (*Herpestes a. auropunctatus and Herpestes a. auropunctatus*), cats (*Felis catus*), a pig (*Sus s. scrofa*), and goats (*Capra h. hircus)* were seen within the study area. Additionally, skeletal remains were encountered of small Indian mongoose, cat, pig, cattle (*Bos Taurus*), goat, and sheep (*Ovis aries*). Tracks and sign of dogs (*Canis f. familiaris*), were encountered in several locations within the project area.

Hawaiʻi's sole endemic terrestrial mammalian species, the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), was not detected during this survey. However, during the 2006 survey one Hawaiian hoary bat was detected as an incidental observation flying down-slope (*makai*) from above the eastern boundary of the site towards the ocean. Thus, it is possible that Hawaiian hoary bats over-fly the general project area on a seasonal basis.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The modification of the project area is not expected to result in significant impacts to any mammalian species. Furthermore, the development of the site is not expected to have a significant deleterious impact on native faunal resources found within the North Kona District.

As previously discussed, it is possible that Hawaiian hoary bats fly-over the general project area on a seasonal basis. The planting of trees and ornamental vegetation following development may increase the presence of prey items for this insectivorous bat, and thus may in fact enhance foraging resources for this species in the area.

3.7.3 Invertebrate Resources

A Survey of Terrestrial Invertebrate Resources was conducted in November 2008 by Steven Lee Montgomery, Ph.D. to assess these resources within the project area. The survey included a literature review of previous studies conducted in the general project area and field surveys of the

project area which were conducted in September and October 2008. The report is included in its entirety as Appendix H.

The following collecting methods for terrestrial invertebrates were used as appropriate to the terrain, botanical resources, and target species:

- Baiting – Baits are used to attract insect species to specific tastes or smells. Baiting is a recognized method of censusing lava tubes for cave adapted fauna. Baited traps were placed in three lava tubes from October 10 – 13, 2008.
- Host plant searches – Potential host plants, both native and introduced, were searched for arthropods that feed or rest on plants.
- Light sampling – A survey of insects active at night using a bright light source in front of a white cloth/sheet. Sampling was conducted approximately 11 hours on each night of surveying. Locations were chosen based on host plant proximity and terrain. Three of the four locations were near the native Dryland Forest.
- Seep nets – This is the most common and general method of collecting most flying and perching insects. A fine mesh net was swept across plants, leaf litter, rocks, etc. to collect any flying, perching, or crawling insects.
- Visual observation

The Montgomery survey found 12-invertebrates endemic to the Hawaiian Islands and 1-invertebrate indigenous to the Hawaiian Islands. No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

Invertebrate species observed within the project area include spiders (*Araneae)*; true bugs (*Heteroptera;*, butterflies and moths (*Lepidoptera*); dragonflies and damselflies (*Odanata);* and praying mantis, grasshoppers, crickets (*Orthoptera).*

The Montgomery survey of the lava tubes yielded few native invertebrates, with a moth (*Schrankia sp*.), being the most common native species encountered. The most common arthropod encountered in the small sample of lava tubes surveyed was the adventive American cockroach (*Periplaneta Americana*). These results are not surprising given that many of the lava tubes have skylights creating a short dark zone, or none at all. Some tubes lack covering vegetation. In many tubes there is no root system reaching into the lava tubes, and insufficient moisture to support a richer ecosystem. Other tubes have only a few grass roots. The major food source, long roots, supporting most lava tube arthropod communities, is mostly absent.

USFWS surveyed 25 – 30 lava tubes in 1995 and reported most caves lacked aspects recognized as necessary to support cave-adapted ecosystems.

Montgomery notes that alien predatory ants which prey on other insects are a major cause of low numbers of native arthropods. The big-headed ant (*Pheidole megacephala*)**,** longlegged ant (*Anoplolepis gracilipes*), and carpenter ant (*Camponotus variegatus*) are present within the project area. Ants are well documented as a primary cause of low levels of native arthropods at elevations up to 2,000 feet. Ant populations often do not overlap, have separate territories, and as a result offer very few ant-free zones to native arthropods.

The Montgomery survey team was alert for a variety of invertebrates on the property which were not found.

No native snails were observed on the project property, by the Montgomery survey team nor were any Lava cricket (*Caconemobius anahulu*) found on site.

The Montgomery study notes that the Kaloko Makai property does not provide appropriate habitat for any of the 12 native picture-winged flies (*Drosophila)* species recently listed as endangered or threatened. No native picture-winged flies were observed on the property.

The Blackburn's sphinx moth (*Manduca blackburni*), an endangered species was not found in this survey. The study also notes that neither the moth's native host plant, nor the best alien host, were observed on the property during the survey or during the botanical survey by Whistler in 2006.

The Kaloko Makai project area includes classic habitat for centipedes, scorpions, and widow spiders.

POTENTIAL IMPACTS AND MITIGATION MEASURES

No federally or state listed endangered or threatened species were noted in the 2008 Montgomery survey. No anticipated actions related to the proposed project activity in the surveyed locations are expected to threaten an entire species.

The preservation of archaeological sites (discussed in Section 4.1) and the native Dryland Forest should assist in providing habitat for native invertebrate species.

Light is attractive to all arthropods. The potential presence of *Manduca blackburni* in the greater area makes shielded lighting an important protection for this endangered invertebrate. As discussed in 3.7 external lights will be shielded and comply with the Hawai'i County Code § 14 – 50 *et seq*.

Grading of the project area will be in compliance with the County of Hawai'i's grading ordinance requirements and will require NPDES permit from the State DOH for storm water discharges associated with construction activities, including BMPs to minimize impacts to adjacent areas. In addition, construction staging areas will be established in areas well away from sensitive areas.

4. DESCRIPTION OF THE HUMAN ENVIRONMENT, POTENTIAL IMPACTS AND MITIGATION MEASURES

This section of the Second Draft EIS describes the existing conditions of the human environment, as well as potential impacts and mitigation measures associated with the Kaloko Makai development project.

4.1. ARCHAEOLOGICAL AND HISTORIC RESOURCES

Archaeological inventory surveys were conducted by Cultural Surveys Hawaiʻi, Inc. (CSH) between March 2007 and April 2008 for the Kaloko Makai project site. The archaeological inventory report consists of seven volumes. The results are summarized below and an abstract of the study is included as Appendix I. The complete report has been filed with the State Historic Preservation Division (SHPD), State Land Use Commission (LUC), Office of Environmental Quality Control (OEQC), and Office of Hawaiian Affairs (OHA).

4.1.1. Archaeological Background

The following archaeological inventory survey scope of work was developed and implemented to satisfy SHPD requirements. The scope of work for this inventory survey was designed in accordance with SHPD rules governing standards for archaeological inventory surveys and reports (Hawaiʻi Administrative Rules (HAR), Title 13, Subtitle 13, Chapter 276):

1) Appropriate consultation with knowledgeable members of the community, requesting information on historic properties in the project area.
2) A complete ground survey of the entire project area for the purpose of historic property identification and documentation. All historic properties would be located, described and mapped with evaluation of function, interrelationships and significance. Documentation is to include photographs and scale drawings of selected historic properties. All historic properties are to be assigned *Inventory of Historic Properties* numbers by the State.
3) Subsurface testing to determine if subsurface deposits are located in the project area, and, if so, evaluate their significance. If appropriate samples from these excavations were found, they were analyzed for chronological and/or paleoenvironmental information.
4) Research on historic and archaeological background, including search of historic maps, written records and Land Commission Award documents. This research was to focus on the specific area with general background on the ahupuaʻa land district and was to emphasize settlement patterns.
5) Preparation of a survey report to include the following:
    a. A topographic map of the survey area showing all historic properties;
    b. Results of consultation with knowledgeable community members about the property and its historical and cultural issues.
    c. Description of all historic properties with selected photographs, scale drawings and discussions of function;
    d. Historical and archaeological background sections summarizing prehistoric and historic land use as they relate to the project area's historic properties;

e. A summary of historic property categories and their significance in an archaeological and historic context;
f. Recommendations based on all information generated that will specify what steps should be taken to mitigate impact of development on the project area's significant historic properties, such as data recovery (excavation) and preservation of specific areas. These recommendations will be developed in consultation with the client and the State agencies.

This scope of work includes full coordination with the SHPD relating to archaeological matters. This coordination takes place after consent of the landowner or representatives.

Given the large size of the total project area (over 1,100-acres) and the large number of archaeological sites identified (341), the work has been organized within separate studies for each of the four Tax Map Key parcels (TMK: [3] 7-3-009:017, 025, 026 & 028 (includes new parcel 063) as follows[1]:

1. *Archaeological Inventory Survey of a 224.43-Acre Parcel within Portions of Kaloko and Kohanaiki Ahupuaʻa, North Kona District, Hawaiʻi Island TMK: [3] 7-3-009:017* (Bell, Groza, Shideler, and Hammatt 2008),
2. *Archaeological Inventory Survey of a 360.131-Acre Parcel within Portions of Kohanaiki Ahupua'a and Kaloko Ahupuaʻa, North Kona District, Hawai'i Island TMK: [3] 7-3-009:025*(Bell, Groza, Simonson, Shideler, and Hammatt 2008),
3. *Archaeological Inventory Survey of a 194.324-Acre Parcel within portions of Kohanaiki Ahupuaʻa and Kaloko Ahupua'a, North Kona District, Hawaiʻi Island TMK: [3] 7-3- 009:026* (Bell, Simonson, Esh, Groza, Shideler, and Hammatt 2008), and
4. *Archaeological Inventory Survey of a 363.106-Acre Parcel within Portions of Kaloko Ahupuaʻa, North Kona District, Hawaiʻi Island TMK: [3] 7-3-009:028 (includes new parcel 063)* (Esh, Bell, Simonson, Shideler, and Hammatt 2008)

The proposed project was considered for its potential to impose adverse visual, auditory or other environmental impact to any known historic properties, including standing architecture, located outside the project area. Based on available information about the proposed development and the visual gravity of industrial/commercial development flanking the project area to the north and south, and Queen Kaʻahumanu Highway to the west (makai*)*, the proposed project is considered to add to an established urban trend in coastal North Kona.

The archaeological inventory surveys involved consultation with knowledgeable members of the community, a complete ground survey of the entire project area for the purpose of historic property identification and documentation, subsurface testing to determine if subsurface deposits are located in the project area, and research on historic and archaeological background.

Because fieldwork was occasionally conducted simultaneously, certain numerical sequences span all four TMKs. Specifically, burials were reported to SHPD upon their discovery and therefore their

[1] TMK (3)7-3-009: 063 was previously within TMK 7-3-009: 028.

numerical sequence reflects the discovery date for the entire study. These numerical designations are consequently not necessarily sequential within the TMK, but they do reflect the designations as originally reported to SHPD.

Document Review

Background research included a review of previous archaeological studies on file at SHPD of the Department of Land and Natural Resources (DLNR); a review of geology and cultural history documents at Hamilton Library of the University of Hawaiʻi, the Hawaiʻi State Archives, the Mission Houses Museum Library, the Hawaiʻi Public Library, and the Archives of the Bishop Museum; study of historic photographs at the Hawaiʻi State Archives and the Archives of the Bishop Museum; and a study of historic maps at the Survey Office, DLNR and the Land Survey Division, Department of Accounting and General Services (DAGS). Information on Land Commission Awards (LCAs) was accessed through Waihona ʻĀina Corporation's Māhele Data Base (www.waihona.com).

This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources studied were used to formulate a predictive model regarding the expected type and location of sub-surface pre-and post-contact historic properties in the project area.

Consultation

A previous cultural impact assessment (Hammatt & Shideler 1996) was conducted for TMK 7-3-09: 17, in 1996. Informants knowledgeable of TMK 7-3-09: 17 and the project area vicinity were interviewed. These consultations focused on identifying traditional cultural practices conducted adjacent to the project area as well as addressed community concerns regarding possible burial sites.

CSH conducted consultation with organizations and the community to identify kūpuna and other individuals with knowledge of the history of the project area and its surroundings.

The results of these interviews are presented in a companion report for this project, titled "Cultural Impact Assessment for a 1,150-Acre Parcel within portions of Kohanaiki and Kaloko Ahupuaʻa, North Kona District, Hawaiʻi Island TMK: [3] 7-3-009:017, 025, 026, 028" (Monahan et al. 2008). The Cultural Impact Assessment (CIA) includes consultation for all five parcels (including new parcel 063) within the Kaloko Makai project. The on-going consultation with organizations includes the State SHPD, OHA and the Hawaiʻi Island Burial Council. The CIA is further discussed in Section 4.2.

Summary of Previous Archaeological Studies

The following is a summary of previous archaeological studies conducted within the current project area, discussed in chronological order (see Figure 4-1). Temporary field numbers were assigned to historic properties during prior field inspections, but no State Inventory of Historic Property numbers were given to any sites within the project area prior to the current study.

Survey work was undertaken in 1970-71 by Renger inland of the highway (see Figure 4-1) - i.e. that middle zone of Kaloko which includes a portion of the present study area. Although the findings of much of this fieldwork within the middle zone were written up in detail (Cordy et al. 1991), the findings from the survey sample conducted specifically within the project area (i.e. that portion of the middle zone situated on the inland side of the Queen Kaʻahumanu Highway) were not included because, "regrettably... it appears that the maps and survey records have been misplaced since the end of the 1971 field season" (Cordy et al. 1991:340). Renger's summary of the findings from that part of the survey indicated that fifteen features were identified:

> Very few sites were discovered within the "transitional middle zone" ... between the coastal and upland exploitation zones ...Seven lava tube shelters, four trails (coast-upland); three platforms, two cairns ... two low-walled enclosures and an L-shaped structure were recorded. (cited in Cordy et al. 1991:340)

These sites are presumably the subject of a set of Renger's (1971) "Kaloko Field Notes" that begins "*Mauka* Excavations" but in the apparent absence of any site location map it is difficult to relate these notes to specific sites in the field.

Lloyd Soehren (1979) conducted a reconnaissance survey of the Kaloko access road corridor, understood as the present alignment of present Hina Lani Street but identified no sites.

In 1985, Barrera, Jr. surveyed an approximately 409-acre area located between Māmalahoa Highway and Queen Kaʻahumanu Highway just below the Kona Heavens Subdivision and just mauka of Kaloko Makai project site. The portion north of Hina Lani Street was later surveyed by Barrera Jr. (1991) and Wolforth et al (2005), as shown in Figure 4-1. Four sites were recorded within the area, including an enclosure (Site 1), a lava tube cave (Site 2), a wall (Site 3), and a platform potentially containing burial sites (Site 4). It is unknown at this time if these sites were assigned SIHP numbers. These sites are located outside of the project site.

In 1987, Paul H. Rosendahl Inc. accomplished an archaeological reconnaissance survey of three one-acre parcels - proposed water tank sites - in Kaloko (TMK: 7-3-09: Por.1, 17) (Rosendahl and Haun 1987), along the south side of the then "main access road between Queen Kaʻahumanu Highway and Kona Heavens Subdivision" - *i.e.* the present Hina Lani Street. The parcels were located at 350 ft. above mean sea level (amsl.), 630 ft. above mean sea level (amsl) and 910 ft. amsl. The lower two parcels are within the present project area, and the highest is outside of it.

Only one site (State site 10- 28-10887), a historic wall interpreted as a boundary or cattle wall was recorded and that was within the mauka-most parcel. Rosendahl and Walker (1991) carried out an Archaeological Field Inspection for proposed Kaloko Industrial crusher sites just south of Hina Lani Street within the present study area. Their study began with the examination of a 10-acre study area that identified a trail and two associated cairns, passing through the east corner at about 450 ft. amsl. The presence of archaeology lead to a determination to examine an adjacent 10-acre area that proved to be free of archaeological concerns.

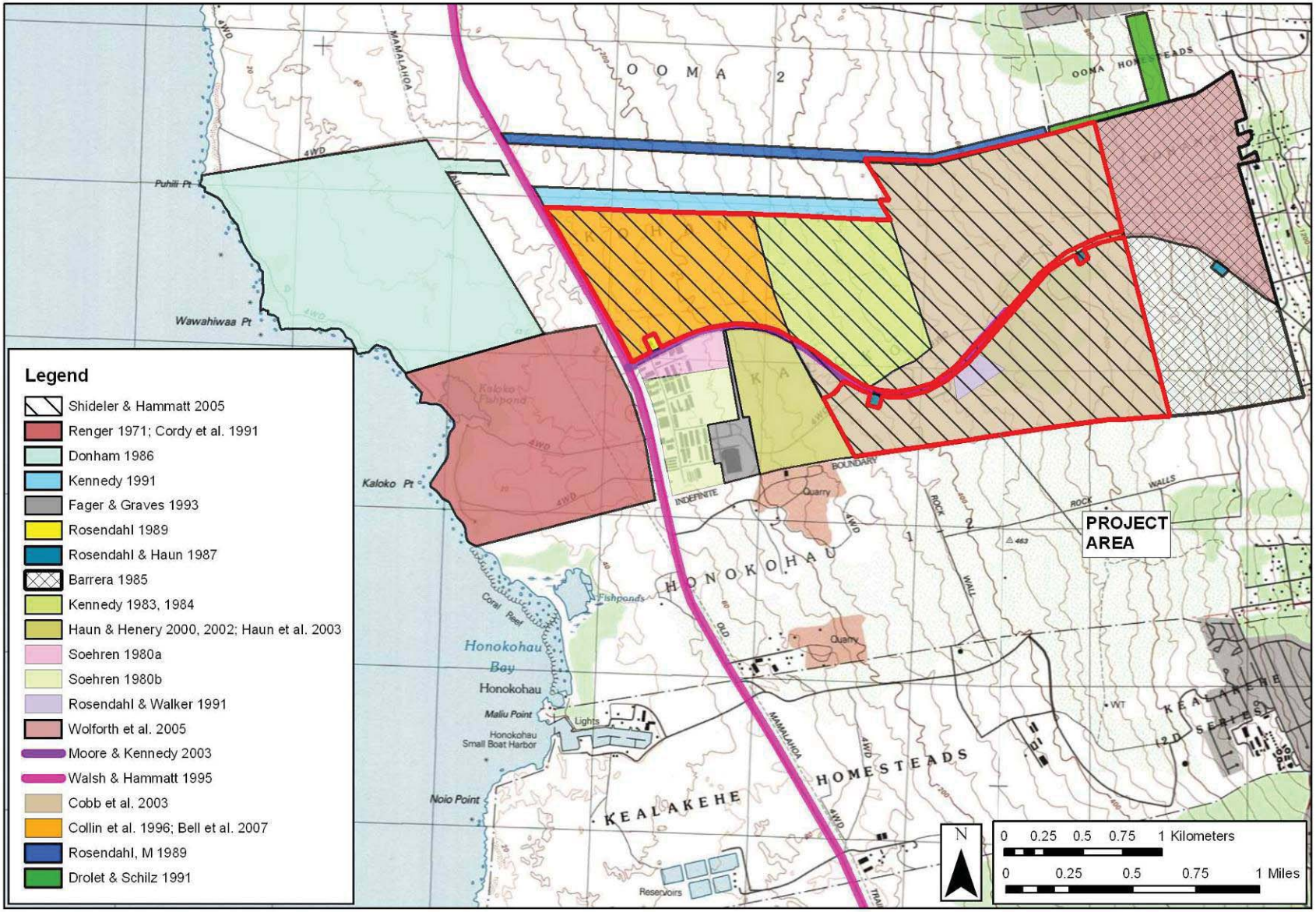


FIGURE 4-1

Previous Archaeological Studies in the Vicinity of the Project Area

Kaloko Makai

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

In 2003, two studies completed archaeological assessments within the project area. A field inspection by Cobb et al. (2003) gives very brief descriptions of possible historic properties within the current project area as well as in two parcels to the north. Because of the large area covered, the maps are generalized, and this combined with the brief descriptions make it difficult to confidently correlate the sites mentioned with sites identified during the current inventory survey. Haun (2003) also did an archaeological assessment of the current project area, largely via helicopter to cover the aʻā terrain, but also by foot in the thicker vegetation. He identified eight sites, all of which correlate to sites currently presented.

In 2005, CSH completed an archaeological field inspection of a 1200+ acre project area in Kaloko and Kohanaiki [TMKS: (3) 7-3-009:017, 025, 026 and 028]. Numerous pre-Contact sites including habitations, agricultural features, petroglyphs, boundary walls, and burials were observed (Shideler & Hammatt 2005). This field inspection included the present project area.

Regarding Lava Tubes

Lava tubes are ubiquitous within portions of the Kaloko Makai project area, especially on the pāhoehoe, and vary greatly in size and shape. All openings in the bedrock were examined for the presence of cultural modification or cultural material. Any opening that appeared large enough to explore was examined thoroughly. Generally, an average size person can fit through a tube entrance 30 centimeters in diameter or greater, but the shape and geology of lava tubes varies greatly, and occasionally a smaller size opening could be entered; likewise, sometimes a larger than 30 centimeter opening could not be traversed due to jagged edges, etc.

Every effort was made to explore the entirety of all lava tubes to their terminus, within reason as far as tube size and safety (i.e., heavily collapsed tubes were entered with caution). When a tube can no longer be explored due to size or safety, this is considered its cultural terminus, and is denoted as impassable on maps.

The primary purpose for the intensive exploration of lava tubes is to locate any human remains that may be present in remote areas of a lava tube, in addition to locating other cultural material. Lava tubes were traditionally used for concealment of burials, and human remains are often located far from any other cultural modification, sometimes at great distances from tube entrances; these burials may have been placed in the lava tube using an entrance that was then filled and concealed on the surface. Therefore, in an effort to locate all burial locations within the project area, a thorough effort was made to explore all lava tubes and side tubes to their natural or cultural terminus.

Human utilization of lava tubes sometimes involved blockage of entrances and inner side tubes. In order to complete the inventory survey, it was necessary to pass this type of blockage; when possible, this was done by finding another passageway for access behind the blockage or attempting to assess what was behind the blockage (i.e., solid lava tube wall vs. a continuing passageway) without disturbing the blockage. If it was determined that the tube did continue past blockage and there was no other way to access the tube, a photo was taken of the blocked area and then rocks

were carefully removed until an archaeologist could pass through. After inspection of the lava tube, the rocks were replaced as carefully as possible to their original position.

All lava tubes with cultural material present were mapped using a compass for bearing and a laser for distances (Stanley FatMax Tru-laser Distance Measurer; stated accuracy for this device is +/- 6 cm). The laser reflects well off most surfaces in tubes, and is an excellent alternative to the rather impractical method of pulling measuring tapes through cramped areas, or simply estimating distances (it is extremely difficult to accurately estimate distances in lava tubes; see Wolforth et al. 2005:24). The laser method may actually increase the efficiency of mapping tubes, since accurate measurements can be obtained nearly instantaneously; overall this technology seems to produce more accurate maps than simply estimating distances in about the same amount of time. In small tubes, a regular measuring tape was used when practical.

Occasionally lava tubes extend long distances beyond any cultural modification. When this occurs, lava tubes are explored to their natural or cultural terminus. Maps are produced for all areas containing cultural materials, and the rest of the lava tube is described but not necessarily mapped. A distance and bearing from the site tag is given for all burials within lava tubes.

4.1.2. Results of Archaeological Inventory Survey

A total of 341 archaeological sites were identified in the course of the archaeological inventory survey work (59 sites in TMK 017, 121 sites in TMK 025, 120 sites in TMK 026 and 041 sites in TMK 28/63. An overview of the formal feature types, functional categories and significance criteria is presented below, followed by a summary discussion of the finds.

Table 4-1
Archaeological Site Density by Parcel and Acreage

Parcel	Acreage	Number of Sites	Sites/Acre
TMK 017	224.430	59	0.26
TMK 025	360.131	121	0.34
TMK 026	194.324	120	0.62
TMK 028 & 063	363.106	41	0.11
Total	**1141.991**	341	0.22

Formal Feature Types

Formal feature type designations are descriptive - based on physical characteristics – and commonly refer to structural elements of a site. Fifteen primary feature types were identified within the project area.

The following are brief descriptions of the different feature types encountered during the inventory survey:

Alignment: A single row of stones one course high.

Cairn: A marker of stacked or piled stones. Cairns are frequently referred to as ahu.

Enclosure: A walled structure that completely encloses an area.

Lava blister: A small subterranean lava formation. Unlike lava tubes, however, they tend to be circular and do not extend in any direction for a great length.

Lava tube: Modifications or apparent usage of a subterranean lava formation characteristic of pāhoehoe lava flows.

Modified depression: An area in which stones have been removed to create a depression or to expose a soil area. Two types of modified depressions were encountered, one type (encountered on a lava flow) appears to have functioned as a storage area and the second type in which the only modification consists of the removal of stones to create an area suitable for agriculture either in soil or possibly through mulching.

Modified outcrop: An area within an existing lava flow in which a portion of the flow has been humanly modified by the placement or removal of stones (a modified tumulus differs from a modified outcrop in that a modified tumulus is in a field of exposed outcrop whereas a modified outcrop may be surrounded by soil).

Mound: Linear, circular or amorphous stone pile which typically lacks a vertical face and level surface.

Pavement: A stone-filled floor or surface.

Platform: A raised free-standing stone structure with three or more vertical faces.

Rock art: A carving or inscription on a boulder, cobble or slab.

Terrace: A raised stone construction partially built against, or level to, a ground or outcrop surface. These structures commonly resemble platforms. Unlike platforms, however, they are not totally free-standing.

Trail: A trodden lava surface, pavement or stone alignment set into the ground or outcrop surface.

Wall: A bi-faced and free-standing stone structure which is an isolated segment or defines large boundaries.

Table 4-2 is a summary of occurrences of formal feature types identified.

Function Interpretation

Function interpretation of a site or feature is determined by criteria which included: site construction and complexity; locational context (association with other sites and/or geological

determinates); analysis of cultural remains (surface and subsurface); and external correlations with other archaeological sites in Hawaiʻi.

Ten primary function categories were identified among the sites within the project area: agriculture; animal husbandry; habitation; human burial, ceremonial; indeterminate; marker; mining (quarrying) and storage (activity areas); rock art, transportation; and water collection (activity area). Findings are summarized in Table 4-3.

The following are brief descriptions of the different function types commonly encountered in this general area:

Activity area: The feature represents the extent of space serving a special function, or the scope of a specific activity; this category may include lithic production, water collection, storage, fishhook manufacture, quarrying or mining, etc.

Agriculture: Primary function is for farming, horticulture or subsistence planting.

Animal husbandry: The feature is associated with the care of livestock.

Burial: Used for the interment of human skeletal remains. This functional category is also used for human remains found out of primary context.

Ceremonial: Used for ritual or religious purposes.

Fireplace: Burn pit or lens of burned material in a limited area.

Habitation: A place for living, which may be either temporary or permanent habitation.

Habitation sites are generally distinguished from shelters by an increased energy investment in modification and formal construction.

Marker: A point visibly marked for the purpose of identifying a point on a line on the surface of the earth such as a boundary or trail.

Rock art: Petroglyphs and pictographs are functionally rock art.

Transportation: The feature was used as a road or trail.

Significance Assessments

Sites were evaluated for significance according to the broad criteria established for the State Register (See Tables 4-4 to 4-8).

The five criteria are:

A Site reflects major trends or events in the history of the state or nation.

B Site is associated with the lives of persons significant in our past.

C Site is an excellent example of a site type.
D Site may be likely to yield information important in prehistory or history.
E Site has cultural significance; probable religious structures (shrines, heiau) and/or burials present.

4.1.3. Conclusions

Kohanaiki and Kaloko, based on the present research, had fairly different resources at the elevation of the project area, and varied significantly in the types of resources as elevation increased. Rainfall, eroded pāhoehoe and barren aʻā all created distinct landscapes for these ahupuaʻa in the project area. Both had numerous lava tubes, a great resource in this arid region. In Kohanaiki the mauka regions had greater potential for agriculture and had very dense lava tubes, attracting habitation to this area.

As a whole, inhabitants of Kohanaiki and Kaloko were fairly spread out, but were more concentrated along the upper half of the project area. In pre-contact times there could have been as many as a dozen households living in this more mauka area. As has been demonstrated elsewhere in Kona, strong preference was given to ridges, small rises and proximity to lava tubes in the case of most of these habitations. This habitation area in the project area was most likely the makai edge of an inland population center that likely extended mauka of the Kohanaiki Homesteads.

In post-contact times, it is likely that many of those who remained resettled near the new government road, at the Kohanaiki Homesteads or in the land claims awarded in this vicinity. Still, findings show that the area continued to be an important resource and habitation area evidenced by a notable number of historic sites including a habitation, platforms, two curb stone trails, a historic habitation and numerous historic burials. In these post-contact times, the mauka project area probably served as an informal extension to the Kohanaiki Homesteads to the makai.

Residents of these areas were industrious and opportunistic use of the natural terrain and natural resources is evident. The lack of readily available freshwater led to a number of adjustments in living practices. Agricultural areas are concentrated higher up the slope where rainfall is more prevalent. Lava tubes were utilized to capture dripping ground water almost without exception, even when the labor required to do so would have been very significant.

Habitation was also somewhat intensive, with dense complexes of structures located further makai than might have been expected by previous work in the area. These areas were interdependent with other portions of the ahupuaʻa. Presence of significant marine food remains in mauka agricultural areas and habitations reinforce the importance of coastal resources here.

Table 4-2
Summary Occurrences of Formal Feature Types (Total number of features: 658)

Feature Type	TMK 17		TMK 25		TMK 26		TMK 28		All TMKs	
	No.	%	No.	%	No.	%	No.	%	No.	%
Alignment	1	1	3	1.4	2	0.7	0	0	6	0.9
Cairn	1	1	8	3.6	17	6.1	2	3.3	28	4.3
Cupboard	2	2	0	0	0	0.0	0	0	2	0.3
Enclosure	12	12.1	31	14	19	6.9	2	3.3	64	9.7
Hearth	1	1	0	0	1	0.4	0	0	2	0.3
Lava blister	1	1	5	2.3	2	0.7	0	0	8	1.2
Lava tube	10	10.1	80	36.2	70	25.3	17	27.9	177	26.9
Modified depression	2	2	9	4.1	4	1.4	4	6.6	19	2.9
Modified outcrop	26	26.3	14	6.3	16	5.8	9	14.7	65	9.9
Mound*	3	3	8	3.6	26	9.4	4	6.6	41	6.2
Pavement	7	7.1	6	2.7	5	1.8	0	0	18	2.7
Platform	2	2	8	3.6	44	15.9	5	8.2	59	9.0
Rock art	0	0	2	0.9	4	1.4	0	0	6	0.9
Rock shelter	1	1	0	0	0	0.0	0	0	1	0.2
Terrace	7	7.1	13	5.9	23	8.3	3	4.9	46	7.0
Trail	21	21.2	17	7.7	12	4.3	7	11.5	57	8.7
Wall	2	2	17	7.7	32	11.6	8	13.1	59	9.0
Total # of Features (% of total features)	**99 (15%)**		**221 (34%)**		**277 (42%)**		**61 (9%)**		**658 (100%)**	

*There are several pervasive agricultural sites in the project area with widespread clearing and planting mounds. As these individual mounds are considered sub-features of the larger sites, each site/feature counts as one occurrence of the formal feature type.

Table 4-3
Summary Occurrences of Formal Site Function (Total number of sites: 341*)

Function	TMK 17		TMK 25		TMK 26		TMK 28		TOTAL
	No.	%	No.	%	No.	%	No.	%	%
Activity Area	0	0.0	3	2.3	24	17.1	3	7.0	**8.0**
Agriculture	7	10.6	4	3.1	9	6.4	1	2.3	**5.6**
Animal husbandry	0	0.0	4	3.1	3	2.1	7	16.3	**3.7**
Burial (Known)	0	0.0	5	3.9	24	17.9	5	11.6	**9.3**
Burial (Probable)	3	4.5	1	0.8	2	2.1	2	4.7	**2.4**
Ceremonial	0	0.0	2	1.6	2	1.4	1	2.3	**1.3**
Indeterminate	3	4.5	4	3.1	1	0.7	0	0.0	**2.1**
Marker	1	1.5	5	3.9	8	5.7	2	4.7	**4.2**
Quarrying	1	1.5	5	3.9	1	0.7	1	2.3	**2.1**
Storage	3	4.5	0	0.0	1	0.7	0	0.0	**1.1**
Permanent Habitation	1	1.5	10	7.8	25	17.9	2	4.7	**10.1**
Temporary Habitation	31	47.0	72	56.3	34	24.3	13	30.2	**39.8**
Transportation	16	24.2	13	10.2	4	2.9	6	14.0	**10.3**

*Since some sites have dual primary functions, i.e. habitation and burial, these functions are each counted as one instance each in the table; thus, the total counts for each parcel here are slightly different than the actual total number of sites (341), for this table only.

Table 4-4
Archaeological Site Summary for TMK Parcel 17

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
13493	Trail	Transportation	D	Pre-Contact	No Further Work
15324	Trail	Transportation	D, E*	Pre-Contact	No Further Work
15325	Wall, modified depressions, mound	Temporary habitation / Transportation / Storage	D	Pre-Contact	Data Recovery
15329	Modified tumulus	Temporary habitation	D	Pre-Contact	No Further Work
20696	Lava tube	Temporary habitation	D	Pre-Contact	No Further Work
20697	Modified tumulus	Temporary habitation	D	Pre-Contact	Data Recovery
20698	Pavements	Temporary habitation	D	Pre-Contact	Data Recovery
20699	Modified tumulus	Indeterminate	D	Pre-Contact	No Further Work
20700	Modified tumulus, Enclosure	Temporary habitation / Agriculture	D	Pre-Contact	Data Recovery
20701	Modified tumulus	Temporary habitation	D	Pre-Contact	No Further Work
20702	Mod. tumulus/ terrace	Temporary habitation	D	Pre-Contact	Data Recovery
20703	Terrace, Pavement, Mod. tumulus	Temporary habitation / Mining	D	Pre-Contact	Data Recovery
20704	Trails, walls	Temporary habitation / Transportation	D	Pre-Contact	No Further Work
20705	Modified tumulus	Possible burial	D, E*	Pre-Contact	Preservation
20706†	Modified tumulus	Temporary habitation	D	Pre-Contact	No Further Work
20707	Lava tube	Temporary habitation	D	Pre-Contact	No Further Work
20708	Modified tumulus	Temporary habitation	D	Pre-Contact	Data Recovery
20709	Platform, enclosures, modified lava blister	Recurrent habitation / Agriculture / Storage	C, D	Pre-Contact	Preservation

Table 4-4 (continued) Archaeological Site Summary for TMK Parcel 17					
SIHP No. 50-10-27-	**Site Type**	**Function**	**Significance**	**Age**	**Mitigation**
20710	Lava tube, Alignment, Mound, Modified tumulus, Pavement	Temporary habitation	D	Pre-Contact	Data Recovery
20711	Enclosure	Temporary habitation	D	Pre-Contact	Data Recovery
20712	C-shape	Temporary habitation	D	Pre-Contact	No Further Work
20713	Cairn	Marker	D	Pre-Contact	No Further Work
20714	Wall	Temporary habitation	D	Pre-Contact	No Further Work
	Terrace	Temporary habitation	D	Pre-Contact	Data Recovery
20716	Modified tumulus	Possible Burial	D, E*	Pre-Contact	Preservation
20717	Modified tumulus	Temporary habitation	D	Pre-Contact	No Further Work
20718	Modified tumulus	Agriculture	D	Pre-Contact	No Further Work
20719	Rock shelter / Hearth	Temporary habitation	D	Pre-Contact	Data Recovery
20720	Terrace	Possible Burial (destroyed)	D, E*	Pre-Contact	No Further Work
20721	Modified tumulus	Temporary habitation	D	Pre-Contact	Data Recovery
20722	Trail	Transportation	D	Pre-Contact	No Further Work
20724	Trail	Transportation	D	Pre-Contact	No Further Work
20725	Modified tumulus	Temporary habitation	D	Pre-Contact	Data Recovery
20726	Trail	Transportation	D	Pre-Contact	No Further Work
20727	Lava tube	Temporary habitation	D	Pre-Contact	Data Recovery
20728	Enclosure	Temporary habitation	D	Pre-Contact	No Further Work
20729	See -15329	N/A	N/A	N/A	No Further Work
20730	Modified tumulus	Temporary habitation	D	Pre-Contact	Data Recovery

Table 4-4 (continued)
Archaeological Site Summary for TMK Parcel 17

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
20732	Trail	Transportation	D	Pre-Contact	No Further Work
20733	Trail	Transportation	D	Pre-Contact	No Further Work
20734	Modified depression	Agriculture	D	Pre-Contact	No Further Work
20735	See -15325	N/A	N/A	N/A	No Further Work
20736	Trail	Transportation	D	Pre-Contact	No Further Work
20737	Trail	Transportation	D	Pre-Contact	No Further Work
20738	Enclosure	Agriculture	D	Pre-Contact	No Further Work
20739	Enclosure / Trail	Transportation	D	Pre-Contact	No Further Work
20740	Modified tumulus	Agriculture	D	Pre-Contact	No Further Work
20742	Lava tube	Temporary habitation	D	Pre-Contact	No Further Work
20743	Modified tumulus	Indeterminate	D	Pre-Contact	No Further Work
20744	Trail	Transportation	D	Pre-Contact	No Further Work
20745	Trail	Transportation	D	Pre-Contact	No Further Work
20746	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
20747	Trail	Transportation	D	Pre-Contact	No Further Work
20748	Lava tube	Storage	D	Pre-Contact	No Further Work
20749	Lava tube, terrace	Temporary habitation	D	Pre-Contact	Data Recovery
26259	Trail	Transportation	D	Pre-Contact	No Further Work
26260	Lava tube	Temporary habitation	D	Pre-Contact	Data Recovery
26261	Terrace	Temporary habitation	D	Pre-Contact	Data Recovery
26262	C-shape	Temporary habitation	D	Pre-Contact	No Further Work
26263	Lava tube	Temporary habitation	D	Pre-Contact	Data Recovery
26264	Modified tumulus	Agriculture	D	Pre-Contact	No Further Work
10712	Wall	Animal Husbandry	D	Historic	Preservation
20741	Complex	Temporary Habitation	C, D	Pre-Contact	Preservation

Table 4-5
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26275	Complex	Ceremonial	C, D, E	Pre-Contact	Preservation
26276	Modified depression	Temporary Habitation	D	Pre-Contact	No Further Work
26277	Complex	Temporary Habitation	D	Pre-Contact	Data recovery
26278	Trail	Transportation	D	Pre-Contact	No Further Work
26279	Modified outcrop	Indeterminate	D	Pre-Contact	No Further Work
26280	Lava blister	Temporary Habitation	D	Pre-Contact	No Further Work
26281	Mounds	Agriculture	D	Pre-Contact	No Further Work
26282	Lava blister	Temporary Habitation	D	Pre-Contact	No Further Work
26283	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26284	Complex	Permanent Habitation	C, D	Pre-Contact	Preservation
26285	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26286	Modified outcrop	Quarry	D	Pre-Contact	No Further Work
26287	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26288	Complex	Temporary Habitation	C, D	Pre-Contact	Preservation
26289	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26290	Lava tube	Burial	D, E*	Pre-Contact	Preservation
26291	Lava tube	Temporary Habitation/ Quarry	D	Pre-Contact	Data Recovery
26292	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26293	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26294	Wall	Indeterminate	D	Pre-Contact/ Historic	No Further Work

Table 4-5 (continued)
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26295	Cairn	Marker	D	Pre-Contact	No Further Work
26296	Enclosure	Permanent Habitation	C, D	Pre-Contact/ Historic	Preservation
26297	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26298	Platform	Temporary Habitation	D	Pre-Contact	No Further Work
26299	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26300	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26301	Terrace	Temporary Habitation	D	Pre-Contact	No Further Work
26302	Cairn	Marker	D	Pre-Contact	No Further Work
26303	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26304	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26305	Modified outcrop	Temporary Habitation	D	Pre-Contact	No Further Work
26306	Modified outcrop	Indeterminate	D	Pre-Contact	No Further Work
26307	Complex	Ceremonial	C, D, E	Pre-Contact	Preservation
26308	Enclosure	Temporary Habitation	D	Historic	No Further Work
26309	Complex	Temporary Habitation	D	Pre-Contact	No Further Work
26310	Lava tube	Temporary Habitation/Burial	D, E*	Pre-Contact	Preservation
26311	Lava tube	Burial	D, E*	Pre-Contact	Preservation
26312	Cairn	Marker	D	Pre-Contact	No Further Work
26313	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26314	Enclosure	Permanent Habitation	D	Pre-Contact	No Further Work
26315	Complex	Temporary Habitation	D	Pre-Contact	Data recovery
26316	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work

Table 4-5 (continued)
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26317	Lava tube	Temporary Habitation/ Quarry	D	Pre-Contact	No Further Work
26318	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26319	Lava tube	Activity Area	D	Pre-Contact	No Further Work
26320	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26321	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26322	Cairn	Marker	D	Pre-Contact	No Further Work
26323	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26324	Lava tube	Temporary Habitation	D, E**	Pre-Contact	Preserve
26325	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26326	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26327	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26328	Platform	Temporary Habitation	D	Pre-Contact	Data recovery
26329	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26330	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26331	Complex	Permanent Habitation	C, D	Pre-Contact	Preserve
26332	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26333	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26334	Complex	Temporary Habitation	D	Pre-Contact	Data recovery
26335	Enclosure	Permanent Habitation	D	Pre-Contact	No Further Work

Table 4-5 (continued)
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26337	Complex	Temporary Habitation	D	Pre-Contact	Data recovery
26338	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26339	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26340	Trail	Transportation	D	Pre-Contact	No Further Work
26341	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26342	Lava tube	Temporary Habitation	D	Pre-Contact/ Historic	Data recovery
26343	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26344	Complex	Permanent Habitation	D	Pre-Contact	Data recovery
26345	Modified outcrop/ Lava tube	Quarry	D	Pre-Contact	No Further Work
26346	Trail	Transportation	D	Pre-Contact	No Further Work
26347	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26348	Complex	Permanent Habitation	C, D	Pre-Contact	Preserve
26349	Complex	Temporary Habitation	D	Pre-Contact	Data recovery
26350	Complex	Permanent Habitation	C, D	Pre-Contact	Preserve
26351	Lava blister	Temporary Habitation	D	Pre-Contact	No Further Work
26352	Cairn	Marker	D	Historic	No Further Work
26353	Trail	Transportation	D, E	Pre-Contact	Preserve
26354	Complex	Temporary Habitation	D	Pre-Contact	Data recovery

Table 4-5 (continued)
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26355	Trail/Wall	Transportation	D	Pre-Contact/ Historic	No Further Work
26356	Lava blister	Temporary Habitation	D	Pre-Contact	No Further Work
26357	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26358	Unknown/ Bulldozed	Habitation/ Indeterminate	D	Pre-Contact	No Further Work
26359	Trail	Transportation	D	Pre-Contact	No Further Work
26360	Wall	Animal Husbandry	D	Historic	No Further Work
26361	Trail	Transportation	D	Pre-Contact	No Further Work
26362	Lava tube	Burial	D, E*	Pre-Contact	Preserve
26363	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26364	Lava tube	Temporary Habitation	D, E	Pre-Contact	Preserve
26365	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26366	Wall	Animal Husbandry	D	Historic	No Further Work
26367	Enclosure	Animal Husbandry	D	Historic	No Further Work
26368	Trail	Transportation	D	Pre-Contact	No Further Work
26369	Trail	Transportation	D	Pre-Contact	No Further Work
26370	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26371	Trail	Transportation	D	Historic	No Further Work
26372	Trail	Transportation	D	Pre-Contact	No Further Work
26373	Lava tube	Temporary Habitation	D	Pre-Contact/ Historic	Data recovery
26374	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26375	Modified outcrop	Quarry	D	Pre-Contact	No Further Work
26376	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26377	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work

Table 4-5 (continued)
Archaeological Site Summary for TMK Parcel 25

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26378	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26379	Complex	Temporary Habitation/ Agriculture	D	Pre-Contact	Data recovery
26380	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26381	Enclosure	Permanent Habitation	C, D	Pre-Contact	Preserve
26382	Trail	Transportation	D	Pre-Contact	No Further Work
26383	Enclosure	Temporary Habitation	D	Pre-Contact	No Further Work
26384	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26385	Mounds	Temporary Habitation	D	Pre-Contact	No Further Work
26386	Modified outcrop	Activity Area	D	Pre-Contact	No Further Work
26387	Modified outcrop	Activity Area	D	Pre-Contact	No Further Work
26388	Lava tube	Temporary Habitation	D	Pre-Contact	Data recovery
26389	Enclosure	Permanent Habitation	D	Pre-Contact	Data recovery
26390	Lava Blister	Temporary Habitation	D	Pre-Contact	No Further Work
26391	Lava Tube	Temporary Habitation	D	Pre-Contact	No Further Work
26392	Mound	Agriculture	D	Pre-Contact	No Further Work
26393	Mound	Agriculture	D	Pre-Contact	No Further Work

Table 4-6
Archaeological Site Summary for TMK Parcel 26 (Keahole Pt. Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
10712	Wall	Animal Husbandry	D	Historic	Preservation
26418	Trail	Transportation	D	Pre-Contact	No Further Work
26475	Lava tube	Shelter	D	Pre-Contact	No Further Work
26476	Mound	Agriculture	D	Historic	No Further Work
26477	Lava tube	Shelter	D	Pre-Contact	No Further Work
26478	Complex	Temporary Habitation & Burial	D, E	Pre-Contact	Preservation & Data Recovery
26479	Enclosure	Permanent Habitation	D	Pre-Contact	No Further Work
26480	Lava tube	Shelter & Burial	D, E	Pre-Contact	Preservation
26481	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26482	Lava tube	Water Collection	D	Pre-Contact	Data Recovery
26483	Lava tube	Water Collection	D	Pre-Contact	Data Recovery
26484	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26485	Lava tube	Permanent Habitation	D	Pre-Contact	Data Recovery

Table 4-7
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
5699	Wall	Animal Husbandry	D	Historic	No Further Work
6601	Complex	Agriculture	D	Pre-Contact	Data Recovery
10714	Trail	Transportation	D, E	Pre-Contact/ Historic	Preservation
16103	Lava tube	Permanent Habitation & Burial	D, E	Pre-Contact	Preservation & Data Recovery
26486	Complex	Permanent Habitation	D	Pre-Contact	Preservation
26487	Enclosure	Permanent Habitation	D	Pre-Contact	No Further Work
26488	Lava tube	Burial	D, E	Pre-Contact	Preservation

Table 4-7 (continued)
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26489	Complex	Permanent Habitation	D, E	Pre-Contact	Preservation
26490	Lava tube	Shelter	D	Pre-Contact	No Further Work
26491	Platform	Permanent Habitation	D	Pre-Contact	No Further Work
26492	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26493	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26494	Complex	Permanent Habitation	D	Pre-Contact	Preservation
26495	Lava tube	Temporary Habitation	D	Pre-Contact	Preservation & Data Recovery
26496	Complex	Temporary Habitation	D	Pre-Contact	No Further Work
26497	Modified outcrop	Indeterminate	D	Pre-Contact	No Further Work
26498	Lava tube	Temporary Habitation & Burial	D, E	Pre-Contact	Preservation & Data Recovery
26499	Lava tube	Shelter	D	Pre-Contact	Data Recovery
26500	Lava tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26501	Lava tube	Water Collection & Burial	D, E*	Pre-Contact	Preservation
26502	Complex	Permanent Habitation	D	Pre-Contact	Data Recovery
26503	Lava tube	Water Collection & Burial	D, E	Pre-Contact	Preservation
26504	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26505	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26506	Lava tube	Shelter	D	Pre-Contact	No Further Work
26507	Complex	Agriculture	D	Pre-Contact	Data Recovery
26508	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26509	Lava tube	Burial	D, E	Pre-Contact	Preservation
26510	Complex	Water Collection, Burial, & Ceremonial	D, E	Pre-Contact	Preservation & Data Recovery
26511	Lava tube	Shelter	D	Pre-Contact	No Further Work
26512	Lava tube	Shelter	D	Pre-Contact	No Further Work

Table 4-7 (continued)
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26513	Complex	Temporary Habitation	D	Pre-Contact	Data Recovery
26514	Complex	Permanent Habitation	D	Pre-Contact	Data Recovery
26515	Platform & Cairns	Burial & Marker	D, E	Pre-Contact	Preservation
26516	Modified outcrop	Storage	D	Pre-Contact	No Further Work
26517	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26518	Enclosure	Permanent Habitation	D	Pre-Contact	No Further Work
26519	Complex	Permanent Habitation	C, D, E	Pre-Contact	Preservation
26520	Lava tube	Burial, Ceremonial, & Animal Husbandry	D, E	Pre-Contact/ Historic	Preservation & Data Recovery
26521	Lava tube	Shelter	D	Pre-Contact	Data Recovery
26522	Lava tube	Burial & Water Collection	D, E	Pre-Contact/ Historic	Preservation & Data Recovery
26523	Platform	Temporary Habitation	D	Pre-Contact	No Further Work
26524	Lava tube	Shelter	D	Pre-Contact	No Further Work
26525	Lava tube	Shelter	D	Pre-Contact	No Further Work
26526	Cairn	Marker	D	Pre-Contact	No Further Work
26527	Lava tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26528	Lava tube	Water Collection	D	Pre-Contact	Data Recovery
26529	Lava tube	Water Collection & Burial	D, E	Pre-Contact	Preservation
26530	Platform	Temporary Habitation	D	Pre-Contact	No Further Work
26531	Enclosure	Agriculture	D	Pre-Contact	No Further Work
26532	Lava tube	Temporary Habitation & Burial	D, E	Pre-Contact	Preservation
26533	Platform	Agriculture	D	Pre-Contact	No Further Work
26534	Complex	Permanent Habitation	C, D	Historic	Preservation

Table 4-7 (continued)
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26535	Platform	Permanent Habitation	D	Pre-Contact	No Further Work
26536	Wall	Animal Husbandry	D	Historic	No Further Work
26537	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26538	Lava tube	Temporary Habitation & Burial	D, E	Pre-Contact	Preservation & Data Recovery
26539	Complex	Temporary Habitation	D	Pre-Contact	No Further Work
26540	Cairn	Marker	D	Pre-Contact	No Further Work
26541	Cairn	Marker	D	Pre-Contact	No Further Work
26542	Platform	Temporary Habitation	D	Pre-Contact	No Further Work
26543	Wall	Marker	D	Pre-Contact	No Further Work
26544	Enclosure	Permanent Habitation	C, D	Pre-Contact	Preservation
26545	Lava tube	Activity Area	D	Pre-Contact	Data Recovery
26546	Lava tube	Water Collection	D	Pre-Contact	Data Recovery
26547	Lava tube	Burial	D, E	Pre-Contact	Preservation
26548	Lava tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26549	Terrace	Agriculture	D	Pre-Contact	No Further Work
26550	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26551	Modified outcrop	Quarrying	D	Pre-Contact	No Further Work
26552	Complex	Permanent Habitation	D	Pre-Contact	Data Recovery
26553	Lava tube	Temporary Habitation	D	Pre-Contact	No Further Work
26554	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26555	Lava tube	Shelter	D	Pre-Contact	No Further Work
26556	Platform	Burial	D, E	Pre-Contact	Preservation
26557	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26558	Platform	Permanent Habitation	D	Pre-Contact	Data Recovery
26559	Platform	Burial	D, E	Pre-Contact	Preservation
26560	Trail	Transportation	D, E	Pre-Contact	No Further Work

Table 4-7 (continued)
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26561	Cairn	Marker	D	Pre-Contact	No Further Work
26562	Complex	Permanent Habitation & Burial	D, E	Pre-Contact	Preservation
26563	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26564	Lava tube	Burial	D, E	Pre-Contact	Preservation
26565	Complex	Permanent Habitation	D	Pre-Contact	Data Recovery
26566	Lava tube	Water Collection	D	Pre-Contact	Data Recovery
26567	Mound	Agriculture	D	Pre-Contact	No Further Work
26568	Lava tube	Water Collection & Burial	D, E	Pre-Contact	Preservation
26569	Lava tube	Water Collection & Burial	D, E	Pre-Contact	Preservation
26570	Lava tube	Water Collection & Burial	D, E	Pre-Contact/ Historic	Preservation
26571	Cairn	Marker	D	Pre-Contact	No Further Work
26572	Complex	Agriculture	D, E	Pre-Contact	No Further Work
26573	Lava tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26574	Complex	Permanent Habitation	D, E	Pre-Contact	Preservation
26575	Lava tube	Water Collection	D	Pre-Contact	No Further Work
26576	Lava tube	Burial & Shelter	D, E	Pre-Contact	Preservation
26577	Mound	Permanent Habitation	D	Pre-Contact	Data Recovery
26578	Lava tube	Shelter	D	Pre-Contact	Data Recovery
26579	Cairn	Marker	D	Pre-Contact	No Further Work
26580	Enclosure	Permanent Habitation	D	Pre-Contact	Preservation
26581	Lava tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26582	Lava tube	Burial	D, E	Pre-Contact	Preservation
26583	Complex	Permanent Habitation & Ceremonial	C, D, E	Pre-Contact	Preservation
26584	Complex	Transportation	D	Pre-Contact	No Further Work
26585	Complex	Agriculture & Temporary Habitation	D	Pre-Contact	No Further Work

Table 4-7 (continued)
Archaeological Site Summary for TMK Parcel 26 (Kailua Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26586	Cairn	Marker	D	Pre-Contact	No Further Work
26587	Platform	Agriculture	D	Pre-Contact	No Further Work
26588	Enclosure	Permanent Habitation	C, D	Pre-Contact	Preservation

* Site is a probable burial

Table 4-8
Archaeological Site Summary for TMK Parcel 28 (Keahole Pt. Quad)

SIHP No. 50-10-27-	Site Type	Function	Significance	Age	Mitigation
26371	Trail	Transportation	D	Historic	Preserve
26414	Wall	Animal Husbandry	D	Historic	Preserve
26415	Trail	Transportation	D	Pre-Contact	No Further Work
26416	Lava Tube	Burial	D, E	Pre-Contact	Preserve
26417	Mounds/Modified Depressions	Agriculture	D	Pre-Contact	No Further Work
26418	Trail	Transportation	C, D	Pre-Contact	Preserve
26419	Trail	Transportation	D	Pre-Contact	No Further Work
26420	Lava Tube	Activity Area	D	Pre-Contact	No Further Work
26421	Lava Tube	Temporary Habitation	D	Pre-Contact	No Further Work
26422	Trail	Transportation	D	Pre-Contact	No Further Work
26423	Lava Tube/ Modified Tumulus	Burial	D, E	Pre-Contact	Preserve
26424	Enclosure	Ceremonial	C, D, E	Pre-Contact	Preserve
26425	Lava Tube/ Modified Tumulus	Temporary Habitation/ Burial	D, E	Pre-Contact	Preserve & Data Recovery
26426	Modified Tumulus	Marker	D	Historic	No Further Work
26427	Lava Tube	Burial	D, E	Pre-Contact	Preserve
26428	Platform	Permanent Habitation	D	Pre-Contact	Data Recovery
26429	Modified Tumulus	Activity Area	D	Pre-Contact	No Further Work

Table 4-8 (continued) Archaeological Site Summary for TMK Parcel 28 (Keahole Pt. Quad)					
SIHP No. 50-10-27-	**Site Type**	**Function**	**Significance**	**Age**	**Mitigation**
26430	Modified Tumulus/ Platform/ Terrace	Temporary Habitation	D	Pre-Contact	Data Recovery
26431	Lava Tube	Activity Area	D	Pre-Contact	Data Recovery
26432	Wall	Animal Husbandry	D	Historic	No Further Work
26433	Trail	Transportation	D	Pre-Contact	No Further Work
26434	Lava Tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26435	Wall	Animal Husbandry	D	Historic	No Further Work
26436	Wall/Cairn	Animal Husbandry	D	Historic	No Further Work
26437	Cairn	Marker/Animal Husbandry	D	Historic	No Further Work
26438	Lava Tube	Temporary Habitation/Burial	D, E	Pre-Contact	Preserve & Data Recovery
26439	Lava Tube	Temp. Habitation	D	Pre-Contact	Data Recovery
26440	Lava Tube	Temporary Habitation/ Burial*	D, E	Pre-Contact	Preserve
26441	Lava Tube	Activity Area	D	Pre-Contact	No Further Work
26442	Wall	Animal Husbandry	D	Historic	No Further Work
26443	Enclosure	Permanent Habitation	D	Pre-Contact	Preserve
26444	Wall	Animal Husbandry	D	Historic	No Further Work
26445	Modified Tumulus	Temporary Habitation	D	Pre-Contact	Data Recovery
26446	Lava Tube	Temporary Habitation	D	Pre-Contact	Data Recovery
26447	Lava Tube	Temporary Habitation	D	Pre-Contact	No Further Work
26448	Modified Tumulus	Temporary Habitation	D	Pre-Contact	No Further Work
26449	Lava Tube	Temporary Habitation	D	Pre-Contact	Data Recovery

Table 4-8 (continued) Archaeological Site Summary for TMK Parcel 28 (Keahole Pt. Quad)					
SIHP No. 50-10-27-	**Site Type**	**Function**	**Significance**	**Age**	**Mitigation**
26450	Wall	Animal Husbandry	D	Historic	No Further Work
26451	Modified Tumulus	Temporary Habitation	D	Pre-Contact	No Further Work
26452	Lava Tube	Activity Area**	D, E	Pre-Contact	Preserve & Data Recovery
26453	Platform	Burial*	D, E	Pre-Contact	Preserve

* Site is a probable burial

** Site contains burials located outside of the project area

The makai project area was probably frequently traversed on mauka-makai trails, which were identified to some degree in the project area and have been identified in Kaloko-Honokōhau National Historic Park to the west. Interestingly, evidence was found that Kaloko and Kohanaiki may have been interdependent upon each other at these elevations, perhaps more than with other neighboring ahupuaʻa. Dense clusters of trails crossing aʻā flows in both the makai project area (TMK 17) and the middle project area (the center of TMK 25) virtually straddle the presently known ahupuaʻa boundary.

Also, historic maps show that the major mauka-makai trail, Site -10714, crossed from Kohanaiki into Kaloko in the middle project area, though this was not definitively confirmed with archaeological findings. At least one possible crossing preserved as a gap in the post-contact ahupuaʻa wall was also located near the mauka end of the project area.

Until the construction of Queen Kaʻahumanu Highway, the use of some of these local trails likely continued for access to the coast. Other historic use, in particular ranching, played a major role in a continually evolving landscape. Huʻehuʻe Ranch provided jobs for paniolo who continued to utilize the area. Introduced fodder flora have overtaken much of the landscape, and grazing and mechanical clearing have likely negatively impacted many sites. Modern use has continued to affect the area and disturbance in the form of bulldozing, dumping and camp sites along Hina Lani Street have had the greatest impact.

Nevertheless, these numerous stages of land use have had a large area to share, and much of the evidence of earliest land use in pre-contact times is still in good condition. Further research on these cultural resources through a comprehensive data recovery program will add considerably to this knowledge. Preservation will also be a major consideration, especially in the northeast project area with emphasis on trails, burials and sites of high interpretive value.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will affect historic properties recommended eligible to the Hawai'i Register. CSH's project specific effect recommendation is "effect, with agreed upon mitigation measures."

Historic properties outside of the project area do have the potential to be affected by the current development. The proximity of the project area to Kaloko-Honokōhau National Historical Park to the east is the primary concern. Historic properties north and south of the project area are of less concern due to the extensive industrial/commercial developments separating the project area from the potential sites there. Also of some concern are the remaining Kohanaiki Homesteads in the next parcel east of the project area. Three of these homesteads were recommended for preservation by previous archaeological work there (Wolforth 2005) and if not directly affected by development of that parcel, their view plane has the potential to be affected by development of the project area.

Overall, the project area contains a large number of significant sites that are recommended for preservation and/or data recovery. It is recommended that of the 341 sites in the project area, a total of eighty (80) sites be subjected to a program of data recovery to address scientific and informational concerns, and a total of seventy-two (72) sites be preserved (see Table 4-9 and Figure 4-2).

Table 4-9
Mitigation measures recommended for each parcel

Recommendation	TMK 17		TMK 25		TMK 26		TMK 28		All TMKs	
	No.	%	No.	%	No.	%	No.	%	No.	%
Preservation	3	5.1	18	14.9	38	30.8	13	31.7	**72**	**21**
Data Recovery	19	32.2	29	24.0	23	19.2	8	19.5	**80**	**23**
No Further Work	37	62.7	74	61.2	60	50.0	20	48.8	**189**	**56**
Total (total %)	**59**	**(17%)**	**121**	**(36%)**	**120**	**(35%)**	**41**	**(12%)**	**341**	**(100%)**

Preservation sites should be considered for some amount of data recovery effort as part of the preservation plan, to include further documentation, dating, etc. as appropriate. It is believed that continued documentation in some cases could help mitigate possible vandalism or looting of preserve areas.

The remaining 189 sites are not recommended to undergo further research, as the documentation and plotting of location during the current study has addressed the limited information available at these sites. These sites are classified under Criterion D significance only and are generally characterized as sites in poor structural condition, or sites such as minimally modified lava tubes, trail remnants, agricultural features or animal husbandry walls that lack excavation potential.

Mitigation for impact on historic properties outside the project area is best addressed by architectural and landscaping measures to minimize visual impact on the environment in Kaloko-Honokōhau National Historical Park. Based on previous development of the vicinity, tall buildings directly adjacent to the highway, bright or light colored paint, heavy use of corrugated metal and landscaping using non-native plants would have the greatest visual impact on those properties in

the park. Use of low-rise architecture, local stone, muted colors and native plants would be preferable from a mitigation perspective and would minimize the urban feel of the land most immediately visible from, and historically tied to, that preserved in the park.

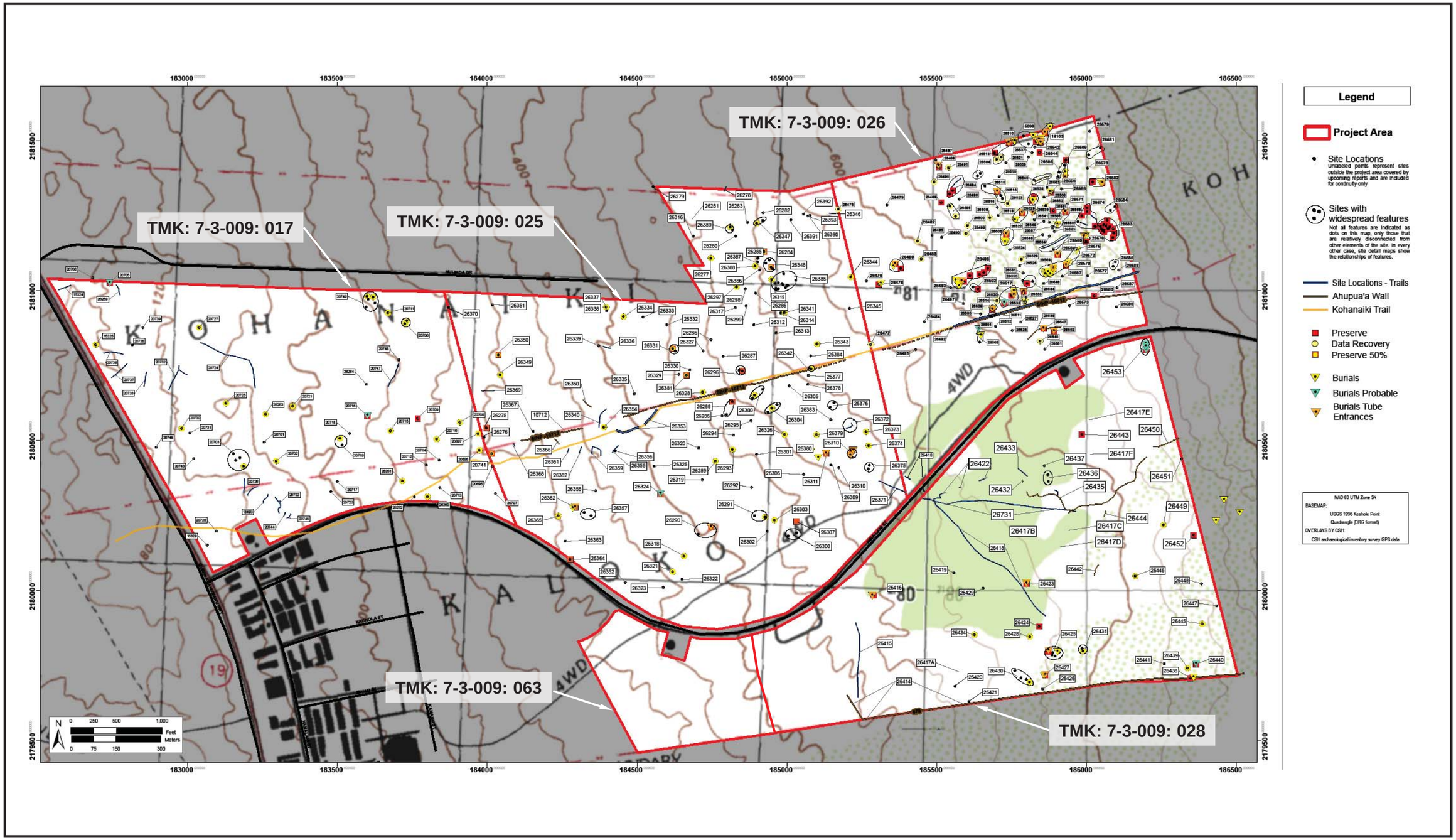
There are a total of seventy-two (72) sites in the project area that are recommended for preservation in whole or in part. A large percentage of these sites are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Burials are especially common in lava tubes within the project area and special consideration will need to be given to the preservation in place of burials, especially when remains are located far from the lava tube entrances. Thus, the preservation plan will need to address the logistics of preservation boundaries in terms of accurate locational information as well as how to preserve/seal entrances associated with burials.

Several of the non-burial preserve sites are major intact trail systems that run for several hundred meters, and two sites are ahupuaʻa walls that are recommended for preservation with breaches allowed. Other preserve sites include ceremonial enclosures and platforms (possible heiau), excellent examples of habitation complexes (some of which utilize both surface and sub-surface areas), and a few petroglyph panels.

All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawaiʻi Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by SHPD prior to final subdivision approval. It is recommended that considerations for the preservation of these sites be detailed in a burial treatment plan and preservation plan to be approved by the SHPD.

The complete collection of artifacts associated with this archaeological inventory survey was collected from private lands; accordingly, this material belongs to the landowner. While a relatively small number of artifacts were collected given the size of the project, some items were retrieved during the inventory survey due to concern over possible looting. Some artifacts and midden were collected as part of the test excavations conducted. The artifacts associated with this archaeological inventory survey will be temporarily housed at a CSH storage facility. CSH will make arrangements with the landowner regarding the disposition of the project's collection. Should the landowner request archiving of material, then the archive location will be determined in consultation with SHPD.



WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-2
Archaeological Sites
Kaloko Makai

4.2. CULTURAL RESOURCES

Cultural Surveys Hawaiʻi, Inc. (CSH) conducted a Cultural Impact Assessment (CIA) of a 1,150-acre parcel within portions of Kaloko Ahupuaʻa and Kohanaiki Ahupuaʻa, North Kona District, Hawaiʻi Island, TMK: (3) 7-3-009: 017, 025, 026, 028 and new parcel 063 (May 2008). The results are summarized below and the study is included as Appendix J.

The purpose of the CIA is to consider the effects that the proposed project may have on the culture of Hawaiʻi, and traditional and customary rights. The Hawaiʻi State Constitution, Article XII, Section 7 protects "all rights" of native Hawaiians that are "customarily and traditionally exercised for subsistence, cultural and religious purposes." Act 50 (SLH 2000) was passed as an attempt to balance the scale between traditional lifestyles and development and economic growth. Act 50 provides that environmental impact statements: (1) Include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

The CIA has been designed and prepared to fulfill the mandate to the Land Use Commission from the Hawaiʻi State Supreme Court in its ruling, *Ka Paʻakai O Ka ʻAina v. Land use Commission, State of Hawaiʻi.* 94 Haw. 31 (2000). The specific section of the ruling that served to guide the development and preparation of the CIA is as follows:

> *In order for the rights of native Hawaiians to be enforceable, an appropriate analytical framework for enforcement is needed. Such an analytical framework must endeavor to accommodate the competing interests of protecting native Hawaiian culture and rights on the one hand, and economic development and security, on the other.*

Likewise, the scope of work was designed to meet the *Guidelines For Assessing Cultural Impacts* as adopted by the OEQC (1997), as well as the requirement of any other State and County agencies involved in the review process for the proposed project. The "Guidelines for Assessing Cultural Impacts" issued by the OEQC discuss the types of cultural resources, practices and beliefs that might be assessed. The Guidelines state:

The type 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, including submerged cultural resources, which support such cultural practices and beliefs.

The assessment also considers cultural resources, practices and beliefs within the broader context of Kaloko Ahupuaʻa and Kohanaiki Ahupuaʻa that are relevant to assessing the role of the project area.

4.2.1. Previous Cultural Impact Assessment (CIA)

A CIA (Hammatt and Shideler 1996) was conducted for a portion of the project area in 1996 as a companion study to the Collin et al. (1996) study of TMK 7-3-009:017. Informants knowledgeable of the project area were interviewed. These consultations focused on identifying traditional cultural practices conducted within the project area, as well as addressing community concerns regarding probable burial sites.

This summary of the CIA focuses on the probable burial sites located within that portion of the project area. The reader is referred to the CIA (Hammatt and Shideler 1996) for a detailed discussion and analysis of the traditional cultural practices documented within the project area.

On March 16, 1996, CSH staff interviewed the Reverend Norman Keanaaina, a kamaʻāina (native-born, one born in a place) of Kohanaiki since the 1940s. Reverend Keanaaina stated his belief that there were indeed burials within the TMK parcel 17 portion of the project area. He stated that interment within the TMK parcel 17 portion of the project area continued into the 1930s or 1940s, when his "grandmother's husband," the Kapaa family, was buried.

Reverend Norman Keanaaina made a site visit with CSH personnel and was taken to three sites (SIHP No. -20702, -20717 and -20720) in the south-central portion of TMK parcel 17, which had been previously identified by CSH as probable burials. The Reverend agreed that the filled-in cracks at these sites were probable burials. He stated that the common practice was to wrap the body in a mat or a horse blanket, then inter it in a sufficiently large crack which would subsequently be filled with stones.

In 1996, eight possible burial sites (SIHP Nos. -20702, -20705, -20716, -20717, -20720, -20731, -20743, and -20749) had not been tested to determine the presence or absence of human skeletal remains, and testing was deferred to data recovery. Because the CSH archaeological inventory survey sought to re-evaluate and improve records for all of these sites, many of these sites were tested. The focus of this effort was to improve decision-making that now depends more heavily on findings of the archaeological inventory survey. The result of this testing was a reduction of eight possible burial sites to two probable burial sites. A third possible burial site (SIHP No. -20720) was determined to have been destroyed and is therefore no longer a current possible burial site.

4.2.2. Environmental Setting

The project area comprises approximately 1,139 acres in the ahupuaʻa of Kaloko and Kohanaiki. The lands are located on the leeward coast of Hawaiʻi Island within the district of North Kona on the lower west slope of Hualālai Volcano.

4.2.2.1. Natural Environment

The project area is bounded by Queen Kaʻahumanu Highway to the west, Hina Lani Street to the south, TMK [3] 7-3-009:032 to the east, and ʻOʻoma 2nd Ahupuaʻa to the north. Elevation within the project area ranges from 80 ft. above annual mean sea level AMSL at the western boundary to 760 ft. amsl. along the eastern boundary.

Kona weather is typified by afternoon showers brought on by warm air that has been moved inland by light sea breezes. The humid air gradually condenses over higher altitudes throughout the day. At night, the land cools resulting in breezes which send warm air back out to sea. Rainfall in the project area averages 10 inches per year (Cordy et al. 1991). There are no natural springs or perennial streams within the project area, but dozens of subterranean water-collection lava tubes have been identified during the archaeological survey by CSH.

The land surface is comprised of a large ʻaʻā flow running mauka/makai through the project area with several smaller flows to the northeast and a large flow in the northwest portion of the area. The surface of the ʻaʻā lava ranges from roughly level expanses to rough fractured ridges.

Pāhoehoe lava covers the west-central and north-central sections of the project area. The surface ranges from level expanses to highly fractured tumultuous areas and is characterized by numerous tumuli and pressure ridges with depressions or undulations in the pāhoehoe containing thin soil pockets. Collapsed portions of lava tubes also contribute to the uneven surface of the pāhoehoe flows.

4.2.2.2. Built Environment

Although much of the land around the project area remains rural, the built environment is distinct on the north and west sides of the parcel. The built environment is distinct near the Queen Kaʻahumanu Highway, makai of the project area. To the north of the project area is a light industrial area bordering Hulikoʻa Drive built after the Colin et al. (1996) study. This area is marked by the Matsuyama Market and Pine Tree Cafe near the intersection of Hulikoʻa Drive and the highway. The area is marked by a stone sign "Kohanaiki."

Hina Lani Street, a major coastal/inland (makai/mauka) connector road, runs through the center of the project lands. Two 1-million-gallon water tanks and a fairly large base yard have been developed along Hina Lani Street and are convenient points of reference. South of the makai (west) portion of the project area is a large industrial area often referred to as "Kaloko Industrial" or "New Industrial" (in contrast to an older industrial area near the old Kona airport). This area features numerous large warehouses, light industrial and commercial buildings (Home Depot and Costco, among others).

The project lands themselves are generally undeveloped, and appear not to have been dramatically impacted by modern activity other than bulldozing. Some modern cattle ranching has apparently taken place intermittently within the project area, with some barbed-wire fencing and a wooden trough present; the historic ahupuaʻa wall that runs through portions of the project area is also a good indication that historic animal husbandry occurred in the area.

Portions of the ʻaʻā and pāhoehoe flows throughout the project area have been bulldozed, and bulldozer roads and intermittent bulldozing activity are present. A large portion of the bulldozing on pāhoehoe areas is probably related to the ranching activities. There are additional swaths of bulldozing on the ʻaʻā around the water tanks located on Hina Lani Street and at the large base yard off of Hina Lani Street. Most bulldozer activity tends to be concentrated either near Hina Lani

Street, near the southern ahupuaʻa wall, or near barbed-wire fences within the central portion of the project area. There are a few distinct bulldozer roads in the project area, but less distinct signs such as bulldozer tread scars on bedrock were also noted in various locations.

A jeep road present since mid-century runs more or less mauka/makai just north of Hina Lani Street and is visible on the aerial view. A bulldozer road, also visible on the aerial view, extends from Hina Lani Street north to the end of Hulikoʻa Drive.

4.2.3. Traditional and Historic Background

4.2.3.1. Mythological and Traditional Accounts

4.2.3.1.1. Kekaha

The ahupuaʻa of Kohanaiki and Kaloko lie at the southern end of Kekaha, the portion of North Kona extending from Honokōhau to ʻAnaehoʻomalu. The character of the region of Kekaha - as it had been established in the Hawaiian consciousness - is represented in a traditional saying recorded by Mary Kawena Pukui and in a brief description by John Papa ʻĪʻī. The saying, "*Kekaha wai ʻole na Kona*", translates to "waterless Kekaha of the Kona district." Pukui states that "Kekaha in Kona, Hawaiʻi, is known for its scarcity of water but is dearly loved by its inhabitants" (Pukui 1983:184).

Pukui (1983:271) also relates the importance of fishing in the following:

> *Ola aku la ka aina kaha, ua pua ka lehua I kai.*
> Life has come to the *kaha* lands for the *lehua* blooms are seen at sea.

Pukui (1983:271) further explains this saying: "Kaha lands refers to Kekaha. When the season for deep-sea fishing arrived, expert fishermen and their canoes headed for the ocean."

Kohanaiki means "small barrenness" (Pukui et al. 1974:115).

ʻĪʻī describes the winds of Kekaha:

> ...a cold wind from Kekaha, the Hoolua. Because of the calm of that land, people often slept outside of [sic] the tapa drying sites at night. It is said to be a land that grows cold with a dew-laden breeze, but perhaps not so cold as in Hilo when the Alahonua blows. (ʻĪʻī 1959:122)

These passages suggest that Kekaha was firmly identified with its austere physical environment. A legend told in Maguire (1966) reveals the importance of water resources in this general area (see also Wolforth 2005:8-9). The story takes place at the Cave of Mākālei, which is located outside of the current project area near ʻAkahipuʻu (a nearby mountain). The story focuses on a man named Koʻamokumokuoheʻeia, who moved to this area and was told by the current residents that water was very scarce.

Water, he was told, could be obtained in "celebrated" caves, but these caves were *kapu* (forbidden), and if caught, trespassers would be killed by the owner of the cave. However, Koʻamokumokuoheʻeia discovered a very small cave entrance that no else knew about. The cave had water dripping from its roof (Maguire 1966:30). Koʻamokumokuoheʻeia and his father used carved ʻōhiʻa and wiliwili trees to capture the dripping water, and his family was thus able to survive during dry spells. This legend clearly demonstrates the importance of water as a resource that is difficult to procure, and it highlights the importance of water collection caves.

Kekaha was, however, "valued by ruling chiefs, inhabited by attendant chiefs, and upon occasion abused by warring chiefs" (Kamakau 1979:31). Describing the apportioning of land by the aliʻi (royalty) before the ascendancy of Kamehameha, Kamakau records this information about the lands of Kekaha:

> Waimea [he is referring in this case to Waimea, O'ahu] was given to the Pa'ao kahuna class in perpetuity and was held by them up to the time of Kamehameha III when titles had to be obtained. But there was one land title held by the kahuna class for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu. (Kamakau 1961:231)

Kamakau further records that during the 1770s, "Kekaha and the lands of that section" were held by descendants of the Nahulu line, the Ka-meʻe-ia-moku and Ka-manawa, the twin half brothers of Keʻe-au-moku, the Hawaiʻi island chief (Kamakau 1961:310). The Great Seal of the State of Hawaiʻi depicts Kameʻeiamoku and Kamanawa (Springer 1989:23).

Intensive archaeological investigation during recent decades has clarified the picture of pre-Contact Hawaiian life within Kekaha and the two ahupuaʻa under study. An especially detailed study of Kaloko has resulted in the following analysis of the development of pre-Contact settlement throughout the ahupuaʻa:

> Throughout its span of occupation Kaloko was but part of a larger society. Kaloko was apparently a unified community after A.D. 1200-1300. When initially occupied (A.D. 1000-1500), it may have been an outlier of another community. Nevertheless, from its initial occupation, Kaloko had 1 or more internal local residence groups containing constituent households. By A.D. 1200-1300 at least 2 residential groups were present in the community, and by contact (circa A.D. 1778) at least 4 residential groups had dwelled in the area. Each residential group performed religious functions as well as being a leisure unit. Members of the group held use rights to adjacent farm lands and probably to areas where forest and marine resources were located. Within each residential group, 1 household seems to have been dominant, being the spatial focus for its group's religious activities. It is suggested that such dominance was a function of consanguineal seniority and/or wealth. (Cordy et al. 1993:45)

While exact population figures for Kaloko were not possible, the study suggested that the "community seems to have gradually grown in size but could never have been larger than 118 and most likely was about 60-100 in size" (Cordy et al. 1993:45). The general pattern of land use and

settlement suggested for Kaloko may also have existed within the similar environment of neighboring Kohanaiki.

4.2.3.1.2. The Legend of Ka-Miki

Kepā Maly (1993) translated the "Kaao Hooniua Puuwai no Ka-Miki" (The Heart stirring Story of Ka-Miki) that appeared in the newspaper *Ka Hoku o Hawaiʻi* between 1914 and 1917. The legend provides details about life and the environment of Kekaha as well as for the entire island of Hawaiʻi. Ka-Miki, the quick or adept one, and his brother Maka-'iole, rat or squinting eyes, traveled around the island to participate in competitions circa the thirteenth century when Pili-a-Kaʻaiea was the chief of Kona. The boy's parents were Pōhaku-o-Kāne (male) and Kapaʻihilani (female), the *ali'i* of Kaloko and Kohanaiki. The legend relates that the supernatural brothers "were empowered by their ancestress Ka-uluhe-nui-hihi-kolo-i-uka (the great entangled growth of *uluhe* fern which spreads across the uplands), a reincarnate form of the earth-mother goddess, creative force of nature Haumea (also called Papa) who dwelt at Kalamaʻula on Hualālai, in the uplands of Kohana-iki, Kona" (Maly 1993:21-22). The twins were raised by Ka-uluhe, who taught them how to use their supernatural powers.

Several of the stories identify heiau of Kaloko and Kohanaiki. The first appeared between April 16 and 30, 1914.

> The ocean at ʻOhiki was named Kauahia or Kai o Kauahia. After an ʻawa ceremony with Ka-uluhe ma, Ka-Miki went to the shore of ʻOhiki to fish, in the pond waters of the chief Ahauhale. ʻOhiki was the name given for several places, including: a heiau; a cove; and an ʻili of Kaloko. The ʻili land parcel came to be known as Kiʻikahala after the punishment of the dual formed priest-shark Kaluaʻolapauila.
>
> On the night of Kāne the priests, chiefs, and people were observing the kapu of silence and all was being made ready to dedicate the royal compound of Kaʻaipuʻaat Kohanaiki. Ka-Miki and Maka-ʻiole descended to the coastal region of Kaloko and Kohanaiki from Kalamʻula and beat the drums in the heiau of Pohakea, ʻOhiki, Kaukeano, ʻOʻunui, Honuʻiwa, Puʻuhoʻolelelupe, Kaukiʻekiʻe, and Hale-o-Lono. The sound of the pahu heiau (temple drums) greatly startled the people, and caused the priests and chiefs of Kaloko to grumble amongst themselves. The sequence of events which followed, led to the naming of Hiʻiakanoholae.
>
> A spring in the land parcel was also named ʻOhiki. The ocean of this area was named Kauahia before ʻOhiki came about, and following the death of the shark-priest Kaluaʻolapauila, the land section and temple of ʻOhiki came to be called Kiʻikahala.

Details about why this area of Kohanaiki became important appeared between January 8 and May 28, 1914 and December 6, 1917.

> Ka-uluhe-nui-hihi-kolo-i-uka a reincarnate form of Haumea (also called Papa) lived at Kalamaʻula in the uplands of Kohana-iki, below Hainoa. Ka-uluhe was the wife of

> Kumua, and the hill site at which Kumua dwelt is also called Kumua; it is below Kalamaʻula, a little above the hidden spring of Kapaʻihi. The reason that Kumua lived at this hill was because it allowed him clear view of the coastal lands of Kohana-iki, which is where his children and grand children lived. One of the children of Kumua ma was Pipipiʻapoʻo and she was married to Hale-o-Lono (an agriculturalist and temple type, coastal Kohana-iki) who was an exceptional farmer. Hale-o-Lono excelled in his trade, and the place upon which he farmed was called Nanawale, and because he marked the area with many cairns, it came to be called Nahiahu, also called Nawaiahu, the place of cairns.

Nawahi ahu appears on Emerson's RM 1449 and RM 1512, dating to 1888 and 1889 respectively. A discussion of the maps and roads that appear on the maps is presented in the "Mid- to late -1800s" section below.

A more recent translation of the legend of Ka-Miki by Maly and Maly (2003:15) includes the following additional information about Nāwahiahu.

> Pipipiʻapoʻo was another daughter of Kūmua and Ka-uluhe-nui-hihi-kolo-i-uka. She married Haleolono, one who cultivated sweet potatoes upon the ʻ*ilima* covered flat lands of Nānāwale, also called Nāhiahu (Nāwahiahu), as it has been called from before and up to the present time. Cultivating the land was the skill of this youth Haleolono, and because he was so good at it, he was able to marry the beauty, Pipipiʻapoʻo. Pipipiʻapoʻo skill was that of weaving pandanus mats, and there grow there many pandanus trees to this day. The grove of pandanus trees and a nearby cave, is called Pipipivapoʻo…

Maly (1993:28) notes that Hale-o-Lono, Kiʻikahala, and ʻOhiki are associated with sites and/or place names that are shared by Kaloko and Kohanaiki.

Ka-Miki completed his journey around the Big Island and

> …became the foremost champion of Pili (7/26/1917). It was at this time that Ka-Miki learned about the sacred palama chiefess Paehala of Honokohau; lands also called Na-Hono-i-na-Hau-ʻElua (the bays of the two dews). Pili gave Ka-Miki permission to wed Paehala if she and her family agreed, and Paehala was the foremost beauty of Kona.
>
> When the chiefess agreed to marry Ka-Miki, Pili told Ka-Miki, that he would also, "oversee the chiefs' sacred fishponds [at Kaloko and Pa'aiea]; the schools of kala, uhu, and palani; and all the lands of Kekaha from Hikuhia which is above Napuʻu u (also called Napuʻupoʻalu); and lands between Keahualono at Kaniku to the plain of Kanoenoe, marked by the hill of Puʻuokaloa at Keahuolu" (10/18/1917). (Maly 1993:22)

Maly (1993:29) explains that traditional accounts of Kaloko and Kohanaiki describe a lush environment that differs from its current state due to several factors. The Hualālai lava flow in 1801 covered the former agricultural and forested lands, residential areas and fishponds. The loss of

forests began the decrease in rainfall that was exacerbated by the introduction of livestock and ranching. Goats and cattle stripped the vegetation from the lands causing water resources to dry up. Thus, over the last 150 years, the environment has been significantly altered.

4.2.4. Early Historic Period

Kamakau (1961) reports that during the war between Alapaʻinui of Hawaiʻi and Kekaulike of Maui, Kekaulike "abused the country people of Kekaha" by destroying all the coconut groves and slaughtering "the country people." The destruction of these valuable trees was devastating.

Kekaha lands were set aside for the priestly class:

> Waimea [O'ahu] was given to the Paao Kahuna class in perpetuity and was held by them up to the time of Kamehameha II when titles had to be obtained. But there was one land title held by the kahuna class of Paao for many years and that was Puuepa in Kohala. In the same way the land of Kekaha was held by the kahuna class of Ka-uahi and Nahulu. (Kamakau 1961:231)

During the last decades of the eighteenth century, following western contact, Kohanaiki and Kaloko - as elements of the larger Kekaha area - remained under the control of Ka-meʻe-ia-moku, who resided to the north at Ka'upūlēhu (Kamakau 1961:147). Ka-meʻe-ia-moku's son, Ulumaheihei Hoapili, "belonged to the priesthood of Nahulu and was an expert in priestly knowledge. He had been taught astronomy and all the ancient lore" (Kamakau 1961:354).

Archibald Menzies, the first foreigner to record his visit to Kekaha, accompanied Captain Vancouver in 1792. He described the land as "barren and rugged with volcanic dregs and fragments of black lava…in consequence of which the inhabitants were obliged to have recourse to fishing for their sustenance" (Menzies 1920:99).

Kamakau recorded that Kaloko is the site where Kamehameha's bones were cached by Hoapili after the king's death in 1819:

> Kamehameha had...entrusted his bones to Ulu-maheihei Hoa-pili with instructions to put them in a place which would never be pointed out to anyone. At midnight, therefore, when black darkness had fallen and no one was likely to be on the road and the rough lava plains of Puʻukaloa lay hushed, Hoa-pili sent his man, Hoʻolulu, to bring the container of wicker work in which the bones of Kamehameha were kept to Kaloko in Kekaha...The next morning Hoa-pili and Ke-opu-lani took canoe to Kaloko where Hoa-pili met the man who had charge of the secret cave and together they placed the bones there. (Kamakau 1961:215)

Kelly (1971:25) notes a February 16, 1887 letter to a person named Kapalu as the "overseer and keeper of the Royal Burial Ground at Kaloko, Kailua." The Interior Department of the Hawaiian Kingdom provided Kapalu with a $20 a month stipend, for seven months. A second letter reappoints Kapalu as a caretaker although there is no payment for his services. Kelly also relates that an informant's grandfather had disclosed the location of the burial cave, and he would move the

remains to protect them. Another informant stated that women are not buried at Kaloko, only men of high rank. Other informants revealed that the burial caves were inland and not in the vicinity of Kaloko Pond (Kelly 1971:25).

Kamakau's account regarding the caching of Kamehameha's remains suggests that Kaloko's population, toward the end of the nineteenth century's second decade, had diminished to such an extent that the ahupuaʻa could provide the necessary isolation and secrecy for the burial.

By the early nineteenth century, the inhabitants of Kaloko and Kohanaiki had long experienced the social pressures and consequences of western contact. "As early as 1788, Hawaiians began enlisting as seamen on the foreign ships that stopped at Island ports, and their number increased rapidly with the growth of whaling in the Pacific" (Schmitt 1973:16). As harbor facilities were developed at Kailua and Kealakekua during the early 1800s, these ports became population centers drawn from increasingly isolated (economically and socially) areas like Kaloko and Kohanaiki. Newly-introduced diseases cut the population severely.

Missionary censuses of the 1830s chart the diminishing population of Kekaha and North Kona. In 1834, the total population of Kekaha is recorded as 1,244, comprising 21% of the total North Kona population of 5,957 (Schmitt 1973:31). The North Kona figure represents a population loss of 692 since the previous census of 1831 (during which no figure specific to Kekaha was noted), which recorded 6,649 persons in the district (Schmitt 1973:9). One factor - inter-island migration – which led to the diminishing population of Kona was specifically noted by missionaries in 1832: "We have been sensible for some time that the number of inhabitants in this island is on the decrease. There is an almost constant moving of the people to the leeward islands, especially since the removal of the governor (Kuakini) to Oahu. Some leave by order of the chiefs, and others go on their own responsibility" (cited in Schmitt 1973:16).

Land Commission documents of the 1840s and 1850s record the disposition of population and land use within Kohanaiki and Kaloko ahupuaʻa that had evolved since western contact. At the Māhele of 1848, Kaloko was claimed by and awarded [Land Commission Award (LCA) 7715] to Lot Kamehameha (who would become Kamehameha V). Kohanaiki was classified as Government Land. Subsequently, 18 kuleana claims - by commoners claiming to occupy and/or cultivate land parcels - were made in Kaloko. Twelve of these claims were awarded. All claims were for mauka lands - between 1200 and 1700 ft. elevation - adjacent to or just makai of the Government Road.

Parcels within Kohanaiki, having become Government Land, were subject to sale - designated grants - by the Hawaiian Kingdom government. Land sales began in the 1850s with Grant 2030 to Kaiakoili in 1856, awarding 102 acres adjacent to and makai of the Government Road. Also beginning in the 1850s, the first taxpayer rolls for Kohanaiki and Kaloko were documented: they indicate, within Kohanaiki, eight, 13 and 12 taxpayers during the years 1857, 1859 and 1860, respectively; within Kaloko, during the same years, 19, 21 and 23 taxpayers were recorded. Just past the middle of the nineteenth century, the populations of Kaloko and Kohanaiki had been drawn beyond the original subsistence-based economy into the western commercial paradigm.

As Cordy notes about Kaloko: "The historical documents suggest that by the 1840s-1850s, the Coastal Zone had been abandoned as a residential area, except probably for a house used by the

fishpond's caretaker. This pattern would have been a stunning change from prehistoric and early historic times, when many coastal residences were present" (Cordy et al. 1991:288). This pattern likely also held for Kohanaiki.

4.2.4.1. Historic Cultivation

Oral histories of the area, ethnographc evidence, and archaeological evidence documents that upland Kaloko and neighboring areas were, in the past utilized for agricultural purposes. Various crops were traditionally cultivated in the "Kona Field System" within the Kekaha region and other parts of the Kona Coast. Sweet potato is likely to have been the most abundantly grown crop because of its adaptability to stony, dry environments. It was commonly planted in mounds and in pāhoehoe excavations.

During the mid 1800s, Captain Charles Wilkes of the American Exploring Team comments on the agricultural use of pāhoehoe excavations (similar to the modification of pāhoehoe outcrop in the project) which he observed specifically in the Kona region:

> Cultivation is carried on in many places where it would be deemed almost impractible in any other country. The natives, during the rainy season, also plant, in excavations among the lava rocks, sweet potatoes, melons, and pine-apples, all of which produce a crop. (Wilkes 1845:91)

Sweet potatoes were also cultivated within walled fields or depressions in the walls themselves. E.S. Craighill Handy and Elizabeth Green Handy discuss this method from an account that appeared in the Hawaiian newspaper *Ka Nupepa Kuʻokoʻa* (March 24, 1922):

> Rocky lands in the olden days were walled up all around with the big and small stones of the patch until there was a wall (*kuaiwi*) about 2 feet high and in the enclosure were put weeds of every kind, *ʻamaʻu* tree ferns and so on, and then topped well with soil taken from the patch itself, to enrich ti, or in other words to rot the rubbish and weeds to make soil.
>
> After several months, the rotted weeds were converted into soil of the best grade. The farmer waited for the time when he knew that the rains would fall, then he made the patch ready for planting. If for sweet potatoes, he made mounds for them and for taro too, on some places on Hawaiʻi. (Handy and Handy 1972:131)

4.2.4.2. Historic Ranching

Ranching has its roots in this early historic period with the introduction of goats, cattle, and horses by sea captains who sought to develop these resources to replenish their ship holds during long journeys. Captain George Vancouver gave Keʻeaumoku, an aliʻi, a pair of goats in 1792, and the following year, he brought Keʻeaumoku four sheep. Vancouver also brought the first cattle, California longhorns, to Kamehameha I in 1793.

Kamehameha issued a kapu (in this case, a prohibition) that carried the death penalty to anyone harming cows or cattle thus ensuring that the first herds would proliferate. The kapu was enforced for 10 years. Due to the kapu, families constructed walls to protect their sweet potato and taro lands from the cattle. Kamehameha ordered the construction of a wall, mauka of the project area, that ran from north to south Kona, to prevent cattle from destroying populated areas (Bergen 2004:22-23). Historical research suggests that both goat and cattle grazing took place within the project area.

In 1803, horses were introduced, and they also ran free although no *kapu* protected them. Horses had difficulties acclimating to local grasses, and herds of feral horses were rare until the 1830s. At that time, Kamehameha III had California *vaqueros*, cowboys of Native Californian, Spanish, and Mexican descent, brought to Hawaiʻi to herd the cattle and teach Hawaiians to ride horses and tend the cattle. The paniolo, as they were called, were expert horsemen and able to chase down the wild cattle on horseback and capture them with a lasso. The hide and tallow trade proved to be successful and cattle were shipped from Kailua Bay to slaughterhouses on Oʻahu. In 1851, it was estimated that Hawaiʻi Island had 8,000 head of tame cattle and 12,000 head of wild cattle (Kelly 1983:79; Bergen 2004:23, 97).

Historic documents related to the Government Homestead Program of the late 1880s indicate officials determined that goats were the only animals that were adept at grazing within arid, rocky Kaloko and Kohanaiki (Maly and Maly 2003:76, 79). Goats were present in the area prior to the late 1880s and may have been present within the project area. Limited cattle ranching was practiced at the same time, although by 1900, cattle ranching had for the most part replaced the goats (Maly and Maly 2003:75).

4.2.5. Mid- to Late -1800s

The division of Kohanaiki - through sales of Government lands -continued throughout the remainder of the nineteenth and into the twentieth century. Grant 2942 in 1864 awarded to Huliko'a 929.75 acres which included the width of the ahupuaʻa, extending makai from Kaiakoiliʻs grant. In 1871, Grant 3086 awarded 154 acres to Kapena; this parcel extended makai from Huliko'a's grant to the shoreline.

At the time of the Māhele, Huliko'a was a resident of Kohanaiki (Maly and Maly 2003:4). Although Maly and Maly (2003:60) reviewed all Māhele claims, no additional references to Hulikoʻa were found. However, based on traditional patterns of residency in the region, it is "likely they had primary residences in the uplands, near sheltered māla ʻai (agricultural fields), and kept near shore residences for seasonal fishing, collection of salt, access to water in dry periods, and for access to other resources of the coastal zone" (Maly and Maly 2003:60).

Maly and Maly (2003:66) also note that during their research "the original notes of survey and map accompanying Grants 2030 and 2942, are missing from the state collection, so the corresponding maps and surveys, and their relationship to Kapena's parcel could not be compared with the original records." These survey documents were also not found during the current study.

Kaloko is documented during the 1870s in testimonies by Hawaiians before the government's Boundary Commission. Testifying on August 12, 1873, Nahuina (who had earlier received LCA 10327 in Kaloko) describes himself as "born at Kaloko North Kona Hawaiʻi at the time of Keikepuipui, the building of the heiau at Kailua, and have always lived there" and states that the boundaries of Kaloko were shown to him by his father, the former konohiki of the ahupuaʻa.

Nahuina adds that Kaloko has "ancient fishing rights extending out to sea." Testifying on the same date, Hoohia, who "moved to Honokohauiki when quite small and reside[s] there now", adds details that suggest the mauka Kaloko-Honokōhau boundary was defined by different vegetation that also reflected former traditional gathering rights: "Honokohaunui ends at Ohiawela, a *pali*. Kaloko takes the *koa*, and Honokohaunui, the *ohia*...The *olona* grows on Honokohaunui and Kealakehe and the *koa* on Kaloko."

During the 1880s, Kona lands - including Kaloko and Kohanaiki - were surveyed by J.S. Emerson for the Hawaiian government. A portion of his Registered Map (RM) 1449, Akapipuʻu Section shows a trail through the project area; the trail actually ran from the Kohanaiki Homesteads to the Kaloko fishpond.

Emerson produced three maps corresponding to the project area during this time period: Registered Map (RM) 1280, RM 1449 and RM 1512. Emerson's assistant, J. Perryman also produced sketches of the west slopes of Hualālai. Although other surveyors and historians have produced maps for the area, these maps are the most comprehensive.

RM 1280 is cited and reproduced with the most frequency. It is often dated to 1888, but the map does not indicate an original date; rather, the date the map was traced by another surveyor in 1952 for reproduction purposes. RM 1449 and RM 1512, dating to 1888 and 1889 respectively, are essentially maps of the same series. RM 1449 is a broad overview map ranging from Kaloko to Kūkiʻo in the north, and RM 1512 is a detail of the land grants around the government road.

A composite of RM 1449 and RM 1512 shows an alternative view of both the country side and the detail in the area of the Kohanaiki Homesteads. Most visible are family claims in the Kohanaiki Homesteads and Kohanaiki Road running directly makai from the homesteads. The road ends abruptly on RM 1449, although it appears to come close to joining the prominent "Lower Government Road." The indication of the "Lower Government Road" also ends shortly into Kaloko.

Oral history interviews (Maly and Maly 2002) relate that in the mid-1800s only a few residences were on the coastal lands, in the uplands above 900 ft. elevation, and in the vicinity of Māmalahoa Highway (east of the project area). The land between 900 ft. and the coast was cattle, donkey and goat pasturage. Mauka/makai trails through Kohanaiki, Kaloko, Kalaoa and Honokōhau were utilized by upland families to access the coast to fish, and gather water during upland droughts.

Kaloko and most of Kohanaiki continued to be held by the aliʻi throughout the remainder of the nineteenth century, passing, after the death of Lot Kamehameha, successively to Bernice Pauahi Bishop, Kalākaua and Kapiʻolani.

4.2.6. 1900s

During the twentieth century, major developments focused on Kaloko Ahupuaʻa, with continuing commercial use of the fishpond and increasing animal husbandry. The Kohanaiki Homesteads were apparently in decline during the early part of the century (Maly and Maly 2003), and are mentioned only in passing in H.W. Kinney's 1913 guide to the Big Island, which notes that it is an "inland settlement without much interest."

Ranching steadily increased. Once John Maguire purchased the former chiefly lands of Kaloko in 1906 after the deaths of Kalākaua and Kapiʻolani (Kelly 1971:29), the ahupuaʻa uplands were developed into the Huʻehuʻe Ranch. Maly and Maly (2003) discuss the acquisition of these lands and the types of ranching that were common:

> In 1899, John A. Maguire, founder of Huʻehuʻe Ranch applied for a Patent Grant on… lots in ʻOʻoma 2nd, but he only secured Grant No. 4536 …. Maguire's Huʻehuʻe Ranch did secure General Lease No.'s 1001 and 590 for grazing purposes on the remaining government lands in the Kohanaiki and ʻOʻoma vicinity. Thus, by the turn of the century, Huʻehuʻe Ranch, utilized both the upper forest lands and lower kula lands to the shore for ranching purposes. Oral history interviews with elder former ranch hands record that this use extended across the Kapena and Hulikoʻa grant lands of Kohanaiki, from the fee and leasehold lands of Kaloko and ʻOʻoma. Nineteenth century goat drives gave way to formalized cattle drives and round ups on these lands. (Maly and Maly 2003:78)

4.2.6.1. Huʻehuʻe Ranch

John Avery Maguire was the son of Charles and Hiilawe Maguire. He was born in Hamakua, Hawaiʻi in 1848 and began his ranching career as a foreman for the Puʻuhue Ranch. Maguire later became the ranch manager and then purchased Huʻehuʻe Ranch in 1888. His biography indicates that he did not live at the ranch until 1897, but this is contradicted by other sources, as is the date of purchase. He also bought Kahuā Ranch Company in 1890 and sold it in 1898 to J.F. Woods (Siddall 1917).

Likely due to its location north of the most populated area on the Big Island, Huʻehuʻe Ranch received many guests over the years including Queen Liliʻuokalani, Prince Jonah Kuhio Kalanianaole, Sanford Dole, first president of the Republic of Hawaiʻi, and Jack and Charmian London (HawaiiHistory.org 2008).

John A. Maguire's lands extended well beyond the current project area to the north into Waipiʻo Valley according to research conducted by Lebo et al. (1999). Maguire, his wife Eliza and his son Charles, conducted multiple land transactions within Waipiʻo Valley between 1898 and 1915.

By the time J.A. Maguire died in 1919, Huʻehuʻe consisted of 40,000 acres of land, most of which was leased from the Bishop Estate. He owned 2,500 head of cattle and 500 sheep. His son, Charles, and daughter-in-law Mary Kiha-lani-nui, pre-deceased him, and their only child Aileen Ruth Kiha-lani Maguire lived with her grandfather and inherited Huʻehuʻe Ranch.

Aileen married Arthur Joseph Stillman at the St. John the Baptist Chapel in Kohanaiki on December 27, 1917. Stillman became the ranch's general manager following the death of his father-in-law in 1919.

The Maguire/Stillman family held thousands of acres of property on Hawaiʻi including lands outside of the project area that are part of Huʻehuʻe Ranch. Maguire initially leased lands from the Bishop Estate and inherited lands from his first wife, as mentioned above; he later added acreage acquired from Kapiʻolani at Kaloko.

Only 12,000 acres were suitable for grazing, since large areas were covered with lava flows, and dense vegetation including lantana and ferns. Huʻehuʻe Ranch contained some 2,000 grade Herefords, 20 purebred Hereford bulls, and 20 purebred cows. Annually, approximately 330 to 400 head of cattle was sold, loaded on steamers in Kailua-Kona and shipped to Honolulu (University of Hawaiʻi 1927:28).

The Maguire/Stillman family held Huʻehuʻe Ranch until they sold it on July 8, 1966. At that time, the Kona Coast Company, a partnership between the Kaloko Land Corporation, Mauna Loa Cattle Corporation (which later was separately held by members of the Karl B. Rodi family), and Foothill Land Corporation (which was later succeeded by the David Pacific Corporation and Davis family members) was established. The company owned and operated the ranch that was managed by Roger T. Williams.

Kona Historical Society records indicate that cattle ranching continued on Huʻehuʻe Ranch although game bird hunting and residential and resort development of properties became more important business aspects.

4.2.6.2. Modern Land Use

The boundary between Kohanaiki and Kaloko was until fairly recently only approximate. Kelly (1971:48) notes that when Emory and Soehren conducted their 1961 archaeological survey, the boundary was south of its current location. Additionally, one of her informants remembered that Kaloko Pond and the coast were within the ahupuaʻa of Kohanaiki, and Kaloko was "farther over, toward Hulikoʻa" (Kelly 1971:48). Kelly cites Beckley's (1887:256) statement that, "These fish ponds are sometimes owned, by the proprietors of two adjoining lands, the people of one owning the right to fish during the rise of the tide and the other during the ebb."

Until the construction of the Queen Kaʻahumanu Highway in the 1970s, access to the "kula kai (shoreward plains)" (Maly and Maly 2003:101) was limited to local residents. The 1924 USGS map shows the mauka/makai road connecting the Kohanaiki Homesteads with the Kaloko fishpond, and crossing the project area at the ahupuaʻa boundary between Kohanaiki and Kaloko. In the first half of the twentieth century, the primary method of travel was "by foot or on horse or donkey, and those who traveled the land, were almost always native residents of Kalaoa, ʻOʻoma, Kohanaiki, Kaloko and Honokōhau" (Maly and Maly 2003:99).

Huʻehuʻe Ranch bulldozed a jeep road to the shore around 1955 during the construction of the Kailua pier, and this was used primarily by the ranch employees for duties or for going fishing along the coast.

The Kaloko fishpond - leased from the Huʻehuʻe ranch - continued as a commercial fishing operation until the 1950s. During the 1970s, the pond was incorporated into the newly-established Kaloko-Honokōhau National Historic Park.

While the present project area is largely undeveloped, surrounding areas have seen increasing modern use. The Huʻehuʻe Ranch jeep road and other signs of animal husbandry activity can be seen on the 1959 USGS map.

In 1985, the Land Use Commission approved a boundary amendment of 190-acres of land for an 18-hole golf course and appurtenant facilities. These include a clubhouse, maintenance building, driving range, practice greens and parking. The proposed golf course was not intended to be a part of, nor associated with any type of resort development. The golf course was proposed to primarily serve the resident population and is oriented for public use (LUC FOF, COL and D&O A84-566-TSA).

More recent nearby development is largely industrial, and the Kaloko Industrial Area is just southwest of the project area, including large stores such as Home Depot and Costco. Hulikoʻa Road is also heavily developed, primarily as an industrial area, along a portion of the north border of the project area. Hina Lani Street runs along the south border of the project area, and leads mauka to a residential area (Kona Heavens) before the Palani junction (at Māmalahoa Highway), as well as leading makai to the modern Queen Kaʻahumanu Highway.

4.2.7. Community Consultation Effort

Throughout the course of the CIA, an effort was made to contact and consult with Hawaiian cultural organizations, government agencies and individuals who might have knowledge of and/or concerns about cultural resources and practices specifically related to the project area. A number of attempts were made to contact individuals, organizations, and agencies apposite to the CIA for Kohanaiki. This effort was made by letter, e-mail, telephone and in person contact.

A total of twenty-five people were contacted for the purposes of the CIA; 18 people responded; and 12 kūpuna and/or kamaʻāina were interviewed for more in-depth contributions. A total of nine of these individuals have consented to have their testimonies included in the report. Efforts at obtaining permission to include the testimonies of the remaining three individuals who were interviewed for this CIA are ongoing.

4.2.7.1. Community Responses

Kamaʻāina and kūpuna with knowledge of Kohanaiki and Kaloko Ahupuaʻa and the proposed project area were contacted for participation in this assessment. The approach of CSH to cultural impact studies affords these community contacts an opportunity to review transcriptions and/or interview notes and to make any corrections, deletions or additions to the substance of their testimony.

4.2.8. Traditional Practices and Properties

Discussions of specific aspects of traditional Hawaiian culture as they may relate to the overall region and the project area are presented below. This section examines resources and practices identified within the project area in the broader context of the encompassing Kohanaiki and Kaloko Ahupuaʻa landscape.

4.2.8.1. Hawaiian Habitation

According to the CSH archaeological inventory surveys of the project area (Bell et. al 2008a, b, c; Esh et al. 2008), of the total fifteen (15) habitation sites in the project area, thirteen (13) sites fit the characteristics of temporary habitation and two (2) are categorized as permanent habitation.

The majority of the temporary habitation sites within the project area are located on the pāhoehoe flow on the east and southeast side of the project area. Both permanent habitation sites are located on or near the edge of the large ʻaʻā flow that dominates the project area. In terms of elevation, all of the habitation sites are located above approximately 500 ft. amsl., and generally the sites are scattered across the eastern portion of the project area. It is notable that nearly all non-lava tube habitation features are located on a naturally elevated area (either tumuli, outcrops, or *ʻaʻā* edge).

4.2.8.2. Gathering of Plant Resources

In ancient Hawaiʻi, upland forest regions provided various woods needed for canoes, tools and more, as well as cordage, food and herbs (Abbott 1992). Several of the plants within the project area have past and present ethnobotanical uses for native Hawaiians (e.g., as medicinal, building, weaving). Many of these plants are (possible) Polynesian introductions such as kukui (*Aleurites moluccana*), kī or tī (*Cordyline fruticosa*), and noni (*Morinda citrifolia*). Some of these Hawaiian canoe plants (plants brought by the early Polynesians in their canoes) are indicators of former Hawaiian habitation. For example, kī was often planted around heiau (temples), and considered a sacred plant in parts of Polynesia. Kī was also planted around taro loʻi (pondfields) (http://www.canoeplants.com).

A contributor to the cultural assessment mentioned past or ongoing plant gathering of the koʻokoʻolau *(Bidens* spp.). As discussed in Section 3.6 Flora, koʻokoʻolau (*Bidens micrantha ctenophylla*) a candidate species was observed on the project site. In addition, ʻaiea (Nothocestrum breviflorum), hala pepe (Pleomele hawaiiensis), uhiuhi (Caesalpinia kavaiensis), maʻaloa (Neraudia ovata), were observed and are located within the Dryland Forest and/or immediately north of Hina Lani Street.

Other plants present in the project area include the native pili grass (*Heteropogon contortus*), ʻōhiʻa trees (*Metrosideros polymorpha*), laua'e ferns (*Phymatosorus scolopendria*), ʻohe trees (*Reynoldsia sandwicensis*), alaheʻe (*Psydrax odorata*), and halapepe (*Pleomele* spp.). Native plants observed at higher elevations within the project site include: naio (*Myoporum sandwicense*), ʻaʻaliʻi (*Dodonaea sp*.) and ʻulei (*Osteomeles anthyllidifolia*).

According to one of the interviewees, during the 1930s to 1940s, alaheʻe, mango, banana, uhi or yam (*Dioscorea alata*), and *pia*, a Polynesian arrowroot (*Tacca leontopetaloides*) were widely distributed in the project area and throughout the Kona Field System. These plants were used as medicine and food by Hawaiians.

4.2.8.3. Marine and Freshwater Resources

Like the integrated system of Hawaiian culture where an individual is linked to the surrounding environment, there is often a connection between marine resources and the agricultural plants found in the project area. One of the interviewees recalled the presence of alaheʻe trees in the project area and cited a proverb that when the alaheʻe tree blooms, the heʻe (squid, octopus) are momona (fattened, fertile) and ready to harvest. Another saying involves the lākana (Lantana camara); when this plant blossoms, the hāʻukeʻuke (*Colobocentrotus atratus*), an edible variety of sea urchin, are also momona.

Although outside the project area, the Kaloko-Honokōhau fishponds provided Hawaiians with a rich resource for fish and shellfish. The ingenious design of the fishponds allowed fresh water in but prevented large fish from getting out. Besides the extensive aquaculture and tidepools available for shellfish and several types of limu, the ocean near the project area abounds with all kinds of fish.

There are no springs or ponds located in the project area; however, there are dozens of water collection lava tubes identified during the archaeological inventory survey. As described in more detail in the archaeological reports (see Bell et al. 2008a, b, c; Esh et al. 2008), most of these subterranean water sources are relatively small and require intensive and careful methods of collection, including building of small rock structures to hold ipu (gourds) in place for days in order to fill them.

4.2.8.4. Burials

There have been at least 65 burials found at about two dozen sites within the current project area. Most of the community participants were aware of the presence of burials throughout the project area. It was a common practice to use lava caves as burial sites in addition to other uses like water collection and habitation. Interviewees confirmed the traditional practice of burying loves ones in the caves after wrapping their bodies with tapa cloth. All participants who mentioned the presence of burials in the project area were adamant at preserving the iwi kūpuna in place.

4.2.8.5. Trails

There were seven trails or trail segments observed during the archaeological inventory survey (Bell et al. 2008a, b, c; Esh et al. 2008). Trails are a common site type within the Kekaha region in general. Although some of the trails in the project area were little more than remnants, several run many hundreds of meters and are in good-to-excellent condition. The intersection of three of the trails is especially of interest, as it appears to represent trail use during subsequent periods of time. The construction type also is indicative of changing needs in transportation, specifically the creation of trails more amenable to travel by horse or other pack animal.

The trails indicate a local network of transportation corridors that focus on transportation over the large ʻaʼā flow that dominates the project area, with mauka/makai and cross slope-oriented trails. The network of trails thus provides fairly direct coast-to-uplands routes via the project area and access to activity areas within the project area. The activity areas include: agricultural pursuits, a ceremonial site, and temporary and recurrent habitation sites, as well as an animal husbandry area. Overall the trails suggest a high level of energy investment in constructing paths for traversing the ʻaʻā flow, both in pre-Contact times as well as historically.

OHA's response letter to CSH's request for consultation (see Appendix J) highlights the importance of the "Road to Sea" trail, also known as the Kohanaiki Trail that has been a subject of some controversy in past archaeological projects, given the uneven nature of its preservation and integrity as a historic property. OHA strongly advocates for a relatively broad interpretation of this particular trail's importance and significance to the wider Kona community, rather than a more narrow scientific view that some or much of the trail has been altered beyond its "traditional" design or intent. According to the CIA, many older people from this area used this "Road to the Sea" trail during the early twentieth century for subsistence purposes.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Background research conducted for this project yields the following results:

- The project area is part of the traditional region known as Kekaha, extending from Honokōhau to ʻAnaehoʻomalu in North Kona. Mary Kawena Pukui notes that Kekaha, within which Kaloko and Kohanaiki Ahupuaʻa are located, is known "for its scarcity of water but is dearly loved by its inhabitants" (Pukui 1983:185). Despite being a dry place, the project area contains many unique resources—including dozens of subterranean lava tubes and caverns used to collect water; the project area included an extensive pre-Contact Hawaiian settlement that continued to support a subsistence-based lifestyle into the early historic era.
- Archaeological research shows the project area contains hundreds of culturally and historically significant sites. Sites in the project area include permanent and temporary habitation structures—many of which incorporate natural features of subterranean lava tubes into their design, agricultural features (including extensive rock mounds used to plant sweet potatoes), at least 65 burials located in approximately two dozen burial sites, ahu (stone markers), trails, petroglyphs, ahupuaʻa boundary walls, papamū (traditional gaming site), and others.
- Radiocarbon dating from nearby sites definitively shows the general area has been utilized by humans for at least 1,000 years.
- The project area is likely to contain substantial additional subsurface deposits—as yet undiscovered and undocumented—associated with lava tubes and subterranean chambers, including burials and other highly sacred materials.
- The project area is also associated with the unique history of Hawaiian-style ranching and paniolo ("Hawaiian cowboys"), including the well-documented Huʻehuʻe Ranch.
- Because of its association with Kaloko and Kohanaiki Ahupuaʻa and the Kekaha region, the project area is associated with specific moʻolelo (oral history) about

- the sixteenth or seventeenth century ruler of Hawaiʻi Island Lonoikamakahiki (Lono-i-ka-makahiki), who was involved in several famous battles with the chiefs of Maui (including Kama-lala-walu) and other parts of Hawaiʻi
- Kamehameha I, whose remains were reportedly interred near Kaloko Fishpond (*makai* of the project area)
- ʻUmi-a-Liloa, who frequented the famous fisheries of Kaloko and Kohanaiki, and the Nahulu chiefs (including Ka-meʻe-ia-moku and Ka-manawa)
- The project area is also associated with more legendary references to Ka-Miki, various moʻo (water spirits) that resided at fishponds at and near the seashore, and Hualālai; and more general references to water-collection lava tubes and the unique environmental conditions of the region.

Community consultation conducted for this project yields the following results:

- Several participants voiced negative feelings and opinions about the overall cumulative impacts of ongoing and future developments in Kona District and the project area environs pointing out such factors as a diminished quality of life for locals, dwindling resources, prices beyond the reach of most kamaʻāina and overtaxed infrastructure as contributing to a loss of what is authentic and traditional about Kona.
- Several participants talked about subsistence resources that were previously available to, and enjoyed by, locals—such as various limu (seaweeds), crabs and fish—but that are no longer available or easily accessed due to the cumulative impacts of development in Kona.
- Most participants talked about the presence of burials and iwi kūpuna (ancestral remains) throughout the project area. It is clear from some of the interviews that there are many lineal and/or cultural descendents to some of these burials that should be consulted during the proposed development, since some historic-era family burial sites, in particular, may be impacted by the subject project.
- A few participants talked specifically about changing patterns of vegetation and plant life, highlighting the loss of native and Polynesian-introduced species as well as useful historic introductions such as mango trees. In particular, there is a remnant area of lowland forest in the project area containing several endangered and threatened native species, including koʻokoʻolau (*Bidens* spp.). It is important to understand that such natural resources are significant cultural and historical resources to many native Hawaiians. Plants were integral to Hawaiians not only for their use as food and medicine, but also for their connection to other aspects of life.
- A few participants talked about drinking from water collection caves in historic times, as they moved around the landscape (e.g., as ranchers), and of brackish pools used by their animals (e.g., cattle and horses).
- Several individuals discussed trails in the project area, including a historic trail running from the ocean to the mountains (this is the so-called "Road to the Sea") along the ahupuaʻa boundary between Kaloko and Kohanaiki, that were used in the recent memories of some participants to gather resources from the sea and the uplands. Given many changes and modern developments, the trails in the project area have not been used by many people for several decades.

As discussed in Section 4.1, the project area contains a large number of significant sites that are recommended for preservation and/or data recovery. It is recommended that of the 341 sites in the project area, a total of eighty (80) sites be subjected to a program of data recovery to address scientific and informational concerns, and a total of seventy-two (72) sites be preserved (see Table 4-9 and Figure 4-2).

The remaining 189 sites are not recommended to undergo further research, as the documentation and plotting of location during the current study has addressed the limited information available at these sites. These sites are classified under Criterion D significance only and are generally characterized as sites in poor structural condition, or sites such as minimally modified lava tubes, trail remnants, agricultural features or animal husbandry walls that lack excavation potential.

Use of low-rise architecture, local stone, muted colors and native plants would be preferable from a mitigation perspective and would minimize the urban feel of the land most immediately visible from, and historically tied to, that preserved in the park.

There are a total of seventy-two (72) sites in the project area that are recommended for preservation in whole or in part. A large percentage of these sites are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial. Burials are especially common in lava tubes within the project area and special consideration will need to be given to the preservation in place of burials, especially when remains are located far from the lava tube entrances. Thus, the preservation plan will need to address the logistics of preservation boundaries in terms of accurate locational information as well as how to preserve/seal entrances associated with burials.

Several of the non-burial preserve sites are major intact trail systems that run for several hundred meters, and two sites are ahupuaʻa walls that are recommended for preservation with breaches allowed. Other preserve sites include ceremonial enclosures and platforms (possible heiau), excellent examples of habitation complexes (some of which utilize both surface and sub-surface areas), and a few petroglyph panels.

All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawaiʻi Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by SHPD prior to final subdivision approval. It is recommended that considerations for the preservation of these sites be detailed in a burial treatment plan and preservation plan to be approved by the SHPD.

The complete collection of artifacts associated with this archaeological inventory survey was collected from private lands; accordingly, this material belongs to the landowner. While a relatively small number of artifacts were collected given the size of the project, some items were retrieved during the inventory survey due to concern over possible looting. Some artifacts and midden were collected as part of the test excavations conducted. The artifacts associated with this archaeological inventory survey will be temporarily housed at a CSH storage facility. CSH will make arrangements with the landowner regarding the disposition of the project's collection. Should the landowner

request archiving of material, then the archive location will be determined in consultation with SHPD.

As discussed in Section 3.6 Flora, none of the listed endangered plants will be "taken" in the development and construction of the Kaloko Makai project.

Three individual endangered plants (two hala pepe and one ʻaiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. radius buffer around the two hala pepe and one ʻaiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

As part of the project proposal, 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

To promote and encourage traditional and customary cultural practices, the harvesting of native woods (such as alahee, elama, iliahi, and ulei, as well as other exotics like mango) or trees during grubbing work, will be allowed by cultural practitioners.

As the project moves forward the Appliant will continue to consult with OHA, community groups / individuals responsible for the long-term care of Kohanaiki and Kaloko Ahupuaʻa, and cultural practitioners.

4.3. TRAIL ACCESS

A mauka-makai historic trail (Kohanaiki Trail or "Road to Sea" trail)) runs through the entire length of the Kaloko Makai project. Kaloko Makai will incorporate the Kohanaiki Trail as an integral component of the project.

4.3.1. Kohanaiki Trail

Kohanaiki Trail is a long mauka/makai running trail originating mauka of Kaloko Makai in the Kohanaiki Homesteads. Generally, the trail parallels the nearby Kaloko/Kohanaiki ahupuaʻa wall.

The trail entirely traverses pāhoehoe and is generally well defined throughout the eastern portion of the parcel, except near the makai parcel boundary where bulldozing and grading has nearly destroyed the ahupuaʻa wall and eliminated any definitive sign of the trail.

The trail is very consistent with the route identified on Emerson's mapping in 1888 and 1889. The present archaeological review for the Kaloko Makai project suggests that the specific route shown on an earlier map, Emerson's RM 1280, is highly schematic.

Cultural Surveys Hawaii (Kaloko Makai's Archaeologists), representatives of Na Ala Hele (State of Hawaiʻi Trail and Access System) and representatives of the Ala Kahakai National Historic Trail identified what they believe is the trail alignmentby walking the trail alignment, , looking at detailed historic maps (including Emerson), archaeological data created by others makai (Donham (1986),

Renger (1971), and Cordy et. al (1991)) of the Queen Ka‘ahumanu Highway (and in consideration of modern aerial photographs) and community comments.

The upper portion of the trail through Kaloko Makai will be preserved. Where the Trail intersects with Hina Lani Street, Kaloko Makai will realign the remaining lower portion of the Trail from that point to run parallel with and adjoining the Hina Lani right-of-way down to Queen Ka‘ahumanu Highway.

Since the integrity of the historic trail is lost at that point, due to Hina Lani road construction, the adjoining industrial subdivision and the water tank, Kaloko Makai will realign the trail and have it run down the southern boundary of the property (fronting Hina Lani,) from the point of intersection with Hina Lani down to Queen Ka‘ahumanu Highway. This alignment gives the users of the trail easy access to cross Queen Ka’ahumanu or Hina Lani at the bottom, as there are crosswalks with crossing signals at that intersection.

Kaloko Makai will incorporate the Kohanaiki Trail as an integral component of the project. Two school sites and multiple parks are proposed near the trail. Likewise, Kaloko Makai will incorporate two trails that run through the Dryland Forest (one also connects to another school site and park in the mauka TND - these will connect through the project to the Kohanaiki Trail).

POTENTIAL IMPACTS AND MITIGATION MEASURES

Kaloko Makai will incorporate the Kohanaiki Trail as an integral component of the project, as shown in Figure 2-11. The original trail surface and other cultural resources located within the trail corridor, including, but not limited to, existing native trees will be retained. Kaloko Makai has located two school sites and multiple parks near the trail. Likewise, Kaloko makai will also be incorporating two trails that run through the Dryland Forest (one also connects to another school site and park – these will connect through the project to the Kohanaiki Trail), as shown in Figure 2-11.

The Kohanaiki Trail extends beyond the Kaloko Makai property. Immediately mauka of Kaloko Makai, the Kohanaiki Trail runs through the adjoining Kaloko Heights project. In November of 2006, a community consensus on the incorporation and preservation of those portions of the Kohanaiki Trail located within the Kaloko Heights project was reached. Kaloko Makai will provide treatment measures to the Kohanaiki Trail as it runs through Kaloko Makai consistent with the consensus treatment measures that were reached between the community and Kaloko Heights, as listed below.

1. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai (note the realignment of the lower portion noted in #11 below.).
2. The Trail will be at least 10-feet wide and will be bordered by perpetual open space buffers of at least 10-feet wide on each side. These buffers are intended to be sloped and otherwise modified as necessary to make grade adjustments. In combination with the buffers, the total width of this perpetual public right of way will be at least 30-feet throughout its length across Kaloko Makai.

3. In direct consideration of federal, state and county rules, regulations and law relating to land use, subdivisions, streets and accessibility, and to further ensure a safer walking surface for the Trail user, vertical changes (that is, cutting and filling in comparison to the surrounding development) in the original Trail elevation may be necessary and will be allowed, as long as the horizontal alignment is kept the same. Such changes are to be kept to the minimum and, wherever possible and practical, the original Trail surface and other cultural resources located within the trail corridor, including but not limited to, existing native trees, rocks will be retained.
4. Wherever vertical changes are not required, the original Trail surface and other cultural resources located within the Trail, including, but not limited to, existing native trees, will be retained.
5. Whenever possible, cultural features found along the existing Trail (such as papamu/konane board) shall be retained and incorporated into the cultural landscape, in living celebration of and consistent with their cultural heritage and significance. Likewise, to the extent it is feasible and appropriate, significant cultural resources located outside the designated right of way and adjacent to the Trail may be relocated within the right of way.
6. In further consideration of existing governmental rules and regulations pertaining to land use and requisite street and sidewalk requirements, it is understood that it will be necessary to cross the existing Trail alignment at specific and limited points. At this early stage of the planning process for Kaloko Makai it is premature for SCD to propose the number and location of specific Trail crossings. Therefore, throughout the land use planning process for Kaloko Makai, SCD will consult on the proposed number and location of the Trail crossings.
7. Subject to the approval of the applicable governmental agencies responsible for approving the easements and construction plans for roadways that cross the Trail, pāhoehoe will be embedded in the roadway paving as the means to mark where the original Trail footprint is located. To the extent practical, pāhoehoe retrieved from other areas within Kaloko Makai shall be used in the paving.
8. Whenever existing rock walls must be removed, the rocks from these walls will be set aside and reused in the construction of new screen, buffer and retaining walls built within Kaloko Makai. Whenever feasible, rocks from Kaloko Makai will be used for such walls (minimize importation of rock from offsite).
9. To promote and encourage traditional and customary cultural practices, the harvesting of native woods (such as alahee, elama, manele, iliahi and ulei, as well as other exotics like mango), from trees downed during the grubbing work or ones that must be removed during permitted land grading, will be allowed by cultural practitioners. If requested and where possible and practical, SCD, or its designated representative(s), will cooperate with cultural practitioners in the gathering and temporary storage of such woods. Harvesting activities will be coordinated in advance with SCD personnel.
10. SCD will consult with cultural practitioners in understanding and compiling oral histories related to Kaloko Makai and the surrounding area, so that these histories can be used within Kaloko Makai (such as for neighborhood identities, street names and the like).
11. Where the Trail intersects with Hina Lani Street, SCD will realign the remaining lower portion of the Trail from that point to run parallel with and adjoining the Hina Lani right-of-way down to Queen Kaʻahumanu Highway.
12. With the vision of perpetuating the life of the land in that which is pono (righteous), and to promote better understanding and aloha among SCD and the larger community, SCD will

continue to meet, consult and cooperate with cultural practitioners regarding the protection and incorporation of Hawaiian cultural perspectives, traditions and practices in appropriate areas and segments of Kaloko Makai.

With respect to number #11 above, Kaloko Makai representatives discussed this with Na Ala Hele staff in 2008 and with the Na Ala Hele Big Island advisory group after that. Since the integrity of the historic trail is lost at that point, due to Hina Lani road construction, the adjoining industrial subdivision and the water tank, Kaloko Makai will realign the trail and have it run down the southern boundary of the property (fronting Hina Lani,) from the point of intersection with Hina Lani down to Queen Kaʻahumanu Highway. This alignment gives the users of the trail easy access to cross Queen Kaʻahumanu or Hina Lani at the bottom, as there are crosswalks with crossing signals at that point.

4.4. ROADWAYS AND TRAFFIC

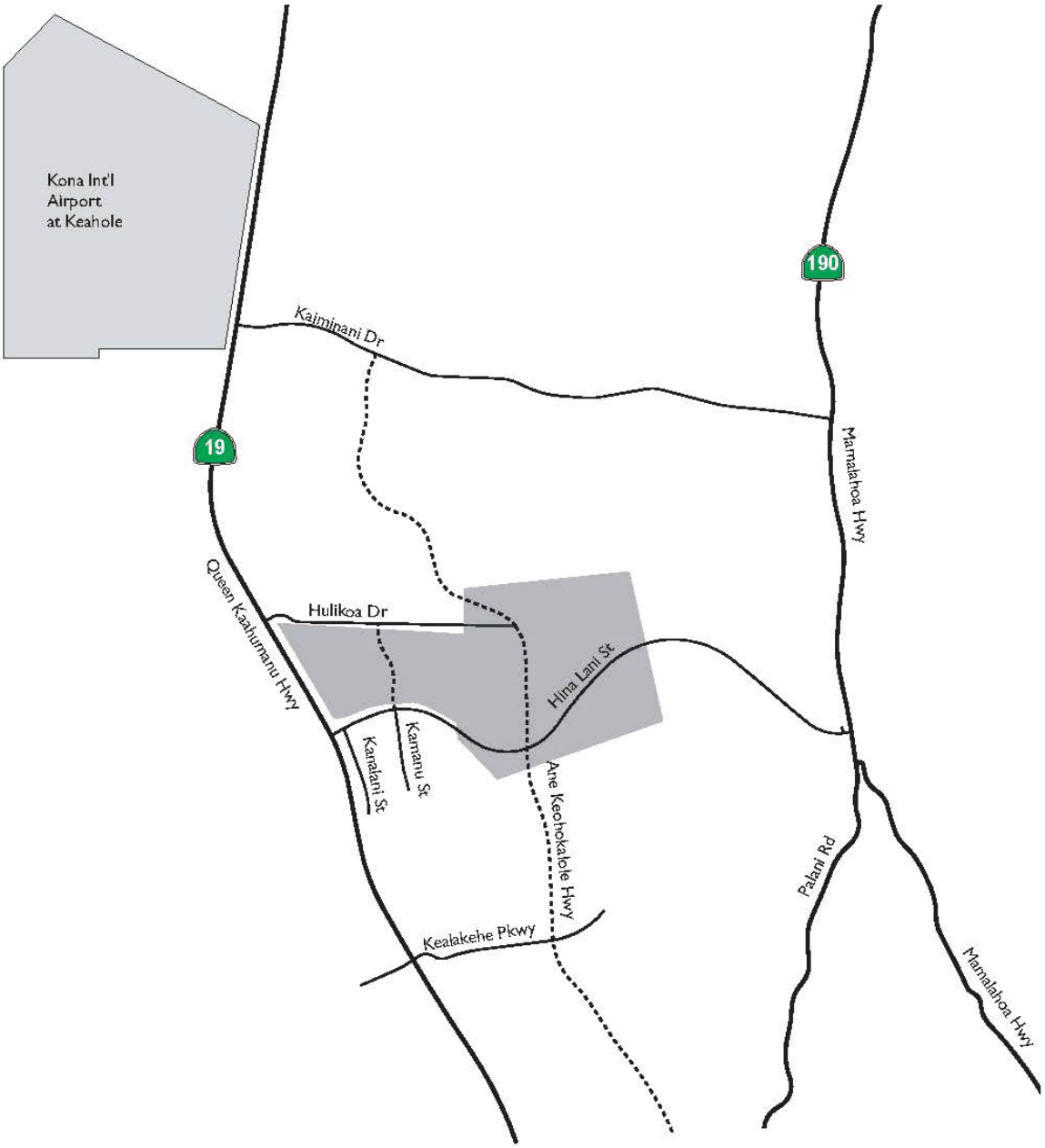
A Traffic Impact Assessment Report (TIAR) was prepared by KOA Corporation to analyze the potential traffic-related effects of the proposed project. Traffic conditions were evaluated for the following conditions:

- Existing Condition
- 2025 without Project Condition
- 2035 without Project Condition
- 2045 without Project Condition
- 2025 with Project Phase 1 Condition
- 2035 with Project Phase 2 Condition
- 2045 with Project Phase 3 Condition

The results are summarized below and included in Appendix K. The TIAR assumes full build out and occupancy at the start of the horizon year in order to provide a conservative analysis of traffic impacts. This contrasts with the market assessment which conservatively assesses market absorption by end of each study period.

The study area consists of the following eight intersections (see Figure 4-3):

1. Queen Kaʻahumanu Highway at Kaʻiminani Drive
2. Queen Kaʻahumanu Highway at Hulikoʻa Drive
3. Queen Kaʻahumanu Highway at Hina Lani Street
4. Kanalani Street at Hina Lani Street
5. Kamanu Street at Hina Lani Street
6. Ane Keohokālole Highway at Hina Lani Street
7. Māmalahoa Highway at Hina Lani Street
8. Queen Kaʻahumanu Highway at Kealakehe Parkway



LEGEND
- Site
- Analysis Intersection
- Future Roadways

NOT TO SCALE

Source: Traffic Impact Study for Kaloko Makai, KOA Corp. September 2012

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-3
TIAR Study Area
Kaloko Makai

Koa Corporation utilizes a level of service system to identify, evaluate, and describe street system operation conditions. Level of service is a report-card scale used to indicate the quality of traffic flow on roadway segments and at intersections. Level of service range from Level A (free flow, little congestion) to Level F (forced flow, extreme congestion). Level of Service D or better are considered as acceptable.

4.4.1. Existing Conditions

4.4.1.1. Existing Roadways

Several existing and planned regional roads serve the Kaloko Makai project. Queen Kaʻahumanu Highway adjoins the project on its makai side. Hina Lani Street adjoins the makai side of the project on the south side of the property and then cuts through the project site as it goes mauka. Ane Keohokālole Highway is proposed to cut through the middle of the project in a north-south direction.

Queen Kaʻahumanu, which runs parallel to the coast, is the main arterial roadway between North Kona and South Kohala. The highway is a two-lane, two-way highway with shoulders. The existing highway right-of-way ranges from 80-feet (from Palani Road to the Honokōhau Boat Harbor) to 300-feet (from the Harbor to Kona International Airport.)

Present improvement projects are expanding Queen Kaʻahumanu from Henry Street to the Kona International Airport to a four-lane (two lanes in each direction) divided highway. Very long-range DOT plans note that Queen Kaʻahumanu could be expanded to 6 or more lanes and revert back to limited access status. Long range plans call for the present signalized intersection at Hina Lani Street to be realigned as a grade separated interchange (no specific plans or budgets are in place, or anticipated in the foreseeable future for this subsequent expansion on the highway).

Phase I of the Queen Kaʻahumanu Highway widening from Henry Street to Kealakehe Parkway has been completed. The next phase of the improvement project, from Kealakehe Parkway to the Kona International Airport has been awarded.

Supporting this project is a new north-south road, Ane Keohokālole Highway. Ane Keohokālole Highway will be constructed in phases; the initial phases consist of a two-lane roadway. In the future as the traffic volume increases, the roadway would be widened to four lanes.

Ane Keohokālole Highway from Palani Road to Kaʻiminani will serve as a north-south highway through the Kona Urban Area. It will be the central corridor for multi-modal transportation for future regional development in this region of North Kona. Phase 1 includes two vehicle lanes between Palani Road and Kealakehe Parkway. Phase 2 is the next section of road between Kealakehe Parkway and Hina Lani Street. Phases 1 and 2 have been completed. Future sections of Ane Keohokālole Highway, ultimately to Kaʻiminani Drive, will be constructed as funds become available. Kona CDP Policy LU-2.6: TOD/Traditional Neighborhood Design (TND) Public Infrastructure and Facilities, states: To encourage the development of TODs and TNDs, public financing sources shall pay 100% for: Major proposed trunk transit route (i.e. Ane Keohokālole.)

Ane Keohokālole Highway, the trunk transit line in the Kona Urban Core, will run through the Kaloko Makai property. In addition, a transit station will be incorporated into the TOD village near the central part of the property.

Hina Lani Street is a two-lane, two-way mauka-makai residential collector roadway that connects Queen Kaʻahumanu Highway to Māmalahoa Highway (mauka of the Kaloko Makai project.) There are signalized intersections where Hina Lani Street intersects with these two highways.

Kamanu Street serves the Kaloko Industrial Park across the street from Kaloko Makai. Several area planning documents (K-to-K Plan and Kona CDP) call for "Main Street" in this area, with an extension of the existing Kamanu Street (to be renamed Main Street) through Kaloko Makai and its adjoining properties as it heads north.

4.4.2. Existing Transit Service

The County of Hawaiʻi Mass Transit Agency provides an island-wide public bus transit system called Hele-On Bus. The Hele-On Bus currently provides bus service along Queen Kaʻahumanu Highway.

4.4.3. Kona CDP

The North Kona area is appropriately seeing urban infill development and proposals, consistent with the 2008 Kona CDP and its accompanying Kona Village Design Guidelines.

Kaloko Makai is strategically located along the major regional traffic corridor of Queen Kaʻahumanu Highway, between the town of Kailua-Kona and the Airport. The Kaloko Makai project layout and road system takes into consideration DOT's plans for a grade-separated interchange for a realigned Hina Lani Street at Queen Kaʻahumanu Highway. Kaloko Makai will use this makai area on an interim basis and when DOT is ready to construct the interchange, arrangements for the land transfer to DOT can be made at that time.

Kaloko Makai is centrally located on Ane Keohokālole Highway, which will run through the development; this is the major transit corridor called for in the Kona CDP.

The Kaloko Makai project was conceived, planned and designed to be consistent with the Hawaiʻi County *General Plan*, the K-to-K Plan and the Kona CDP. It serves to implement these planning documents.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, and a variety of businesses and employment opportunities, focused around a TOD corridor along the extension of Ane Keohokalole Highway through the project, with land available (at no cost) for a new Kona regional hospital and the Kona Judiciary Complex.

Kaloko Makai has been designated as a Neighborhood TOD in the Official Kona Land Use Map of the Kona CDP. Kaloko Makai also supports many of the Guiding Principles of the Kona CDP, which was adopted by County ordinance on September 25, 2008. Kaloko Makai:

- **Directs future growth patterns toward compact centers** – Kaloko Makai is planned around a compact urban center within the Kona Urban Area.
- **Provides connectivity and transportation choices** – Kaloko Makai will be transit-ready and is located along key alignments for regional transportation. Developer SCD will also contribute to the development of Ane Keohokālole Highway. The Project itself is planned to offer walking and biking trails in addition to vehicular roads.
- **Provides housing choices** – Kaloko Makai will offer a broad range of housing types including affordable as well as "market-priced" housing units. Offerings will range from traditional single-family homes to mid- and higher-density multifamily homes, and may include live-work and mixed use developments.
- **Provides recreation opportunities** – Kaloko Makai features an approximately 150-acre Dryland Forest Preserve, as well as numerous community parks, a district-scale park and trails.
- **Provides infrastructure and essential facilities concurrent with growth** – In addition to the recreational and transportation contributions noted above, Kaloko Makai is planned to include a Hospital and medical complex, Lodge and Business Center, two Elementary Schools and a Middle School.

In addition, Kona CDP Policy LU-2.6: TOD/Traditional Neighborhood Design (TND) Public Infrastructure and Facilities, states: To encourage the development of TODs and TNDs, public financing sources shall pay 100% for:

- Major proposed trunk transit route,
- A transit station (or transit station component if the transit station is part of a private mixed-use project) within the urban core,
- A major park or plaza within the urban core.

Likewise, the Kona CDP states: "Public Financing of Infrastructure. In recognition of the regional benefits of major roads and transit stations, these types of improvements within TODs shall be funded with general revenue funding sources." (Kona CDP, Page 4-34)

4.4.4. Levels of Service Analysis of Existing Condition

Table 4-10 shows the existing intersection Level of Service (LOS) for both AM and PM peak hours. The study area intersections currently operate at LOS D or better during AM and PM peak hours.

Table 4-10
Existing Conditions Intersection Levels of Service Analysis Summary

No.	Intersection	Peak Hour	Existing		
			Delay (Sec)	V/C	LOS
1	Queen Ka'ahumanu Hwy at Kaʻiminani Drive	AM	16.9	0.85	B
		PM	8.6	0.65	A
2	Queen Ka'ahumanu Hwy at Hulikoʻa Drive[1]	AM	25.2	0.50	C
		PM	52.1	0.85	C
3	Queen Ka'ahumanu Hwy at Hina Lani Street	AM	11.1	0.65	B
		PM	15.7	0.82	C
4	Kanalani Street at Hina Lani Street[1]	AM	19.2	0.36	B
		PM	22.8	0.58	C
5	Kamanu Street at Hina Lani Street[1]	AM	10.7	0.25	B
		PM	14.1	0.40	B
6	Ane Keohokālole Hwy at Hina Lani Street[2]	AM	--	--	--
		PM	--	--	--
7	Māmalahoa Hwy at Hina Lani Street	AM	44.8	1.01	B
		PM	22.2	0.55	A
8	Queen Ka'ahumanu Hwy at Kealakehe Pkwy	AM	15.7	0.79	B
		PM	26.5	0.92	C

[1] Non-signalized. The delay is for the most constrained stop-controlled approach.
[2] Intersection does not currently exist.

4.4.5. Planned Roadway Improvements

KOA Corporation's TIAR includes a comprehensive analysis of traffic scenarios that account for present and future conditions with and absent the development of Kaloko Makai. KOA Corporation's projections utilize regressive analysis of regional traffic count data over a three year period from 2007 to 2010 to model projected future figures compounded with existing traffic volumes and modeled project trip distribution patterns derived from surrounding land uses and geographic conditions.

The following methodologies and assumptions were used to forecast the future traffic volumes for the project area:

- Existing traffic count data: Turning movement counts at existing eight study area intersections on September 21 and 22, 2010. The AM and PM peak hour counts were conducted from 6:00 AM to 9:00 AM and 3:00 PM to 6:00 PM, respectively.
- Trip generation rates: This study used nationally recognized trip rates, published by the Institute of Traffic Engineers (ITE), 8th Edition to determine the site-only traffic volumes generated by the proposed Kaloko Makai project,
- Pass-by-trip reduction: Pass-by-trip is a portion of traffic generated by retail uses already on the road stopping at a secondary destination on its way to an ultimate destination.
- Internal trip capture: Internal trip capture is a portion of traffic that visits multiple uses within the project boundary on a single trip.

- Transit trip discount: Transit trip discount is a portion of traffic that utilizes public transportation or vanpool opportunities instead of driving alone in person vehicles to their destinations.
- Project traffic generation: The proposed project is anticipated to generate 5,023 AM peak hour trips and 5,834 PM peak hour trips, with pass-by, internal capture and transit trip discount adjustments (see Table 3 in Appendix K for details).
- Project trip distribution patterns: Trip distribution is the process of identifying the probable destination, direction or traffic routes that will be utilized by project traffic. The potential interaction between the proposed land use and surrounding regional access routes are considered when identifying the route where the project traffic will distribute. Refer to Tables 4-6 in Appendix K for project-only traffic volumes.
- Other cumulative development traffic: Future traffic increases consider additional traffic that are generated by other cumulative developments that either is under construction, approved, planned, or proposed for development near the project area. This study included five other cumulative developments in the vicinity of Kaloko Makai: Kaloko Heights, Kula Nei, West Hawaiʻi Business Park, Kohaniki Business Park, and Kaloko Industrial Park, Phases 3 and 4.
- Ambient background growth: In addition to cumulative development traffic, other unidentified projects and general population growth contribute to ambient background traffic growth. Based on available data and other traffic studies in the surrounding area, it appears the annual growth rate is 1.74%. Therefore, the study utilizes a 1.74% ambient growth rate to assess future traffic conditions. The total ambient growth for the three analysis horizon years are as follows:
    - Phase 1 (2015): 29.6%
    - Phase 2 (2025): 54.0%
    - Phase 3 (2035): 83.1%
- Future traffic volumes: Based on the traffic forecast methodologies discussed above, the following future traffic volumes for the study area intersections were assessed (see Tables 8-11 in Appendix K):
    - 2025 Without Project Traffic
    - 2025 With Project Phase 1 Traffic
    - 2035 Without Project Traffic
    - 2035 With Project Phase 2 Traffic
    - 2045 With Project Traffic
    - 2045 With Project Phase 3 Traffic

Table 4-11 summarizes the recommended intersection improvements in a tabular format. The recommended intersection improvements for each analysis scenario are described in the following sub-sections.

2025 Without Project Conditions

For 2025 Without Project Conditions, there are some planned improvements that will implemented in the future which include the widening of Queen Kaʻahumanu Highway and the new construction of a Ane Keohokālole Highway that will run in a north-south direction between Queen Kaʻahumanu Highway and Māmalahoa Highway.

Table 4-11
Intersection Mitigation Summary

Intersection	Recommended Intersection Improvements				
	2025 & 2035 Without Project	**2045 Without Project**	**Year 2025 Project Phase 1**	**Year 2035 Project Phase 2**	**Year 2045 Project Phase 3**
1 Queen Ka'ahumanu Hwy. at Ka'iminani Dr.	• Add a 2nd NB Thru Lane • Add a 2nd SB Thru Lane	• No additional improvements	• No additional improvements	• No additional improvements	• Add a 3rd NB Thru Lane • Add a 2nd SB Left-Turn Lane • Add a 3rd SB Thru Lane • Add a 2nd WB Left-Turn Lane • Provide WB Right-Turn Overlap Signal Phasing
2 Queen Ka'ahumanu Hwy. at Huliko'a Dr.	• Add a 2nd NB Thru Lane • Add a 2nd SB Thru Lane • Retain WB Free Right-Turn Lane • Restrict SB and WB Left-Turn Movements	• No additional improvements	• No additional improvements	• No additional improvements	• Add a 3rd SB Thru Lane
3 Queen Ka'ahumanu Hwy. at Hina Lani St.	• Add a 2nd NB Thru Lane • Add a 2nd SB Thru Lane • Add a 2nd SB Left-Turn Lane • Add a 2nd WB Left-Turn Lane	• No additional improvements	• No additional improvements	• Add a 3rd NB Thru Lane • Add a 2nd NB Right-Turn Lane • Add a 3rd SB Thru Lane	• Construct a Grade Separation Interchange (See Appendix K for conceptual layout)
4 Kanalani St.at Hina Lani St.	• No additional improvements	• No additional improvements	• Restrict NB Left-Turn Movement	• Add a 2nd EB Thru Lane	• Add a WB Left-Turn Lane
5 Kamanu St.at Hina Lani St.	• Install a New Traffic Signal • Add a 2nd NB Left-Turn Lane	• No additional improvements	• Add a NB Thru Lane • Add SB Left-Turn, Thru, and Right-Turn Lanes • Add an EB Left-Turn Lane • Add a 2nd WB Thru Lane	• Add a SB Free-Right Turn Lane • Add a 2nd EB Left-Turn Lane • Add a WB Right-Turn Lane	• No additional improvements

Table 4-11 (continued)
Intersection Mitigation Summary

Intersection	Recommended Intersection Improvements				
	2025 & 2035 Without Project	**2045 Without Project**	**Year 2025 Project Phase 1**	**Year 2035 Project Phase 2**	**Year 2045 Project Phase 3**
6 Ane Keohokālole Hwy. at Hina Lani St.	• Provide Left-Turn, Thru, and Right-Turn for all approaches • Install a new traffic signal	• No additional improvements	• No additional improvements	• Add a NB Free-Right Turn Lane • Add a 2nd EB Thru Lane • Add a 2nd WB Thru Lane • Add a 2nd WB Left-Turn Lane	• Add a 2nd EB Left-Turn Lane • Provide EB Right-Turn Overlap Signal Phasing • Provide WB Right-Turn Overlap Signal Phasing
7 Māmalahoa Hwy .at Hina Lani St.	• No additional improvements	• No additional improvements	• Add a 2nd NB Left-Turn Lane • Provide SB Right-Turn Overlap Signal Phasing • Add a 2nd EB Left-Turn Lane • Provide EB Right-Turn Overlap Signal Phasing	• No additional improvements	• Add a SB Free Right-Turn Lane
8 Queen Kaʻahumanu Hwy. at Kealakehe Pkwy.	• Add a 2nd NB Thru Lane • Convert SB Right-Turn Lane to a shared (2nd) Thru/Right-Turn Lane	• Add a 2nd WB Left-Turn Lane	• Add a 2nd WB Left-Turn Lane	• Add a 3rd NB Thru Lane • Provide NB Right-Turn Overlap Signal Phasing • Add a 3rd SB Thru Lane	• No additional improvements

Queen Kaʻahumanu Highway is currently a two-lane roadway, and it is anticipated to be widening to a four-lane roadway prior to Year 2025. The planned roadway widening along Queen Kaʻahumanu Highway will provide additional northbound and southbound travel lane improvements to the following study area intersections:

Queen Kaʻahumanu Highway at Kaʻiminani Drive (#1)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane

Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Restrict southbound and westbound left turn movements – this intersection is anticipated to remain unsignalized

Queen Kaʻahumanu Highway at Hina Lani Street (#3)

- Add a Second Northbound Through Lane
- Add a Second Southbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a second Westbound Left-Turn Lane

Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

- Add a Second Northbound Through Lane
- Convert Southbound Right-Turn Lane to a shared (Second) Through/Right-Turn Lane

The future Ane Keohokālole Highway will be a two-lane mid-level road that is planned to be constructed in a north-south direction between Queen Kaʻahumanu Highway and Māmalahoa Highway. By the first horizon year of this traffic study (Year 2025), Ane Keohokālole Highway is anticipated to be completed between Hulikoʻa Drive and Palani Road to the south. Ane Keohokālole Highway has been completed between Palani Road and Hina Lani Street. The northerly extension of Ane Keohokālole Highway to Kaʻiminani Drive is anticipated to be completed by 2028 (or near the beginning of Project Phase 2). The completion of Ane Keohokālole Highway will serve as a parallel corridor to relief traffic congestion on Queen Kaʻahumanu Highway and Māmalahoa Highway. The planned Ane Keohokālole Highway will provide lane improvements to the following study area intersection:

Ane Keohokālole Highway at Hina Lani Street (#6)

- Ane Keohokālole Highway will be constructed as a new mid-level road, and it will run in a generally north-south direction through the project site.
- Construct new intersection: Provide Left-Turn, Through, and Right-Turn for all approaches
- Install a new traffic signal

As previously mentioned, the Kona CDP Policy LU-2.6: TOD/Traditional Neighborhood Design (TND) Public Infrastructure and Facilities, states: To encourage the development of TODs and TNDs, public financing sources shall pay 100% for: Major proposed trunk transit route (i.e. Ane Keohokālole.)

By 2025, there are additional planned improvements to the study area intersections that will be implemented by other surrounding developments to accommodate the overall traffic growth due to background ambient growth and new cumulative developments. The following planned intersection improvements are anticipated:

Kamanu Street at Hina Lani Street (#5)

- Install a New Traffic Signal
- Add a Second Northbound Left-Turn Lane

Table 4-12 summarizes the result of the 2025 Without Project Conditions intersection LOS analysis. As shown in Table 4-12, the intersection of Queen Kaʻahumanu Highway and Hulikoʻa Drive is projected to operate at Level of Service "E" or worse for 2025 Without Project Conditions during the peak hours, with existing lane geometry and planned improvements:

The following additional improvement is recommended to accommodate 2025 Without Project Conditions (see Figure 4-4):

Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)

- Retain westbound free-right turn lane along with the roadway widening on Queen Kaʻahumanu Highway

With recommended 2025 Without Project intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

2025 With Project Phase 1 Conditions

Table 4-13 summarizes the results for the 2025 With Project Phase 1 Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 4-13, the following study area intersections are projected to operate at Level of Service "E" or worse for 2025 With Project Phase 1 Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaahumanu Highway at Hulikoʻa Drive (#2)
- Kanalani Street at Hina Lani Street (#4)
- Māmalahoa Highway at Hina Lani Street (#7)
- Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

Figure 4-5 shows the recommended roadway network and intersection lane geometry for 2025 With Project Phase 1 Conditions to mitigate the traffic impact. In addition to the recommended 2025 Without Project improvements previously listed above, the following additional improvement is recommended to accommodate 2025 With Project Phase 1 Conditions:

Kanalani Street at Hina Lani Street (#4)

- Restrict Northbound Left-Turn Movement

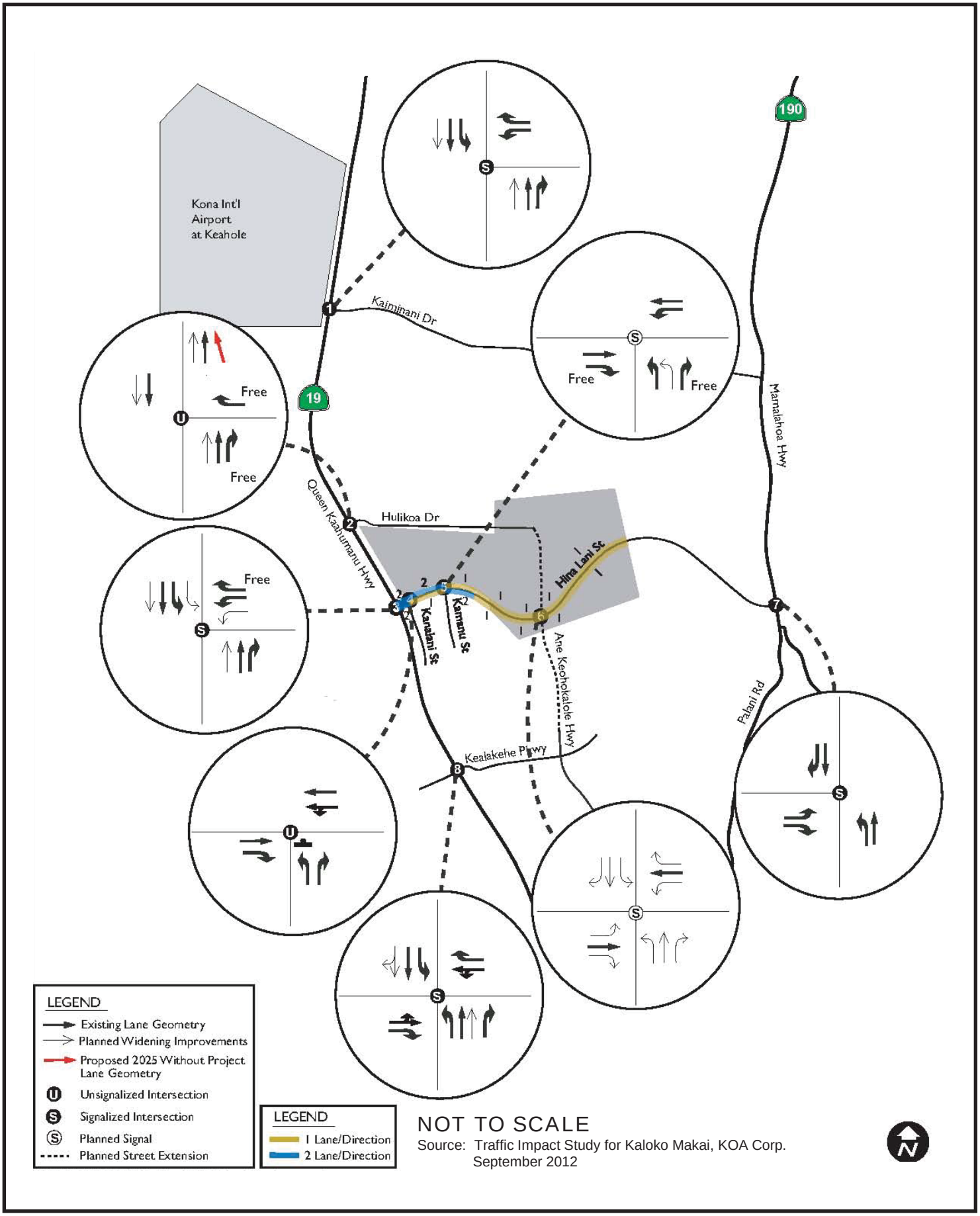
Kamanu Street at Hina Lani Street (#5)

- Add a Northbound Through Lane
- Add Southbound Left-Turn, Through, and Right-Turn Lanes
- Add an Eastbound Left-Turn Lane
- Add a Second Westbound Through Lane

Table 4-12

2025 Without Project Conditions Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Kaʻahumanu Hwy. at Kaiminani Dr.	AM	14.0	0.79	B	NO	14.0	0.79	B	NO
		PM	9.7	0.68	A	NO	9.7	0.68	A	NO
2	Queen Kaʻahumanu Hwy. at Hulikoʻa Dr.	AM	18.4	0.50	C	NO	0.1	0.01	A	NO
		PM	46.2	0.81	E	YES	0.1	0.01	A	NO
3	Queen Kaʻahumanu Hwy. at Hina Lani St.	AM	10.6	0.59	B	NO	10.6	0.59	B	NO
		PM	14.8	0.79	B	NO	14.8	0.79	B	NO
4	Kanalani St. at Hina Lani St.	AM	24.2	0.59	C	NO	24.2	0.59	C	NO
		PM	29.2	0.67	D	NO	29.2	0.67	D	NO
5	Kamanu St. at Hina Lani St.	AM	4.1	0.30	A	NO	4.1	0.30	A	NO
		PM	4.6	0.46	A	NO	4.6	0.46	A	NO
6	Ane Keohokālole Hwy. at Hina Lani St.	AM	9.3	0.47	A	NO	9.3	0.47	A	NO
		PM	15.4	0.65	B	NO	15.4	0.65	B	NO
7	Māmalahoa Hwy. at Hina Lani St.	AM	40.7	0.98	D	NO	40.7	0.98	D	NO
		PM	15.9	0.79	B	NO	15.9	0.79	B	NO
8	Queen Kaʻahumanu Hwy. at Kealakehe Pkwy.	AM	17.5	0.79	B	NO	17.5	0.79	B	NO
		PM	43.3	1.00	D	NO	43.3	1.00	D	NO



WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

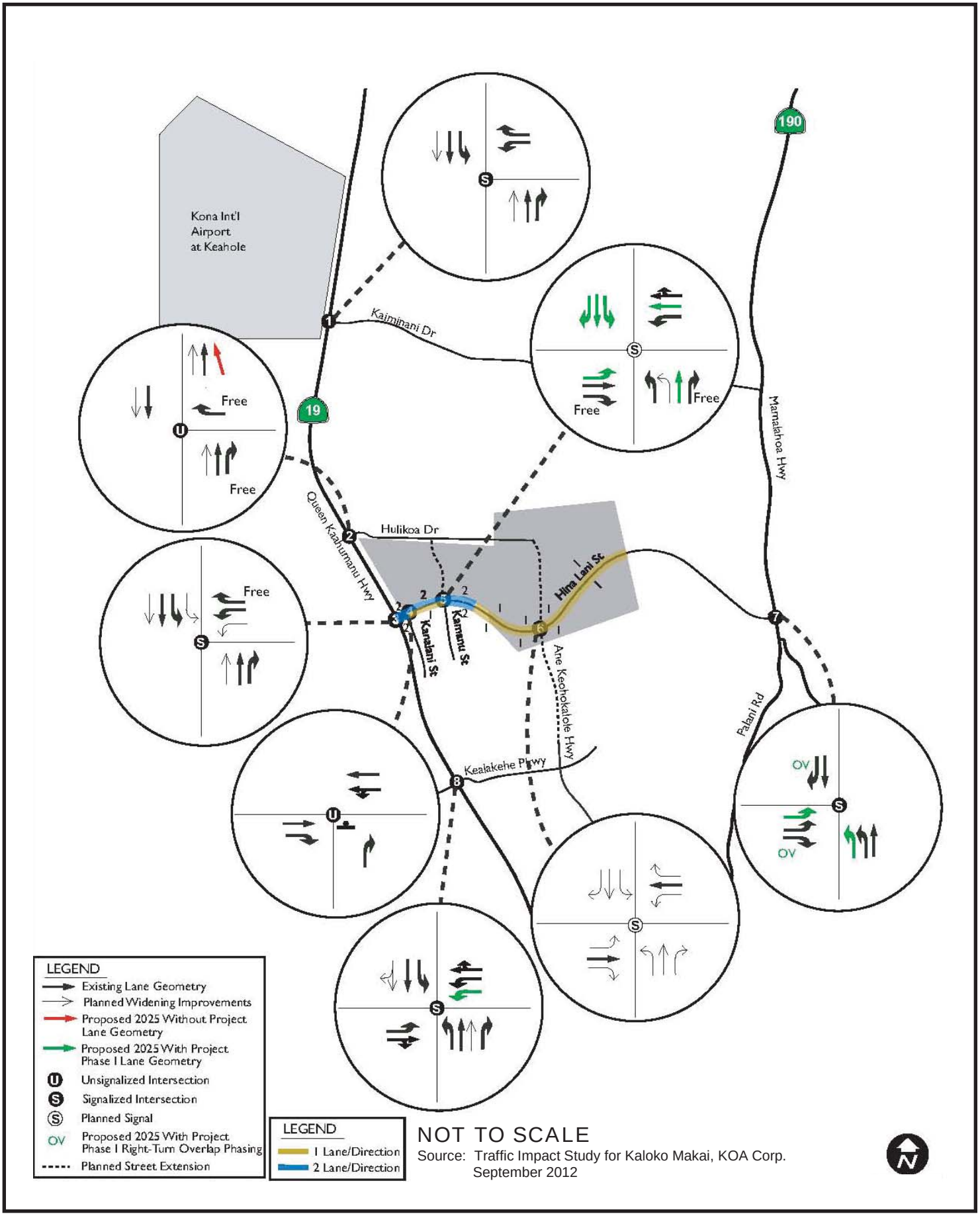
FIGURE 4-4

Recommended 2025 Without Project Lane Geometry

Kaloko Makai

Table 4-13
2025 With Project Phase 1 Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay (Sec)	V / C	LOS	Project Impact	Delay (Sec)	V / C	LOS	Project Impact
1	Queen Kaʻahumanu Hwy. at Kaʻiminani Dr.	AM	16.7	0.87	B	NO	16.7	0.87	B	NO
		PM	12.8	0.81	B	NO	12.8	0.81	B	NO
2	Queen Kaʻahumanu Hwy at Hulikoʻa Dr.	AM	36.8	0.80	E	YES	0.1	0.01	A	NO
		PM	>100	1.43	F	YES	0.1	0.01	A	NO
3	Queen Kaʻahumanu Hwy. at Hina Lani St.	AM	24.6	0.91	C	NO	24.6	0.91	C	NO
		PM	53.9	1.07	D	NO	53.9	1.07	D	NO
4	Kanalani St. at Hina Lani St.	AM	>100	>2	F	YES	23.5	0.09	C	NO
		PM	>100	>2	F	YES	34.3	0.40	D	NO
5	Kamanu St. at Hina Lani St.	AM	13.5	0.55	B	NO	32.5	0.70	C	NO
		PM	35.7	0.85	D	NO	40.8	0.78	D	NO
6	Ane Keohokālole Hwy. at Hina Lani St.	AM	19.0	0.7	B	NO	19.0	0.70	B	NO
		PM	21.8	0.80	C	NO	21.8	0.80	C	NO
7	Māmalahoa Hwy. at Hina Lani St.	AM	74.9	1.14	E	YES	47.6	1.00	D	NO
		PM	25.5	0.90	C	NO	15.1	0.78	B	NO
8	Queen Kaʻahumanu Hwy. at Kealakehe Pkwy.	AM	32.3	0.98	C	NO	29.8	0.82	C	NO
		PM	>100	1.27	F	YES	54.0	0.94	D	NO



WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-5

Recommended 2025 Project Lane Geometry

Kaloko Makai

Māmalahoa Highway at Hina Lani Street (#7)

- Add a Second Northbound Left-Turn Lane
- Provide Southbound Right-Turn Overlap Signal Phasing
- Add a Second Eastbound Left-Turn Lane
- Provide Eastbound Right-Turn Overlap Signal Phasing

Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

- Add a Second Westbound Left-Turn Lane

With recommended 2025 With Project Phase 1 intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

2035 Without Project Conditions

The 2035 Without Project Conditions have the same planned improvements as the 2025 Without Project Conditions which were previously listed. The planned improvements include the widening of Queen Kaʻahumanu Highway and the construction of Ane Keohokālole Highway.

Table 4-14 summarizes the results for the 2035 Without Project Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 4-14, the intersection of Queen Kaʻahumanu and Hulikoʻa Drive (#2) is projected to operate at Level of Service "E" or worse for 2035 Without Project Conditions during the peak hours, with existing lane geometry and planned improvements:

The recommended lane improvements for 2035 Without Project Conditions are same as the ones previously listed in the 2025 Traffic Conditions Section above and as shown in Figure 4-4.

With recommended 2035 Without Project intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

2035 With Project Phase 2 Conditions

Table 4-15 summarizes the results for the 2035 With Project Phase 2 Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 4-15, the following study area intersections are projected to operate at Level of Service "E" or worse for 2035 With Project Phase 2 Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)
- Queen Kaʻahumanu Highway at Hina Lani Street (#3)
- Kanalani Street at Hina Lani Street (#4)
- Kamanu Street at Hina Lani Street (#5)
- Ane Keohokālole Highway at Hina Lani Street (#6)
- Māmalahoa Highway at Hina Lani Street (#7)
- Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

Figure 4-6 shows the recommended roadway network and intersection lane geometry for 2035 With Project Phase 2 Conditions to mitigate the traffic impact. In addition to the recommended 2025 With Project Phase 1 improvements previously listed, the following additional improvements are recommended to accommodate 2035 With Project Phase 2 Conditions:

Queen Kaʻahumanu Highway at Hina Lani Street (#3)

- Add a Third Northbound Through Lane
- Add a Second Northbound Right-Turn Lane
- Add a Third Southbound Through Lane

Kanalani Street at Hina Lani Street (#4)

- Add a Second Eastbound Through Lane

Kamanu Street at Hina Lani Street (#5)

- Add a Southbound Free-Right Turn Lane
- Add a Second Eastbound Left-Turn Lane
- Add a Westbound Right-Turn Lane

Ane Keohokālole Highway at Hina Lani Street (#6)

- Add a Northbound Free-Right Turn Lane
- Add a Second Eastbound Through Lane
- Add a Second Westbound Through Lane
- Add a Second Westbound Left-Turn Lane

Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

- Add a Third Northbound Through Lane
- Provide Northbound Right-Turn Overlap Signal Phasing
- Add a Third Southbound Through Lane

With recommended 2035 With Project Phase 2 intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

2045 Without Project Conditions

It should be noted that the 2045 Without Project Conditions have the same planned improvements as the 2025 Without Project Conditions which were previously listed.

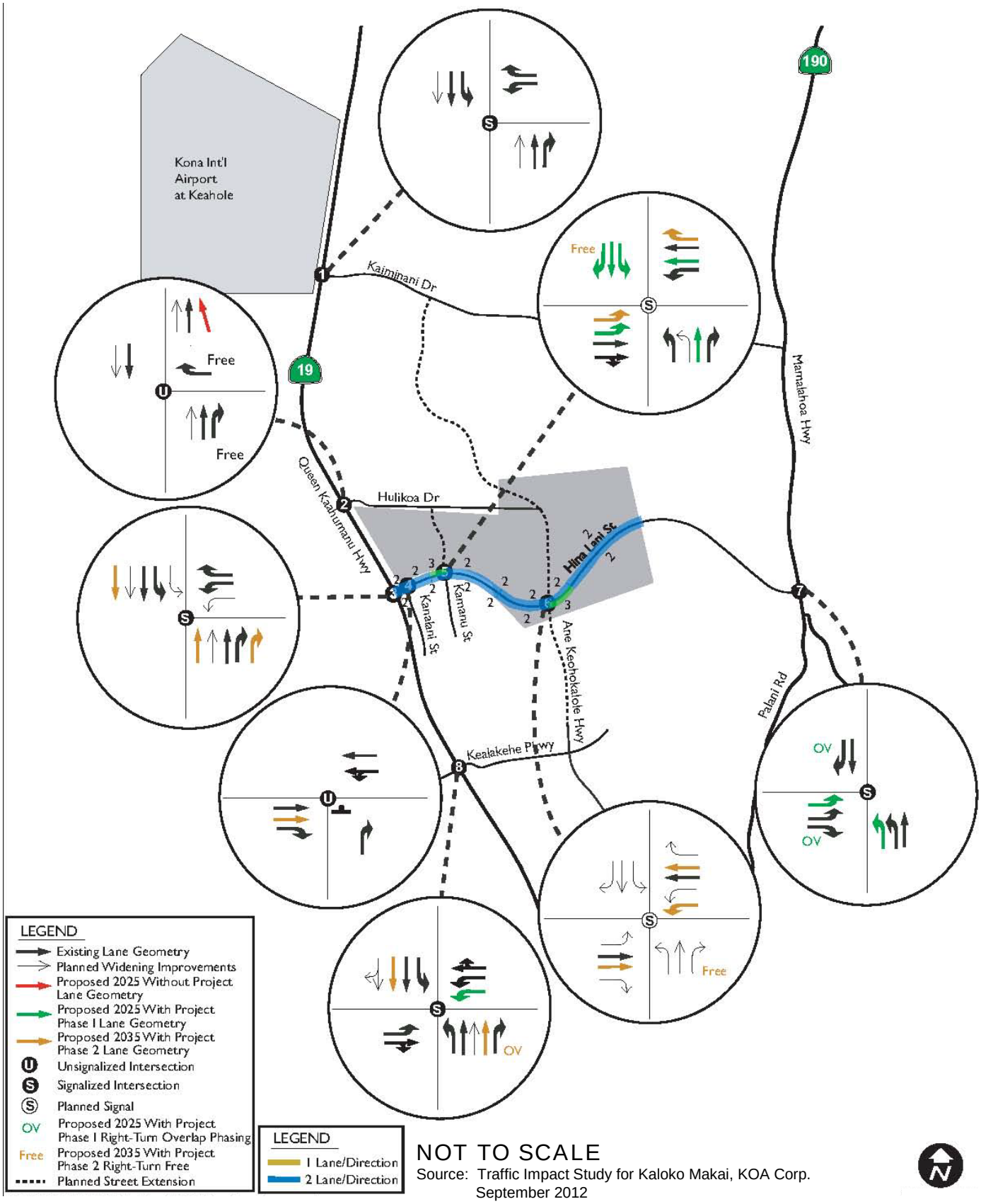
Table 4-16 summarizes the results for the 2045 Without Project Conditions intersection level of service analysis, with existing geometry and planned improvements. As shown in Table 4-16, the following study area intersections are projected to operate at Level of Service "E" or worse for 2045 Without Project Conditions during the peak hours, with existing lane geometry and planned improvements:

Table 4-14
2035 Without Project Conditions Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Ka'ahumanu Hwy at Kaʻiminani Drive	AM	17.1	0.77	B	NO	17.1	0.77	B	NO
		PM	14.5	0.73	B	NO	14.5	0.73	B	NO
2	Queen Ka'ahumanu Hwy at Hulikoʻa Drive	AM	20.1	0.53	C	NO	0.1	0.01	A	NO
		PM	36.9	0.75	E	YES	0.1	0.01	A	NO
3	Queen Ka'ahumanu Hwy at Hina Lani Street	AM	10.6	0.59	B	NO	10.6	0.59	B	NO
		PM	14.2	0.77	B	NO	14.2	0.77	B	NO
4	Kanalani Street at Hina Lani Street	AM	19.2	0.51	C	NO	19.2	0.51	C	NO
		PM	22.8	0.58	C	NO	22.8	0.58	C	NO
5	Kamanu Street at Hina Lani Street	AM	3.7	0.42	A	NO	3.7	0.42	A	NO
		PM	4.3	0.4	A	NO	4.3	0.4	A	NO
6	Ane Keohokālole Hwy at Hina Lani Street	AM	25.9	0.71	C	NO	25.9	0.71	C	NO
		PM	22.6	0.79	C	NO	22.6	0.79	C	NO
7	Māmalahoa Hwy at Hina Lani Street	AM	26.7	0.92	C	NO	26.7	0.92	C	NO
		PM	18.2	0.8	B	NO	18.2	0.8	B	NO
8	Queen Ka'ahumanu Hwy at Kealakehe Pkwy	AM	17.8	0.92	B	NO	17.8	0.92	B	NO
		PM	50.4	1.04	D	NO	50.4	1.04	D	NO

Table 4-15
2035 With Project Phase 2 Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay			Project	Delay			Project
			(Sec)	V / C	LOS	Impact	(Sec)	V / C	LOS	Impact
1	Queen Kaʻahumanu Hwy. at Kaʻiminani Dr.	AM	37.6	1.01	D	NO	37.6	1.01	D	NO
		PM	36.2	0.96	D	NO	36.2	0.96	D	NO
2	Queen Kaʻahumanu Hwy. at Hulikoʻa Dr.	AM	54.0	0.90	F	YES	0.1	0.01	A	NO
		PM	>100	1.27	F	YES	0.1	0.01	A	NO
3	Queen Kaʻahumanu Hwy. at Hina Lani St.	AM	50.2	1.07	D	NO	22.7	0.85	C	NO
		PM	>100	1.42	F	YES	43.2	1.00	D	NO
4	Kanalani St. at Hina Lani St.	AM	>100	>2.00	F	YES	13.4	0.04	B	NO
		PM	>100	>2.00	F	YES	18.2	0.23	C	NO
5	Kamanu Street at Hina Lani St.	AM	83.7	1.42	F	YES	21.7	0.63	C	NO
		PM	>100	>2.00	F	YES	26.0	0.70	C	NO
6	Ane Keohokālole Hwy. at Hina Lani St.	AM	78.3	1.35	E	YES	43.3	0.89	D	NO
		PM	>100	1.46	F	YES	44.7	1.02	D	NO
7	Māmalahoa Hwy. at Hina Lani St.	AM	81.2	1.17	F	YES	38.7	0.98	D	NO
		PM	47.9	1.04	D	NO	16.7	0.82	B	NO
8	Queen Kaʼahumanu Hwy. at Kealakehe Pkwy.	AM	66.1	1.16	E	YES	24.4	0.78	C	NO
		PM	>100	1.46	F	YES	36.8	0.88	D	NO



Source: Traffic Impact Study for Kaloko Makai, KOA Corp. September 2012

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

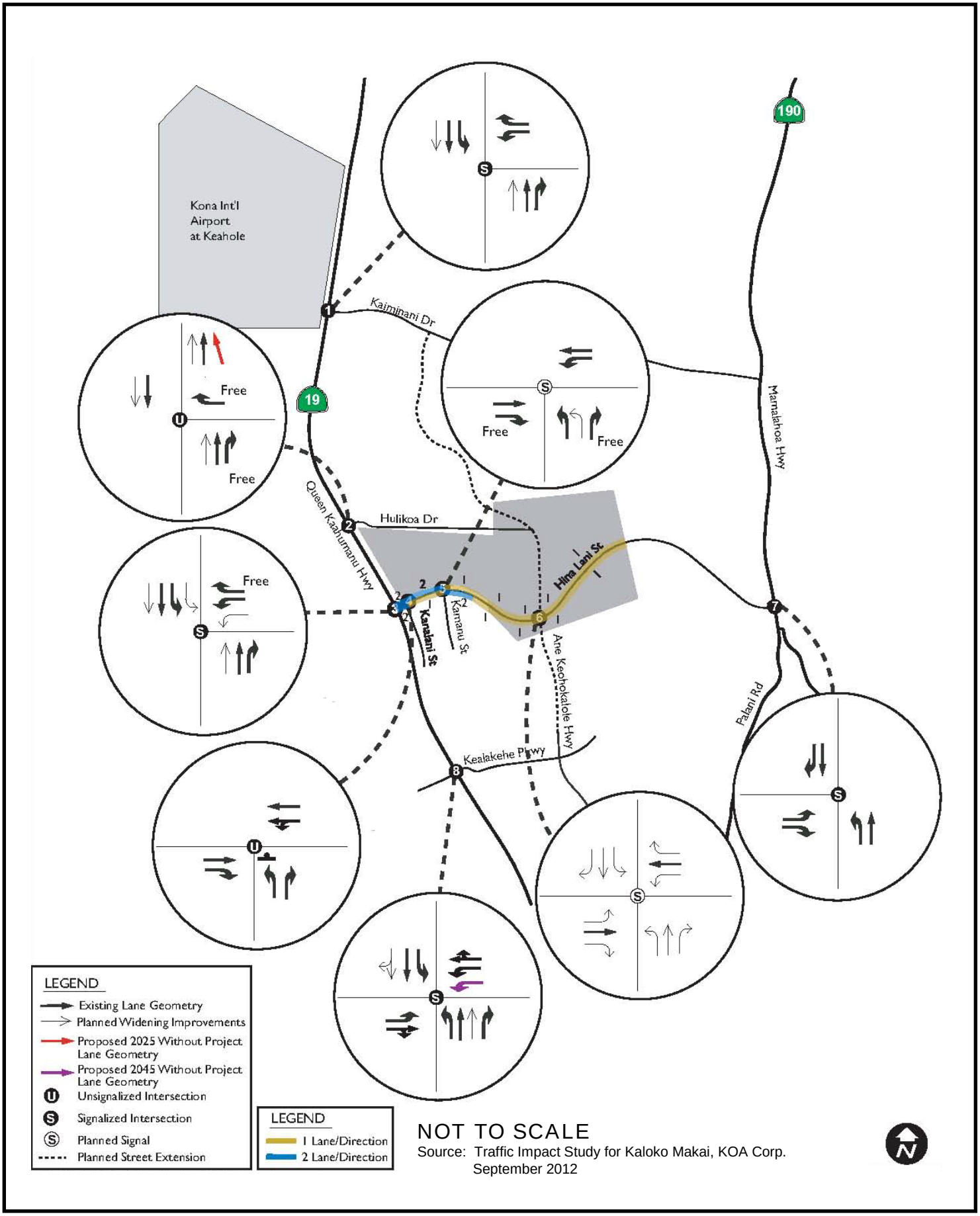
FIGURE 4-6

Recommended 2035 Project Lane Geometry

Kaloko Makai

Table 4-16
2045 Without Project Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITHOUT PROJECT				WITHOUT PROJECT PLUS MITIGATION			
			Delay (Sec)	V/C	LOS	Cum. Impact	Delay (Sec)	V/C	LOS	Cum. Impact
1	Queen Kaʻahumanu Hwy. at Kaʻiminani Dr.	AM	20.0	0.87	C	NO	20.0	0.87	C	NO
		PM	15.9	0.76	B	NO	15.9	0.76	B	NO
2	Queen Kaʻahumanu Hwy. at Hulikoʻa Dr.	AM	25.2	0.61	D	NO	0.1	0.01	A	NO
		PM	52.1	0.85	F	YES	0.1	0.01	A	NO
3	Queen Kaʻahumanu Hwy. at Hina Lani St.	AM	11.1	0.65	B	NO	11.1	0.65	B	NO
		PM	15.7	0.82	B	NO	15.7	0.82	B	NO
4	Kanalani St.at Hina Lani St.	AM	19.2	0.51	C	NO	19.2	0.51	C	NO
		PM	22.8	0.58	C	NO	22.8	0.58	C	NO
5	Kamanu St. at Hina Lani St.	AM	3.7	0.42	A	NO	3.7	0.42	A	NO
		PM	4.3	0.40	A	NO	4.3	0.40	A	NO
6	Ane Keohokālole Hwy. at Hina Lani St.	AM	24.5	0.74	C	NO	24.5	0.74	C	NO
		PM	24.3	0.81	C	NO	24.3	0.81	C	NO
7	Māmalahoa Hwy. at Hina Lani St.	AM	44.8	1.01	D	NO	44.8	1.01	D	NO
		PM	22.2	0.86	C	NO	22.2	0.86	C	NO
8	Queen Kaʻahumanu Hwy.at Kealakehe Pkwy.	AM	19.7	0.90	B	NO	23.7	0.76	C	NO
		PM	63.2	1.11	E	YES	37.2	0.87	D	NO



WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-7

Recommended 2045 Without Project Lane Geometry

Kaloko Makai

- Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)
- Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

In addition to the recommended 2025 Without Project improvements previously listed, the following additional improvement is recommended to accommodate 2045 Without Project Conditions (see Figure 4-7):

Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

- Add a second Westbound Left-Turn Lane

With recommended 2045 Without Project intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

2045 With Project Phase 3 Conditions

Table 4-17 summarizes the result of the 2035 With Project Phase 3 intersection LOS analysis. As shown in Table 4-17, the following study area intersections are projected to operate at Level of Service "E" or worse for 2045 With Project Phase 3 Conditions during the peak hours, with existing lane geometry and planned improvements:

- Queen Kaʻahumanu Highway at Kaʻiminani Drive (#1)
- Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)
- Queen Kaʻahumanu Highway at Hina Lani Street (#3)
- Kanalani Street at Hina Lani Street (#4)
- Kamanu Street at Hina Lani Street (#5)
- Ane Keohokālole Highway at Hina Lani Street (#6)
- Māmalahoa Highway at Hina Lani Street (#7)
- Queen Kaʻahumanu Highway at Kealakehe Parkway (#8)

Figure 4-8 shows the recommended roadway network and intersection lane geometry for 2045 With Project Phase 3 Conditions to mitigate the traffic impact. In addition to the recommended 2035 with Project Phase 2 improvements previously, the following additional improvements are recommended to accommodate 2045 With Project Phase 3 Conditions:

Queen Kaahumanu Highway at Kaʻiminani Drive (#1)

- Add a Third Northbound Through Lane
- Add a Second Southbound Left-Turn Lane
- Add a Third Southbound Through Lane
- Add a Second Westbound Left-Turn Lane
- Provide Westbound Right-Turn Overlap Signal Phasing

Queen Kaʻahumanu Highway at Hulikoʻa Drive (#2)

- Add a Third Southbound Through Lane

Table 4-17
2045 With Project Phase 3 Intersection Level of Service Analysis Summary

No.	Intersection	Peak Hour	WITH PROJECT				WITH PROJECT PLUS MITIGATION			
			Delay			Project	Delay			Project
			(Sec)	V / C	LOS	Impact	(Sec)	V / C	LOS	Impact
1	Queen Kaʻahumanu Hwy. at Kaʻiminani Dr.	AM	65.9	1.13	E	YES	17.6	0.84	B	NO
		PM	69.9	1.11	E	YES	16.2	0.85	B	NO
2	Queen Kaʻahumanu Hwy. at Hulikoʻa Dr.	AM	>100	1.20	F	YES	0.1	0.01	A	NO
		PM	>100	1.62	F	YES	0.1	0.01	A	NO
3	Queen Kaʻahumanu Hwy. at Hina Lani St.	AM	>100	1.29	F	YES	Interchange			
		PM	>100	1.76	F	YES				
4	Kanalani St. at Hina Lani St.	AM	>100	>2.00	F	YES	15.5	0.05	C	NO
		PM	>100	>2.00	F	YES	26.1	0.32	D	NO
5	Kamanu St. at Hina Lani St.	AM	>100	>2.00	F	YES	26.5	0.72	C	NO
		PM	>100	>2.00	F	YES	37.3	0.80	D	NO
6	Ane Keohokālole Hwy. at Hina Lani St.	AM	>100	1.96	F	YES	46.5	0.89	D	NO
		PM	>100	>2.00	F	YES	54.4	0.99	D	NO
7	Māmalahoa Hwy. at Hina Lani St.	AM	>100	1.35	F	YES	51.5	1.03	D	NO
		PM	86.3	1.23	F	YES	22.2	0.90	C	NO
8	Queen Ka'ahumanu Hwy. at Kealakehe Pkwy.	AM	>100	1.28	F	YES	30.5	0.85	C	NO
		PM	>100	1.64	F	YES	41.7	0.93	D	NO

Queen Kaʻahumanu Highway at Hina Lani Street (#3)

- Construct a grade-separated interchange

Kanalani Street at Hina Lani Street (#4)

- Add a Westbound Left-Turn Lane

Ane Keohokālole Highway at Hina Lani Street (#6)

- Add a Second Eastbound Left-Turn Lane
- Provide Eastbound Right-Turn Overlap Signal Phasing
- Provide Westbound Right-Turn Overlap Signal Phasing

Māmalahoa Highway at Hina Lani Street (#7)

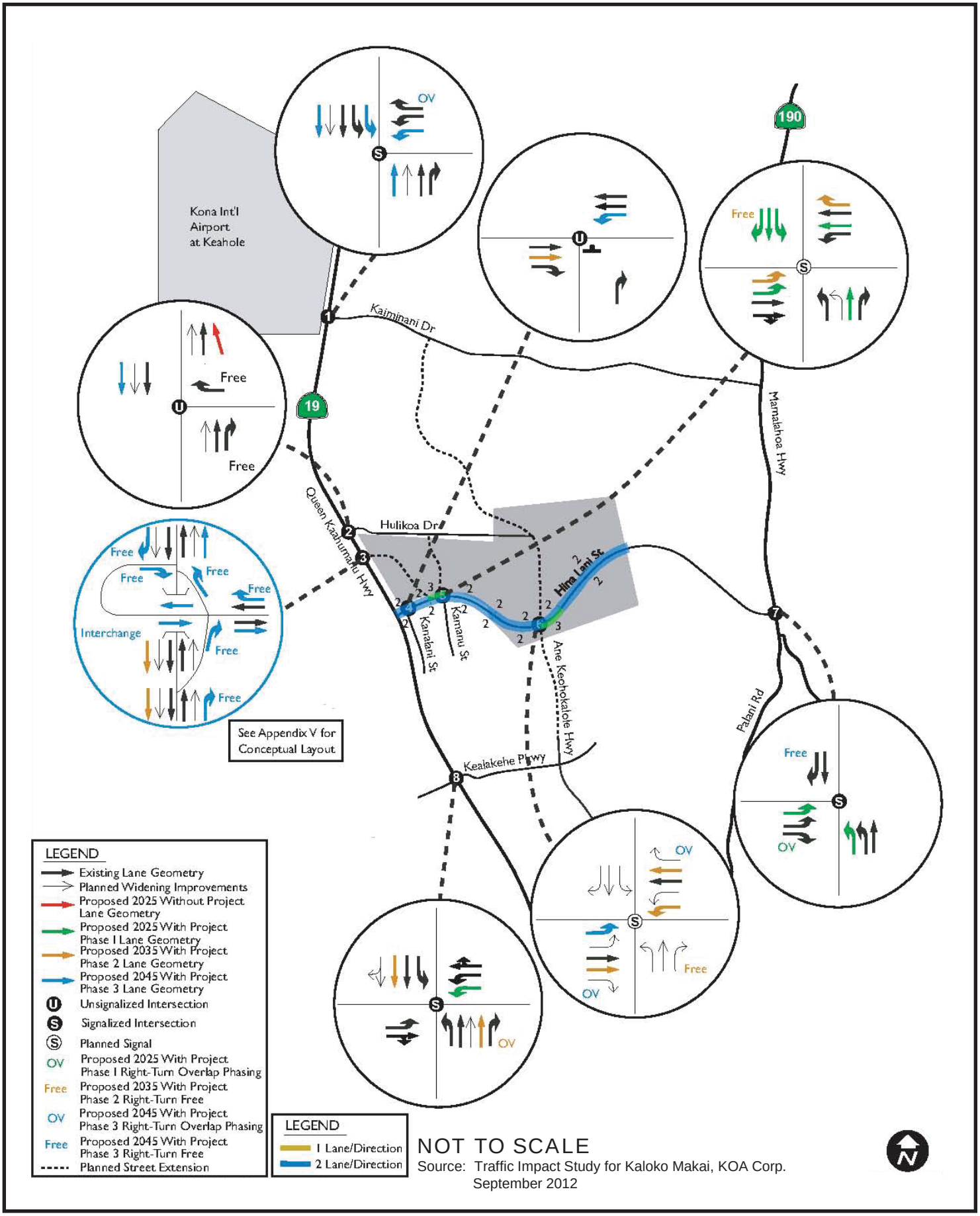
- Add a Southbound Free Right-Turn Lane

With recommended 2045 With Project Phase 3 intersection lane improvements, the study area intersections are projected to be mitigated to Level of Service "D" or better during the peak hours.

Figures 4-9A and 4-9B summarizes the recommended intersection lane geometry to mitigate traffic impact for the following conditions:

- 2025 Without Project conditions, with existing lane geometry and planned widening
- 2035 Without Project conditions, with existing lane geometry and planned widening
- 2045 Without Project conditions, with recommended intersection improvements
- 2025 With Project Phase 1 conditions, with recommended intersection improvements
- 2035 With Project Phase 2 conditions, with recommended intersection improvements
- 2045 With Project Phase 3 conditions, with recommended intersection improvements

Table 4-18 summarizes the intersection level of service analysis results with existing lane geometry and planned improvements. Table 4-19 summarizes the expected levels of service for the study area intersections with additional mitigation measures in place.

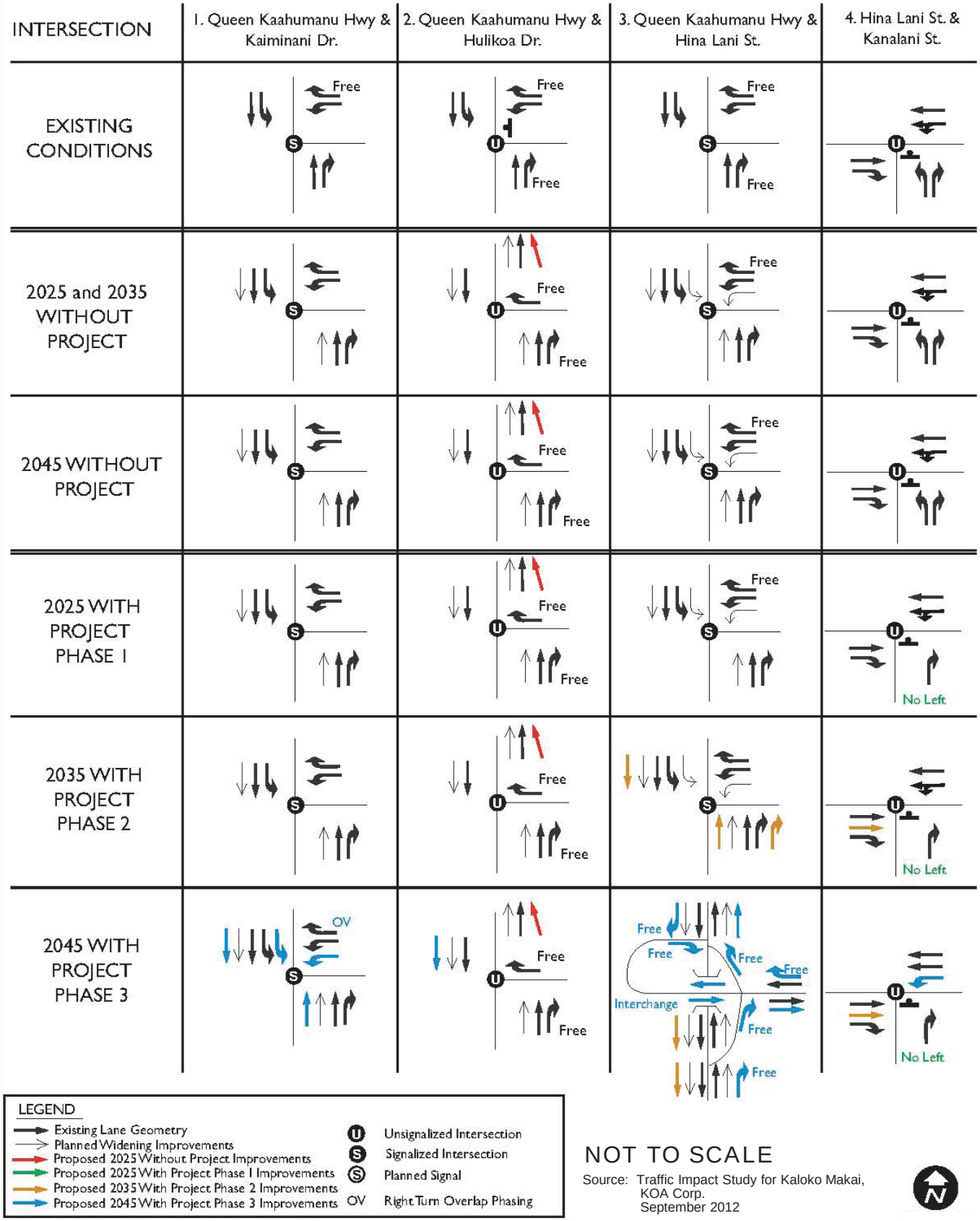


WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-8

Recommended 2045 Project Lane Geometry

Kaloko Makai

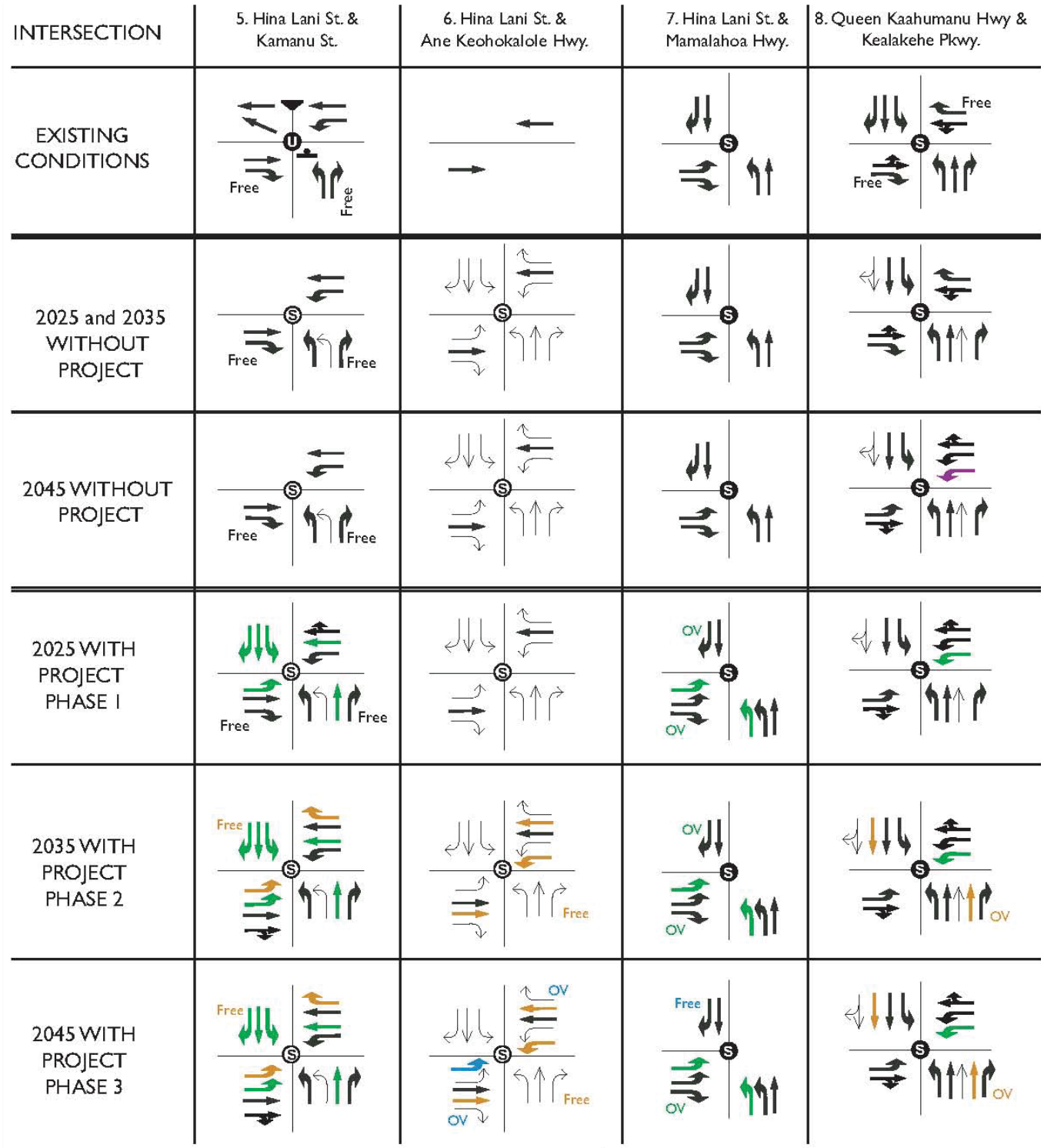


WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-9A

Intersection Improvement Summary 1 of 2

Kaloko Makai



NOT TO SCALE

Source: Traffic Impact Study for Kaloko Makai, KOA Corp. September 2012

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-9B

Intersection Improvement Summary 2 of 2

Kaloko Makai

Table 4-18
Intersection Level of Service Analysis Summary, Without Recommended Mitigations

No.	Intersection	Peak Hour	Existing		2025 Without Project		2035 Without Project		2045 Without Project		2025 With Project Phase 1		2035 With Project Phase 2		2045 With Project Phase 3	
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	16.9	B	14.0	B	17.1	B	20.0	C	16.7	B	37.6	D	65.9	E
		PM	8.6	A	9.7	A	14.5	B	15.9	B	12.8	B	36.2	D	69.9	E
2	Queen Kaahumanu Hwy at Hulikoa Dr	AM	25.2	C	18.4	C	20.1	C	25.2	D	36.8	E	54.0	F	>100	F
		PM	52.1	C	46.2	E	36.9	E	52.1	F	>100	F	>100	F	>100	F
3	Queen Kaahumanu Hwy at Hina Lani St	AM	11.1	B	10.6	B	10.6	B	11.1	B	24.6	C	50.2	D	>100	F
		PM	15.7	C	14.8	B	14.2	B	15.7	B	53.9	D	>100	F	>100	F
4	Kanalani St at Hina Lani St	AM	19.2	B	24.2	C	19.2	C	19.2	C	>100	F	>100	F	>100	F
		PM	22.8	C	29.2	D	22.8	C	22.8	C	>100	F	>100	F	>100	F
5	Kamanu St at Hina Lani St	AM	10.7	B	4.1	A	3.7	A	3.7	A	13.5	B	83.7	F	>100	F
		PM	14.1	B	4.6	A	4.3	A	4.3	A	35.7	D	>100	F	>100	F
6	Ane Keohokalole Hwy at Hina Lani St	AM	--	--	9.3	A	25.9	C	24.5	C	19.0	B	78.3	E	>100	F
		PM	--	--	15.4	B	22.6	C	24.3	C	21.8	C	>100	F	>100	F
7	Mamalahoa Hwy at Hina Lani St	AM	44.8	B	40.7	D	26.7	C	44.8	D	74.9	E	81.2	F	>100	F
		PM	22.2	A	15.9	B	18.2	B	22.2	C	25.5	C	47.9	D	86.3	F
8	Queen Kaahumanu Hwy at Kealakehe Pkwy	AM	15.7	B	17.5	B	17.8	B	19.7	B	32.3	C	66.1	E	>100	F
		PM	26.5	C	43.3	D	50.4	D	63.2	E	>100	F	>100	F	>100	F

Table 4-19
Intersection Level of Service Analysis Summary, with Recommended Mitigations

No.	Intersection	Peak Hour	2025 Without Project		2035 Without Project		2045 Without Project		2025 With Project Phase 1		2035 With Project Phase 2		2045 With Project Phase 3	
			Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS	Delay (Sec)	LOS
1	Queen Kaahumanu Hwy at Kaiminani Dr	AM	14.0	B	17.1	B	20.0	C	16.7	B	37.6	D	17.6	B
		PM	9.7	A	14.5	B	15.9	B	12.8	B	36.2	D	16.2	B
2	Queen Kaahumanu Hwy at Hulikoa Dr	AM	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
		PM	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A
3	Queen Kaahumanu Hwy at Hina Lani St	AM	10.6	B	10.6	B	11.1	B	24.6	C	22.7	C	Interchange	
		PM	14.8	B	14.2	B	15.7	B	53.9	D	43.2	D		
4	Kanalani St at Hina Lani St	AM	24.2	C	19.2	C	19.2	C	23.5	C	13.4	B	15.5	C
		PM	29.2	D	22.8	C	22.8	C	34.3	D	18.2	C	26.1	D
5	Kamanu St at Hina Lani St	AM	4.1	A	3.7	A	3.7	A	32.5	C	21.7	C	26.5	C
		PM	4.6	A	4.3	A	4.3	A	40.8	D	26.0	C	37.3	D
6	Ane Keohokalole Hwy at Hina Lani St	AM	9.3	A	25.9	C	24.5	C	19.0	B	43.3	D	46.5	D
		PM	15.4	B	22.6	C	24.3	C	21.8	C	44.7	D	54.4	D
7	Mamalahoa Hwy at Hina Lani St	AM	40.7	D	26.7	C	44.8	D	47.6	D	38.7	D	51.5	D
		PM	15.9	B	18.2	B	22.2	C	15.1	B	16.7	B	22.2	C
8	Queen Kaahumanu Hwy at Kealakehe Pkwy	AM	17.5	B	17.8	B	23.7	C	29.8	C	24.4	C	30.5	C
		PM	43.3	D	50.4	D	37.2	D	54.0	D	36.8	D	41.7	D

4.5. NOISE

Y. Ebisu & Associates prepared an acoustic study to describe and assess the regional and local existing and future noise environment in the environs of Kaloko Makai, as well as provide guidance for the mitigation of noise impacts. Appendix L details the complete acoustic study in full.

Noise within Kaloko Makai's regional vicinity is primarily derived from: 1) the natural environment (wind, rain, and the ocean); 2) traffic along Queen Kaʻahumanu Highway and other regional roads; and 3) Aircraft passing overhead in flight to/from the Kona International Airport.

The noise descriptor currently used by federal agencies (i.e. the Federal Housing Administration, Housing and Urban Development (FHA/HUD), the Department of Transportation (DOT), and the Federal Aviation Administration (FAA)) to assess environmental noise is the Day-Night Average Sound Level (DNL or Ldn). This unit of measure is also utilized by the Hawaiʻi State DOT, and the metered values are indicative of the average noise during a typical day of the year.

Specifically, DNL exposure levels of 55 or less are generally typical of quiet rural or suburban areas, while levels of 55-65 are indicative of standard urbanized regions with medium to high levels of activity and street traffic. DNL levels exceeding 65 are associated with densely developed urban regions and regions fronting high volume roadways.

4.5.1. Traffic Noise

Existing traffic conditions within the vicinity of the project indicate noise levels of approximately 62 DNL along the makai (west) property boundary, to less than 55 DNL at the mauka (east) property boundary. It was further concluded that the existing 65 DNL traffic noise contour is located approximately 132 to 141 feet from the centerline of Queen Kaʻahumanu Highway, and approximately 93 to 95 feet from the centerline of Māmalahoa Highway in the immediate vicinity of the project site. At the interior portions of the project site existing background noise levels drop to 55 DNL or less, and aircraft noise and the natural sounds of birds and winds in foliage are the dominant noise sources. Between intermittent noise events, background ambient noise levels drop to a range of 35 to 40 dB. During calm wind periods, background ambient noise levels decrease to levels less than 40 dB.

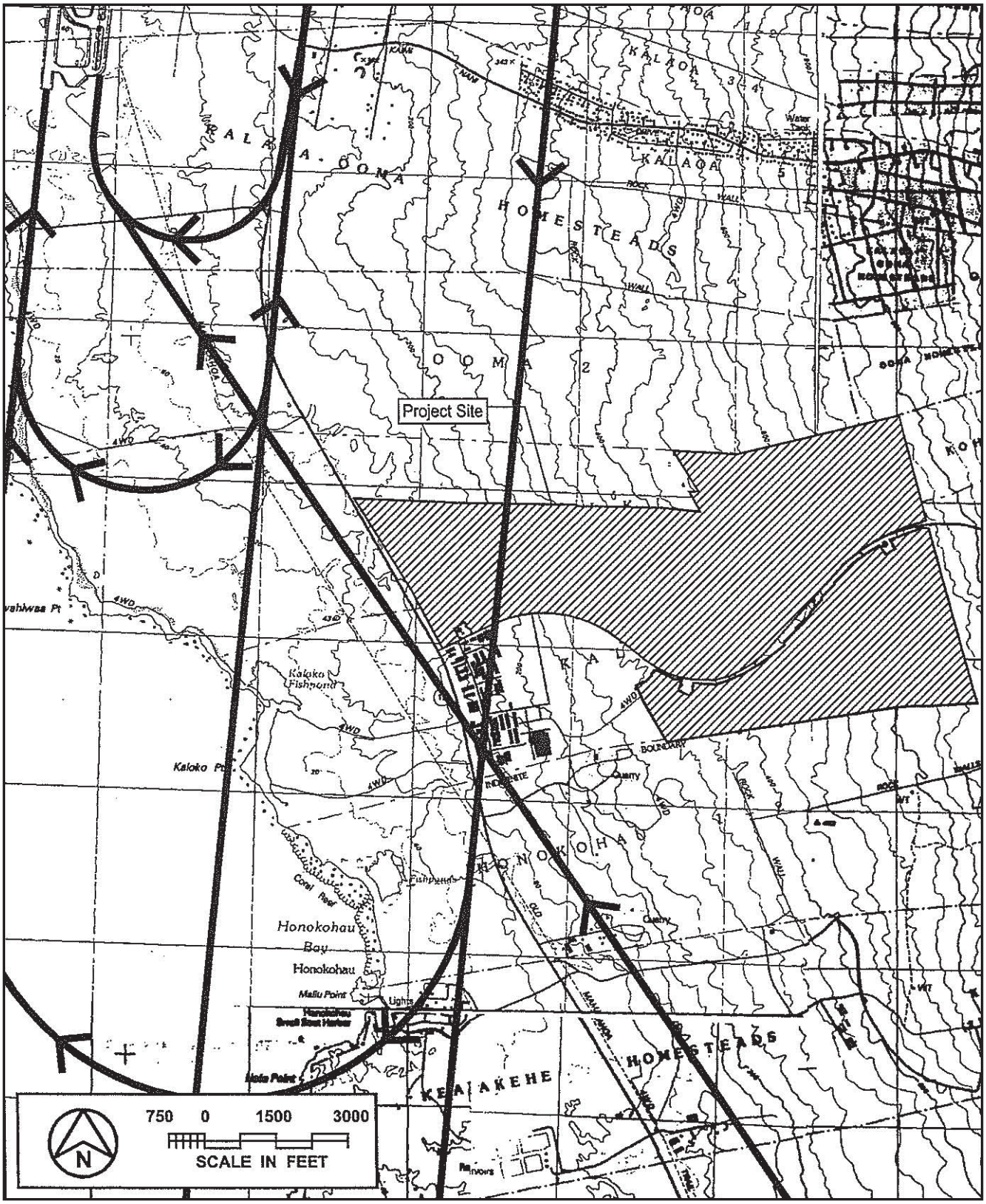
4.5.2. Aircraft Noise

Aircraft noise within the project environs are associated with fixed and rotary wing aircraft operations at Kona International Airport at Keahole. On occasion, depending upon weather, visibility, or air traffic conditions, helicopter and light, fixed wing aircraft may cross over the western boundary of the project site, as an additional source of aircraft-related noise. While the majority of noisier jet aircraft flight patterns do not fall within the project vicinity, larger overseas jet aircraft occasionally overfly the west end of the project site. Figures 4-10 to 4-12 depict existing aircraft noise contours over the project site. As noted in Figure 4-13, the locations of the 55 through 75 DNL aircraft noise contours during the 2008 (Kona International Airport at Keahole 14 CFR Part 150 Report) period are notably distant from the project site and as such, are considered to be in the

Source: Acoustic Study for the Proposed Kaloko Makai Project, Y. Ebisu & Associates, August 2012

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

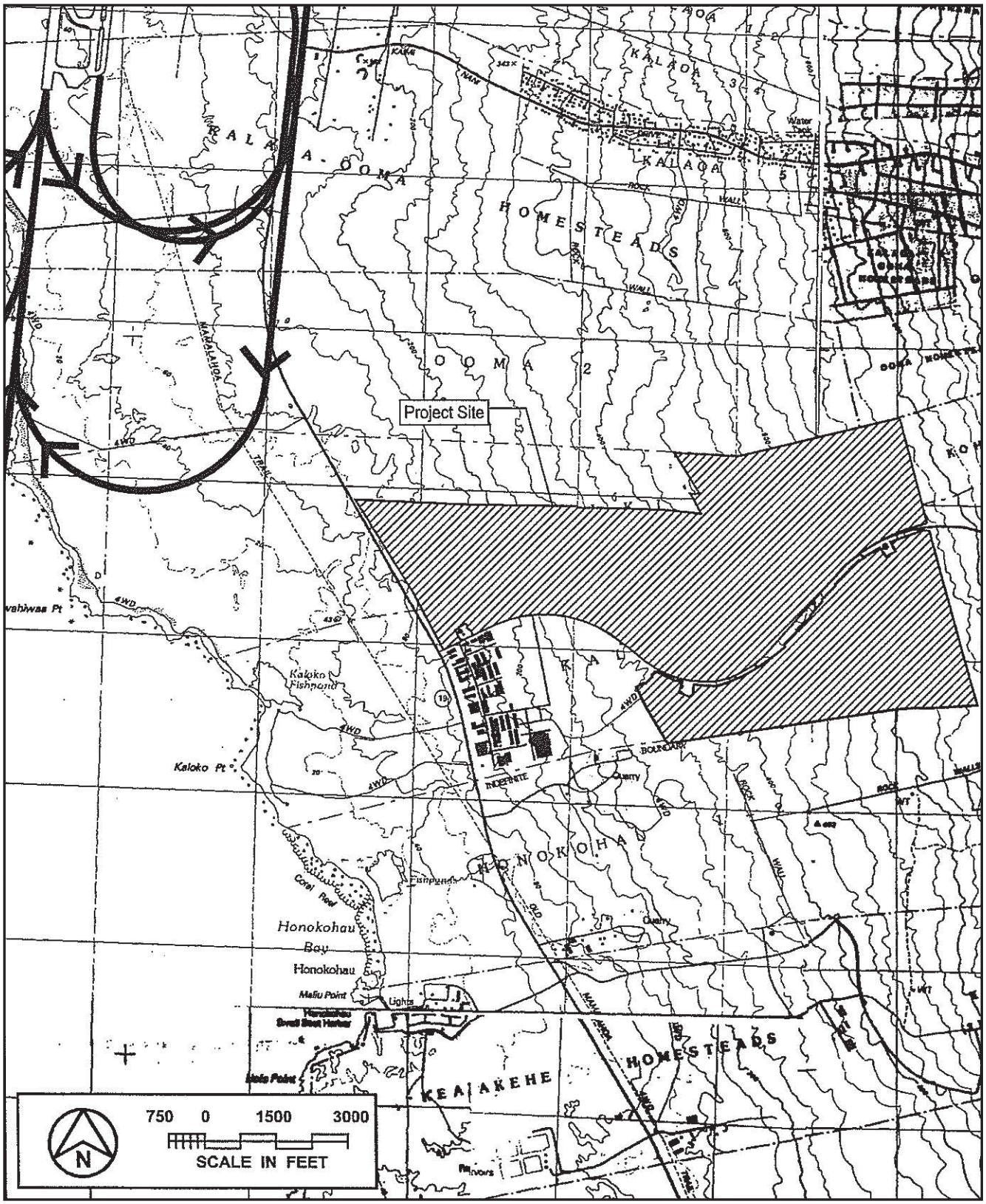
FIGURE 4-10
Locations of Existing Average Aircraft Departure Flight Tracks in Project Environs
Kaloko Makai



Source: Acoustic Study for the Proposed Kaloko Makai Project, Y. Ebisu & Associates, August 2012

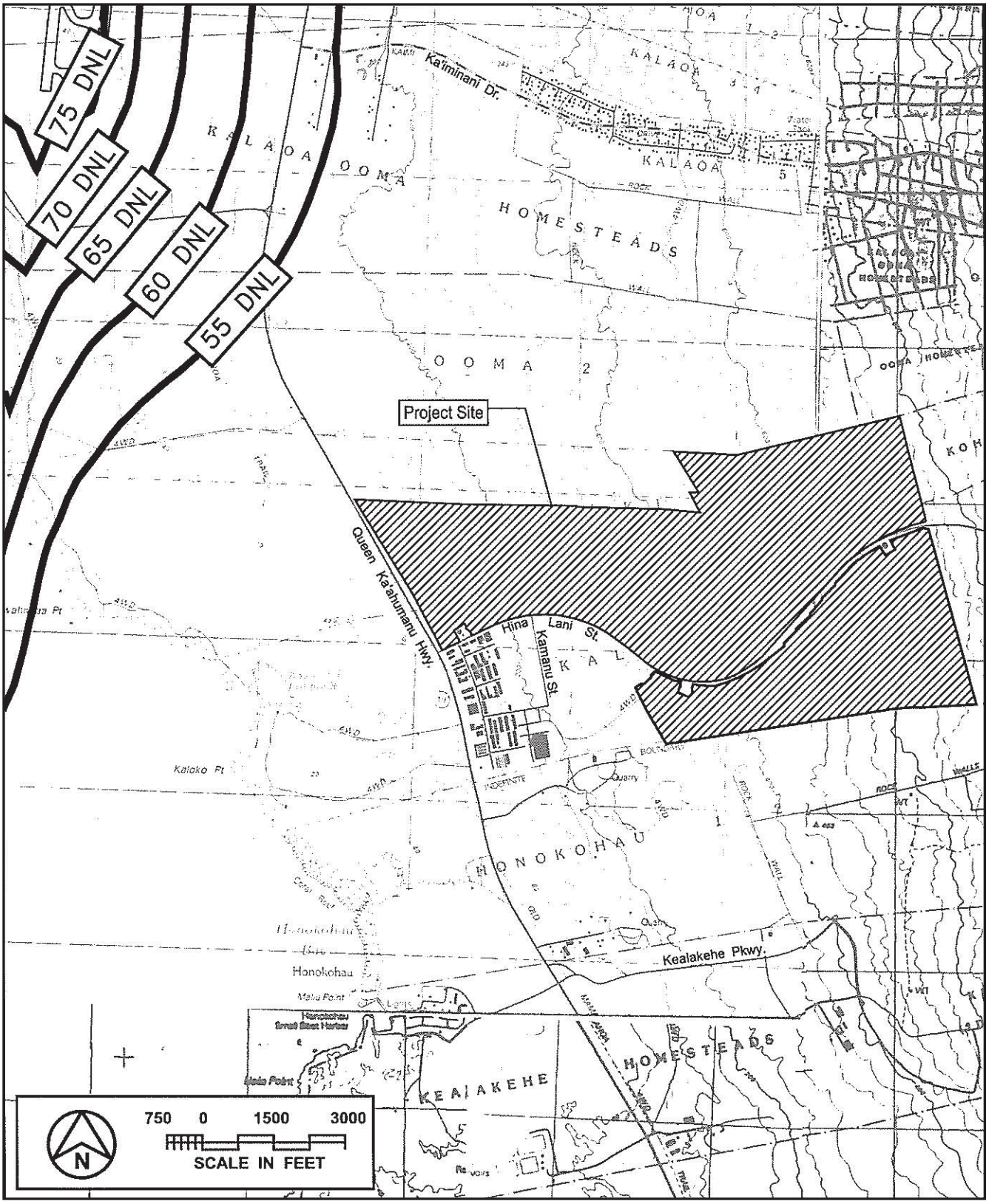
WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-11
Locations of Existing Average Aircraft Arrival Flight Tracks in Project Environs
Kaloko Makai



Source: Acoustic Study for the Proposed Kaloko Makai Project, Y. Ebisu & Associates, August 2012

FIGURE 4-12
Locations of Existing Average Aircraft Training Flight Tracks in Project Envions
Kaloko Makai



Source: Acoustic Study for the Proposed Kaloko Makai Project, Y. Ebisu & Associates, August 2012

FIGURE 4-13
2008 14 CFR Part 150 Noise Contours for Kona International Airport at Keahole
Kaloko Makai

WILSON OKAMOTO CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

"Minimal Exposure, Unconditionally Acceptable" category for the planned land uses on the project site. Based on these 14 CFR Part 150 noise contours and their relationship to the project site it was concluded that special aircraft noise mitigations are not required, and that existing aircraft noise levels do not place special development constraints on the project site. The acoustic study further concludes that existing aircraft noise levels over and within the proximity of the project site fall well in line with federally mandated compatibility guidelines, as well as with the proposed land uses of Kaloko Makai.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Potential impacts on the ambient acoustic integrity of the site and surrounding project area due to the development of Kaloko Makai are primarily constrained to short-term construction activity, and long-term human activity within the community.

Short-term Construction Noise – During construction, there will likely be unavoidable noise impacts associated with operation of heavy construction machinery, paving equipment and material transport vehicles. Proper mitigating measures will be employed to minimize construction-related noise impacts and comply with all Federal and State noise control regulations. Increased noise activity due to construction will be limited to daytime hours and persist only during the construction period. Noise from construction activities will be short-term and will comply with DOH noise regulations (Hawaii Administrative Rules (HAR), Chapter 11-46, Community Noise Control). When construction noise exceeds, or is expected to exceed the DOH's allowable limits, a permit must be obtained from the DOH. Specific permit restrictions for construction activities are:

- No permit shall allow any construction activities that emit noise in excess of the maximum permissible sound levels before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday.
- No permit shall allow any construction activities that emit noise in excess of the maximum permissible sound levels before 9:00 a.m. and after 6:00 p.m. on Saturday.
- No permit shall allow any construction activities that would emit noise in excess of the maximum permissible sound levels on Sundays and holidays.

Traffic Noise – Table 4-20 summarizes the traffic noise levels by calendar year 2045 following complete project build-out. Traffic noise levels along Queen Ka'ahumanu Highway in the areas fronting the project site are predicted to increase by approximately 6 to 7 DNL. Along Māmalahoa Highway, traffic noise levels are predicted to increase by 2 to 3 DNL. Along Hina Lani Street, traffic noise levels are predicted to increase by 6 to 9.4 DNL. The range of increases in traffic noise levels from 0 to 6 is considered to be low to moderate, since it represents the growth in forecasted project and non-project traffic in the project area over the buildout of the project2045.) The range of increases from 6 to 10 DNL over the same period is considered to be moderate to high.

Table 4-21 summarizes the predicted increases in future setback distances to the 65 and 75 DNL traffic noise contour lines along the roadways in the project environs attributable to both project and non-project traffic in 2045. The setback distances to the 65 DNL contour are predicted to range from 292 feet to 348 feet from the centerline of Queen Ka'ahumanu following project build-

Table 4-20 Calculations of Project and Non-Project Traffic Noise Contributions (2045)		
STREET SECTION	**NOISE LEVEL (DNL) INCREASE DUE TO:**	
	NON-PROJECT TRAFFIC	**PROJECT TRAFFIC**
Māmalahoa Hwy. – N. of Hina Lani St.	2.2	0.9
Māmalahoa Hwy. – S. of Hina Lani St.	1.2	1.1
Hina Lani St. – W. of Māmalahoa Hwy.	4.1	2.2
Hina Lani St. – E. of Ane Keohokālole Hwy.	4.9	4.5
Ane Keohokālole Hwy. – N. of Hina Lani St.	59.5	5.1
Ane Keohokālole Hwy. – S. of Hina Lani St.	62.8	2.4
Hina Lani St. – W. of Ane Keohokālole Hwy.	3.2	5.3
Hina Lani St. – E. of Kamanu St.	2.2	6.7
Hina Lani St. – W. of Kamanu St.	1.2	7.4
Hina Lani St. – E. of Queen Kaʻahumanu Hwy.	0.6	5.4
Kamanu St. – N. of Hina Lani St.	N/A	60.1
Queen Kaʻahumanu Hwy. – N. of Hina Lani St.	5.2	1.1
Queen Kaʻahumanu Hwy. – S. of Hina Lani St.	4.9	2.2

Table 4-21 Year 2011 and 2045 Distances to 65 and 75 DNL Contours				
	65 DNL SETBACK (FT)		**75 DNL SETBACK (FT)**	
STREET SECTION	**2011**	**2045**	**2011**	**2045**
Māmalahoa Hwy. – N. of Hina Lani St.	95	136	28	40
Māmalahoa Hwy. – S. of Hina Lani St.	93	121	26	35
Hina Lani St. – W. of Māmalahoa Hwy.	76	159	21	48
Hina Lani St. – E. of Ane Keohokālole Hwy.	64	223	18	57
Ane Keohokālole Hwy. – N. of Hina Lani St.	N/A	96	N/A	31
Ane Keohokālole Hwy. – S. of Hina Lani St.	N/A	103	N/A	33
Hina Lani St. – W. of Ane Keohokālole Hwy.	64	197	18	50
Hina Lani St. – E. of Kamanu St.	64	208	18	52
Hina Lani St. – W. of Kamanu St.	54	172	15	42
Hina Lani St. – E. of Queen Ka'ahumanu Hwy.	86	197	24	48

Table 4-21 (continued) Year 2011 and 2045 Distances to 65 and 75 DNL Contours				
	65 DNL SETBACK (FT)		**75 DNL SETBACK (FT)**	
STREET SECTION	**2011**	**2045**	**2011**	**2045**
Kamanu St. - N. of Hina Lani St.	N/A	56	N/A	17
Queen Kaʻahumanu Hwy. - N. of Hina Lani St.	132	292	38	92
Queen Kaʻahumanu Hwy. - S. of Hina Lani St.	141	348	41	107

Notes:
(1) All setback distances are from the roadways' centerlines.
(2) See Tables 5A, 5B, 7A, and 7B in Appendix L for traffic volume, speed, and mix assumptions.
(3) Setback distances are for unobstructed line-of-sight conditions.

out in 2045. Along Māmalahoa Highway, setback distances to the 65 DNL contour are predicted to range from 121 to 136 feet from the centerline of Māmalahoa Highway. Along Hina Lani Street, setback distances to the 65 DNL contour are expected to range from 159 to 223 feet.

As indicated in Table 4-20, the increases in traffic noise along Queen Kaʻahumanu Highway due to project traffic are much greater than those resulting from non-project traffic. Along Māmalahoa Highway, project traffic noise contributions are expected to be much less than non-project traffic noise contributions by 2045. Along Hina Lani Street, project traffic is expected to increase traffic noise levels above those associated with non-project traffic by 2.2 to 7.4 DNL. The largest increases in traffic noise levels attributable to project traffic are expected to occur along Hina Lani Street near Kamanu Street. The relatively large increases in future traffic noise levels along Ane Keohokālole Highway are due to the relatively low non-project traffic volumes expected on that roadway prior to 2045.

By 2045 with the project, a highway interchange will be required on Queen Kaʻahumanu at Hina Lani Street. In cooperation with the County (pursuant to the Kona CDP) and other project developers in the area, Kaloko Makai will pay for its pro rata share of the costs of the interchange. The proposed park at the west end of the Project Site is the closest land use to the future interchange which may be considered noise sensitive. In order that the 2045 traffic noise levels not exceed 65 DNL at the park's west boundary, the centerline of the northbound on-ramp should be located at least 85 feet west of the park's west boundary.

The predicated noise level from the grade separation interchange in 2045 ws 65 DNL at 116 feet from the centerline of the ramp structure (interchange). Because the overpass ramp structure will probably be located on the northwest quadrant of the interchange, the 65 DNL count from Queen Kaʻahumanu Highway through traffic will extend between 110 to 130 feet beyond the westernmost edge of the overpass ramp structure. Beyond the future interchange at Hina Lani Street, the 2045 setback distances to the highway's 65 DNL contours north and south of Hina Lani Street should be similar to those shown in Table 4-21.

Increased traffic noise attributable to the project ranging from the present to the 2045 horizon are predicted to range from 1.1 to 2.2 DNL along Queen Kaʻahumanu Highway, where traffic noise levels

are expected to be at or above 65 DNL at relatively large distances from the highway right-of-way. The project's development plan has allowed for adequate setback distances of the project's noise sensitive parcels from Queen Kaʻahumanu Highway, with the light industrial properties acting as a functional buffer for sound attenuation between the highway and the noise sensitive parcels planned to the east. The lands along the highway right-of-way are generally vacant in the project environs, with the exception of a handful of existing commercial developments south of the Hina Lani Street intersection. Resultantly, traffic noise impacts along Queen Kaʻahumanu Highway and resulting from project traffic are not considered to be serious, however, setback distances to the 65 and 75 DNL contours are expected to increase as a result of both project and non-project traffic.

Relatively small increases (1.0 DNL or less) in traffic noise levels along the north and south sections of Māmalahoa Highway at the Hina Lani intersection are expected to occur as a result of the proposed project. Non-project traffic is expected to cause increases of 1.2 and 2.2 DNL (see Table 4-20) during the same period. By 2045, project traffic is expected to increase traffic noise levels along the north and south sections of Māmalahoa Highway by approximately 0.9 and 1.1 DNL, respectively. This level of increase is not considered significant, and traffic noise levels resulting from project traffic along these sections of the highway will be difficult to quantify over 34 year period.

Existing and future residences which are located along the Hina Lani Street, between Māmalahoa Highway and Queen Kaʻahumanu Highway, may be impacted by the future traffic noise along the roadway if setback distances from roadway centerline is less than 223 feet. As traffic noise along public roadways such as Hina Lani Street is generated by non-project as well as project traffic, mitigation of off-site traffic noise impacts are generally performed by individual property owners along the roadways' rights-of-way or by public agencies during roadway improvement projects. These mitigation measures ordinarily take the form of increased setbacks, sound attenuating walls, total closure and air-conditioning, in addition to the utilization of sound attenuating windows and window fixtures. Where adequate setbacks beyond the 65 DNL noise contour are not available, Kaloko Makai proposes to utilize 6 foot high sound walls as an effective means of traffic noise attenuation for single-story structures, or at the ground floors of multi-story structures. Along the future Ane Keohokālole Highway, project residences and school buildings will require setback distances in the order of 96 to 103 feet from the centerline of the highway, or sound attenuation walls constructed along the rights-of-way may be required for traffic noise mitigation.

Aircraft Noise – Aircraft noise contours in the project environs for the 2013 and 2030 periods are similar to the existing (2008) airport noise contours, thus the risks of adverse noise impacts from aircraft noise should be minimal at the project site, and the proposed noise sensitive developments on the project site conforms to the land use compatibility recommendations of the State DOT, Airports Division.

In observance of existing and forecasted aircraft noise contours over the project site, special aircraft noise attenuation measures are not considered mandatory for the project. Furthermore, the implementation of airport noise disclosure provisions of Act 208 is not required as existing and forecasted 55 DNL noise contours do not enter the project's physical boundaries.

4.6. AIR QUALITY

B.D. Neal & Associates prepared an air quality study for the proposed Kaloko Makai project to: 1) define existing air quality in the project region; 2) evaluate the potential short- and long-term direct and indirect air quality impacts that may arise from the development of Kaloko Makai; 3) advise on actionable measures and policies to mitigate potential impacts where possible and appropriate. The findings of the air quality study are summarized below and the report is included in its entirety in Appendix M.

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 near coastal situation and nearby mountains. Winds are predominantly light and variable, although Kona storms generate occasional strong winds from the south or southwest during winter. Temperatures in the project area are generally very consistent and moderate with average daily temperatures ranging from about 65° to 85°F. The extreme minimum temperature recorded at the nearby Old Kona Airport is 47°F, while the extreme maximum temperature is 93°F. Average annual rainfall in the area amounts to about 25 inches with each month typically contributing about 2 inches.

Present air quality in the project area is mostly affected by air pollutants from vehicular, industrial, natural and/or agricultural sources. Much of the manmade particulate emissions in Hawaiʻi originate from area sources, such as the mineral products industry and agriculture. Manmade sulfur oxides are emitted almost exclusively by point sources, such as power plants and other fuel-burning industries. Nitrogen oxides emissions emanate predominantly from area sources (mostly motor vehicle traffic), although industrial point sources 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 Hawaiʻi, emissions of particulate and nitrogen oxides may have increased during the past several years, while emissions of sulfur oxides, carbon monoxide and hydrocarbons have likely declined.

Table 4-22 summarizes State of Hawaiʻi and National Ambient Air Quality Standards (AAQS). At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems. Concentrations of lead and nitrogen dioxide generally have not been found to exceed AAQS elsewhere in the state.

Unlike its sister islands, the Island of Hawaiʻi is unique in that it experiences frequent volcanic activity. Specifically in terms of natural volcanic air pollution, concentrated volcanic haze (vog), comprised primarily of sulfur dioxide, persistently looms over the island. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and either washed out as acid rain or gradually transformed into particulate sulfates or acid aerosols. Although emissions from Kilauea are vented on the other side of a mountain barrier more than 50 miles east of the project site, the prevailing wind patterns eventually carry some of the emissions into the Kona area. These emissions can be seen in the form of the volcanic haze (vog) which persistently looms over the region.

Table 4-22
Summary of State of Hawai'i and National Ambient Air Quality Standards

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawai'i
Particulate Matter (<10 microns)	$\mu g/m^3$	Annual 24 Hours	- 150[a]	- 150[a]	50 150[b]
Particulate Matter (<2.5 microns)	$\mu g/m^3$	Annual 24 Hours	15[c] 35[d]	15[c] 35[d]	- -
Sulfur Dioxide	ppm	Annual 24 Hours 3 Hours 1 Hour	- - - 0.075[e]	- - 0.5[b] -	0.03 0.14[b] 0.5[b] -
Nitrogen Dioxide	ppm	Annual 1 Hour	0.053 0.100[f]	0.053 -	0.04 -
Carbon Monoxide	ppm	8 Hours 1 Hour	9[b] 35[b]	- -	4.4[b] 9[b]
Ozone	ppm	8 Hours	0.075[g]	0.075[g]	0.08[g]
Lead	$\mu g/m^3$	3 Months Quarter	0.15[h] 1.5[i]	0.15[h] 1.5[i]	- 1.5[i]
Hydrogen Sulfide	ppm	1 Hour	-	-	35[b]

[a] Not to be exceeded more than once per year on average over three years.
[b] Not 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 average over three years.
[g] Three-year average of annual fourth highest daily 8-hour maximum.
[h] Rolling 3-month average
[i] Quarterly average.

Major industrial source of air pollution in the project vicinity is Hawai'i Electric Light Company's Keahole Power Plant, which is located approximately 2 miles to the north. Air pollution emissions consist of sulfur dioxide and oxides of nitrogen.

Except for periodic impacts from volcanic emissions (vog) and possibly occasional localized impacts from traffic congestion, the present air quality of the project area is believed to be relatively good. The limited air quality data that are available for the area from the DOH indicate that fine particulate concentrations, which are due to the vog, exceed the national air quality standards.

POTENTIAL IMPACTS AND MITIGATION MEASURES

If the proposed project is given the necessary approvals to proceed, the development and continued operation of the Kaloko Makai project will inevitably result in a number of short- and long-term impacts to regional air quality as direct or indirect consequence of project construction and use. It is however anticipated that no Federal or State air quality standards will be infringed upon by Kaloko Makai's development and operation.

Short-term Impacts- Short-term impacts to regional air quality will likely arise from construction, and construction related activities. For a project of this nature, there are two potential types of air pollution 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. Fugitive dust emissions may result from grading and dirt-moving activities associated with site clearing and preparation work. Furthermore, project construction activities may potentially obstruct the normal flow of traffic to such an extent that overall vehicular emissions in the project area will temporarily increase.

A dust/particulate matter control plan will be implemented throughout the entire construction phase. All construction and construction related activities will comply with the provision set forth in Chapter 11-60.1-33 of the HAR on fugitive dust. Measures to be utilized include:

- Planning construction in phases to minimize the amount of dust-generating materials and activities, refining on-site vehicular traffic routes, and situating potential dust-generating equipment in areas of minimal impact.
- Watering active work areas and any temporary unpaved work roads on a consistent, daily basis.
- Landscaping and accelerated covering of barren areas, including slopes, commencing from the outset of the grading phase.
- Controlling dust from debris and materials being hauled off-site.
- Using wind screens and/or minimizing the area of disturbance as possible at any given time.
- Preventing trucks from tracking dirt and sediment onto paved roadways by routine road washing and tire cleaning.
- Monitoring dust at the project site boundary throughout construction as a method of evaluating the efficiency of the dust/particulate matter control program, and subsequently modifying and updating the program as deemed necessary.

Long-term Impacts- Post-construction, the increase in regional population and internal community traffic may potentially result in a long-term increase in emissions; however, it is anticipated that concentrations will fall well within State and Federal standards. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide, and also emit nitrogen oxides among other contaminants.

To evaluate the potential long-term indirect ambient air quality impact of the increased roadway traffic associated with a project such as Kaloko Makai, computerized emission and atmospheric dispersion study were undertaken to contrast ambient concentrations of carbon monoxide levels at critical receptor areas in the vicinity of the project site. Seven scenarios were evaluated for carbon

monoxide: 1) 2011 with present conditions; 2) years 2025, 2035, and 2045 without the Project; and 3) years 2025, 2035, and 2045 with Project. For this analysis, roadway intersections were identified as critical receptor areas because of traffic congestion and the subsequent increase in vehicular emissions associated with traffic queuing. For this study, several of the key intersections identified in the traffic study were also selected for air quality analysis. These included the following intersections:

- Queen Kaʻahumanu Highway at Hulikoʻa Drive
- Queen Kaʻahumanu Highway at Kaʻiminani Drive
- Queen Kaʻahumanu Highway at Hina Lani Street
- Queen Kaʻahumanu Highway at Kealakehe Parkway
- Hina Lani Street at Kamanu Street
- HIna Lani Street at Māmalahoa Highway
- Hina Lani Street at Ane Keohokālole Highway (future)

The assessment was based on the future traffic conditions and proposed configurations of the above intersections in the Traffic Impact Assessment Report (see Section 4.4 and Appendix K for more details).

Tables 4-23 and 4-24 summarizes the worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations for the seven scenarios. As indicated in Tables 4-23 4-24, all predicted worst-case 1-hour concentrations for the 2011 scenario were within both the National AAQS of 35 ppm and the State standard of 9 ppm. The predicted concentrations for 2025 without the project are slightly higher at most of the locations studied compared to the 2011 scenario, but the predicted worst case concentrations remained within the standards. The results were similar for 2035 and 2045 without the project, with the worst-case concentrations tending to increase slightly, but concentrations still remained within standards.

With the project and assuming the roadway improvements identified in the TIAR are implemented, carbon monoxide concentrations in the year 2025 were predicted to increase compared to the without project scenario at all locations studied. However, the predicted worst-case concentrations remained within the standards.

In 2035 with Project, this trend would tend to continue. In 2045 with Project, worst-case concentrations generally decreased (improved) slightly or remained unchanged. For all three years with Project, worst-case concentrations were predicted to remain within standards.

Tables 4-25 and 4-26 summarizes the worst-case 8-hour morning and afternoon ambient carbon monoxide concentrations for the seven scenarios. As indicated in Tables 4-2 and 4-26, all predicted worst-case 1-hour concentrations for the 2011 scenario were within both the National AAQS of 9 ppm and the State standard of 4.4 ppm. The predicted concentrations for 2025 without the project increased slightly ore remain nearly unchanged compared to the 2011 scenario. Analysis also shows that this trend would continue through 2035 and 2045 without the Project, and worst-case 8-hour concentrations should remain within the standards through 2045.

Table 4-23
Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations
Along Roadways Near Kaloko Makai Project: Present and Without Project (parts per million)

ROADWAY INTERSECTION	YEAR/SCENARIO							
	2011/Present		2025/Without Project		2035/Without Project		2045/Without Project	
	AM	PM	AM	PM	AM	PM	AM	PM
Queen Kaʻahumanu Highway at Kaʻiminani Drive	2.7	1.9	2.5	1.8	3.0	2.2	2.9	2.0
Queen Kaʻahumanu Highway at Hulikoʻa Drive	2.9	1.9	3.0	1.9	3.3	2.1	3.2	2.0
Queen Kaʻahumanu Highway at Hina Lani Street	2.9	2.6	3.2	2.7	3.4	2.7	3.4	2.4
Queen Kaʻahumanu Highway at Kealakehe Parkway	3.6	2.3	3.9	2.7	4.3	2.9	4.3	2..8
Hina Lani Street at Kanalani Street	2.3	1.7	2.3	1.6	2.2	1.6	1.9	1.4
Hina Lani Street at Kamanu Street	1.4	1.5	1.7	1.6	1.5	1.5	1.3	1.5
Hina Lani Street at Ane Keohokālole Highway	-	-	1.5	1.4	2.5	2.0	2.3	1.8
Hina Lani Street at Māmalahoa Highway	2.2	1.5	2.8	1.8	2.8	1.8	2.7	1.8
Hawaiʻi State AAQS: 9 National AAQS: 35								

Table 4-24
Estimated Worst-Case 1-Hour Carbon Monoxide Concentrations
Along Roadways Near Kaloko Makai Project: With Project (parts per million)

ROADWAY INTERSECTION	YEAR/SCENARIO					
	2025/With Project		2035/With Project		2045/With Project	
	AM	PM	AM	PM	AM	PM
Queen Kaʻahumanu Highway at Kaʻiminani Drive	2.9	2.1	4.0	3.0	4.6	2.8
Queen Kaʻahumanu Highway at Hulikoʻa Drive	3.6	2.2	3.9	2.5	3.4	2.2
Queen Kaʻahumanu Highway at Hina Lani Street	5.4	3.6	5.6	4.4	-	-
Queen Kaʻahumanu Highway at Kealakehe Parkway	5.1	3.6	5.8	3.9	5.5	3.6
Hina Lani Street at Kanalani Street	3.1	2.0	3.4	2.2	3.4	2.3
Hina Lani Street at Kamanu Street	3.3	3.0	3.7	2.9	3.6	2.9
Hina Lani Street at Ane Keohokālole Highway	2.7	2.1	4.2	2.8	4.3	3.0
Hina Lani Street at Māmalahoa Highway	3.8	2.4	4.1	2.6	4.2	2.5
Hawaiʻi State AAQS: 9 National AAQS: 35						

Table 4-25
Estimated Worst-Case 8-Hour Carbon Monoxide Concentration
Along Roadways Near Kaloko Makai Project: Present and Without Project (parts per million)

ROADWAY INTERSECTION	YEAR/SCENARIO			
	2011/Present	2025/Without Project	2035/Without Project	2045/Without Project
Queen Kaʻahumanu Highway at Kaʻiminani Drive	1.4	1.2	1.5	1.4
Queen Kaʻahumanu Highway at Hulikoʻa Drive	1.4	1.5	1.6	1.6
Queen Kaʻahumanu Highway at Hina Lani Street	1.4	1.6	1.7	1.7
Queen Kaʻahumanu Highway at Kealakehe Parkway	1.8	2.0	2.2	2.2
Hina Lani Street at Kanalani Street	1.2	1.2	1.1	1.0
Hina Lani Street at Kamanu Street	0.7	0.8	0.8	0.8
Hina Lani Street at Ane Keohokālole Highway	-	0.8	1.2	1.2
Hina Lani Street at Māmalahoa Highway	1.1	1.4	1.4	1.4
Hawaiʻi State AAQS: 4.4 National AAQS: 9				

Table 4-26
Estimated Worst-Case 8-Hour Carbon Monoxide Concentrations
Along Roadways Near Kaloko Makai Project: With Project (parts per million)

ROADWAY INTERSECTION	YEAR/SCENARIO		
	2025/With Project	2035/With Project	2045/With Project
Queen Kaʻahumanu Highway at Kaʻiminani Drive	1.4	2.0	2.3
Queen Kaʻahumanu Highway at Hulikoʻa Drive	1.8	2.0	1.7
Queen Kaʻahumanu Highway at Hina Lani Street	2.7	2.8	-
Queen Kaʻahumanu Highway at Kealakehe Parkway	2.6	2.9	2.8
Hina Lani Street at Kanalani Street	1.6	1.7	1.7
Hina Lani Street at Kamanu Street	1.6	1.8	1.8
Hina Lani Street at Ane Keohokālole Highway	1.4	2.1	2.2
Hina Lani Street at Māmalahoa Highway	1.9	2.0	2.1
Hawaiʻi State AAQS: 4.4 National AAQS: 9			

For 2025 with Project scenario, worst-case 8-hour concentrations increased at all locations studied. Worst-case concentrations for 2035 and 2045 were predicted to increase slightly or remain nearly unchanged, but still remain within the standards.

The air quality study concludes that the implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

Construction contractors will comply with the State DOH regulations that prohibit visible dust emissions at property boundaries. Compliance with State regulations will require adequate measures to control airborne dust by methods such as water spraying and sprinkling of loose or exposed soil or ground surface areas and dust-generating equipment, and the use of wind screens in sensitive areas during construction.

No significant impacts on air quality are anticipated with appropriate mitigation during the construction phase and no violations of federal and state air quality standards are anticipated in the long-term.

Electrical Demand and Solid Waste Demand- The air quality study concludes that any long-term impacts on air quality resulting from indirect emissions stemming from the provision of electricity and fulfillment of solid waste disposal requirements for the project will likely be small based on the relatively minute magnitudes of these emissions. Table 4-27 details the projected indirect air pollution emissions from Kaloko Makai's anticipated electrical demand. Regardless, Kaloko Makai will seek to include and promote renewable technologies and measures to reduce further reduce any associated impacts and to engender the conservation of the island's natural resources and environment.

Table 4-27
Estimated Indirect Air Pollution Emissions
From Kaloko Makai Project Electrical Demand

AIR POLLUTANT	EMISSION RATE (TONS/YEAR)			
	Phase 1	Phase 2	Phase 3	Total
Particulate	9	9	4	22
Sulfur Dioxide	91	91	44	226
Carbon Monoxide	9	9	4	22
Volatile Organics	<1	<1	<1	1
Nitrogen Oxides	39	39	19	97

*Based on U.S. EPA emission factors for utility boilers [2]. Assumes annual electrical demand of 35 million kw-hrs for Phase 1, 35 million kw-hrs for Phase 2 and 17 million kw-hrs for Phase 3, for a total of 87 million kw-hrs per year of electrical power use [12]. Estimated emission rates assume low-sulfur oil used to generate power.

4.7. VISUAL RESOURCES

The project site occupies an area of relatively uniform slope, ranging from 5 to 8%. The lowest elevation along the makai boundary of the site is approximately 100-feet AMSL. Along the mauka boundary, the site reaches an elevation of about 700-feet AMSL.

As described in Chapter 3, the project area is presently undeveloped land overgrown with scrub forest that includes grasses, trees and dense Christmasberry. The project also includes 150-acre Dryland Forest located within the southern portion of the project site.

Due to the sloping topography, the project site is highly visible from lower elevations looking uphill. It is less visible looking laterally along the same elevation, such as the view from Hina Lani. Visibility looking downhill depends on the elevation of the viewpoint and any obstructions such as vegetation or structures. Most of the views from Māmalahoa Highway are obscured by homes and vegetation along the makai side of the highway.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Development of the project site will result in the replacement of vacant and vegetated land with urban uses such as homes, a hospital, and light industrial uses. There will also be generous open space features including approximately 293 acres of parks and open space consisting of 87 acres of open space, 56 acres of parks, and preservation of a Dryland Forest.

Kaloko Makai will be visible almost entirely from the shoreline and Queen Kaʻahumanu Highway looking mauka and visible from existing surrounding developments which lie to the east. The project site will appear as a continuation of the proposed Kaloko Heights and Kula Nei developments to the east and Kaloko Industrial Park to the south.

From the shoreline and Queen Kaʻahumanu Highway, Kaloko Makai will be distinguishable from the open and undeveloped areas surrounding the project site on the north, east and south.

The proposed project will not obstruct views from Queen Kaʻahumanu Hgiwhay or from the shoreline to the summit of Hualalai because of its location on the lower slope of the mountain.

The views of the on-site wastewater treatment plant and desalinization plant will be landscaped and setback to reduce the visual impact.

4.8. PUBLIC SERVICES AND FACILITIES

4.8.1. Police Protection

The Kealakehe Police Station, located on Queen Kaʻahumanu Highway less than 2 miles south of the project site, provides service to the North and South Kona Districts. The station has a force of 45 uniformed officers, with ten patrol units assigned to each of the three watches within a 24-hour period. There is also a small substation in Captain Cook for South Kona.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will increase housing inventory and resident population in the project area, thereby increasing the demand on existing County police services. The proposed project may require an increase in police staffing and possible expansion of existing police facilities that would presumably be funded out of property taxes generated by the project.

Kaloko Makai will coordinate with the Police Department to address service capabilities of police protection services, address their concerns, and develop appropriate mitigation measures, if appropriate. Plans include providing a site for a Fire Station with room for a Police Sub-Station on Hina Lani Street.

4.8.2. Fire Protection

Fire protection service for the project area is provided by the Kailua-Kona Fire Station located approximately 3.6 miles to the southeast near the intersection of Palani Avenue and Queen Ka'ahumanu Highway. The station serves areas within a 30-miles radius extending from Keauhou to the Kona Village Resort. The station is equipped with a ladder truck, a tanker, a rescue boat, and an Emergency Medical Service (EMS) ambulance. There is also a volunteer-operated fire station along Māmalahoa Highway that provides back-up support to the Kailua-Kona Station. Other fire stations are located in South Kohala, Waikoloa, and Keauhou.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will increase housing inventory and resident population in the project area, thereby increasing the demand on existing County fire protection services. The proposed project may require an increase in fire protection service and possible expansion of existing fire protection facilities that would presumably be funded out of property taxes generated by the project.

The proposed project will provide a water system whereby all appurtenances, hydrant spacing and fire flow requirements will meet the standards of the County of Hawai'i. Kaloko Makai will contain fire prevention measures including access roads in accordance with Uniform Fire Code (UFC) Section 10.207, water supply for fire suppression in accordance with UFC Section 10.301(c), buildings under construction in compliance with the provisions of UFC Article 87.

As discussed in Section 3.4.6, Kaloko Makai development will reduce the probability of wildfires on site by replacing vegetation with buildings and structures. Additionally, landscaping will incorporate native species and appropriate vegetation for the area.

To further support firefighting efforts, Kaloko Makai may install a helicopter dip tank within the Kaloko Makai Dryland Forest Preserve. It will be placed in the previously graded portion of land within the Dryland Forest Preserve.

Kaloko Makai will coordinate with the Fire Department to address service capabilities of fire protection services, address their concerns, and develop appropriate mitigation measures, if

appropriate. Plans include providing a site for a Fire Station with room for a Police Sub-Station on Hina Lani Street.

4.8.3. Health Care Services

Kona Community Hospital (KCH) is the primary health care facility serving West Hawaiʻi. KCH is a 94-bed full-service medical center; including 49-beds Acute, 34-beds Skilled Nursing/Long Term Care, and an 11-bed Psychiatric Unit. It is located in Kealakekua, Kona, 18 miles south of Kona International Airport.

KCH is part of the State of Hawaiʻi's public hospital system, operated by the Hawaiʻi Health Systems Corporation (HHSC). HHSC is a public benefit corporation governed by a 13-member Board of Directors whose responsibility is to develop policies, procedures, and rules necessary to plan, operate, and manage the 13 facilities included in the State's public hospital system.

KCH employs approximately 475 employees. There are a little over 60 active medical staff members representing a wide variety of medical specialties. Approximate annual workload consists of over 4,000 acute inpatient admissions, nearly 500 births and over 15,000 emergency room visits.

In 2010, KCH was designated a Level III emergency center. Under this program, first responders alert the emergency room to the arriving trauma patients; a trauma announcement is made at the hospital and team members assemble in the emergency room prior to the patient's arrival.

Another medical facility in the region is the North Hawaiʻi Community Hospital in Waimea. The hospital has 50 beds and provides a full spectrum of acute care services, including a 24-hour emergency room, medical/surgical care, obstetrical/gynecological care, cardiac care, and long-term care.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will increase the demand on the existing medical and emergency services in the North Kona region. Kaloko Makai is strategically located to incorporate the new hospital into its master plan and is actively pursuing a hospital developer/operator for the new facility on a 40-acre site along Ane Keohokālole Highway. The site will also have access to Queen Kaʻahumanu Highway via Hina Lani Street and interconnecting roads (possibly also through adjoining Kohanaiki Business Park). A new regional hospital for Kona is projected to provide approximately 100-150 total beds (with 150 targeted - which will include between 50-70 beds for medical surgery) to serve the growing West Hawaiʻi population.

Ultimately, Kaloko Makai intends to continue discussions with HHSC and KCH concerning the new hospital at Kaloko Makai. Any new hospital may impact the future operations of KCH. A transition plan needs to be developed for the ultimate use of the KCH.

A new regional hospital at Kaloko Makai will likely replace some of the services (primarily the acute care medical surgery) that are presently performed at KCH. It is envisioned that KCH will remain

open, transitioning out of acute care and into a long-term care facility. In addition, the existing KCH emergency room, some outpatient services, oncology and imaging will remain at KCH.

4.8.4. Schools

Schools servicing the project area include Kealakehe Elementary, Kealakehe Intermediate and Kealakehe High Schools located approximately two (2) miles to the southeast. The elementary school's capacity is 1,064 students, and the 2009/2010 school year enrollment was 946 students (Department of Education, 2010a). Kealakehe Intermediate School, with facilities for 1,078 students, has an enrollment of 850 students (Department of Education, 2010b). Kealakehe High School opened in 1997, and currently has a student body numbering 1,610 (Department of Education, 2010c).

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will generate increased demand on student enrollment within the region. The Applicant will dedicate land to the State Department of Education (DOE) for three sites in selected locations, anticipated to be comprised of two elementary schools and one middle school, as well as provide for all required off-site infrastructure.

Based on the proposed components within the Kaloko Makai project, full build-out (after the 30-year development and marketing period) population estimates indicate that approximately 12,000 to 15,000 people will live at Kaloko Makai.

Applying State DOE criteria for student generation estimates, after the 30-year build-out (the year 2045), the 5,000-units proposed in Kaloko Makai will generate an estimated stabilized student body of approximately 1,207 school-aged children.[2]. This is broken down as approximately 641-Elementary School, 275-Middle School and 291-High School students.

In 2008, the Board of Education (BOE) adopted a policy on School Design Enrollment Guidelines. In that policy, the following enrollment and land area guidelines were established (see Table 4-28):

Table 4-28
BOE Policy on School Design Enrollment Guidelines

School Type	Enrollment	Usable Land Area
Elementary (K-5)	400 - 750	8 - 15
Middle (6-8)	500 - 1,000	15 - 20
High (9-12)	800 - 1,000	50

Given these parameters, Kaloko Makai generates the need for an Elementary School but falls short of the BOE suggested guidelines for a Middle and/or a High School.

[2]The 1,207 school aged children estimate is broken down as approximately 641-Elementary School, 275-Middle School and 291-High School students.

School campuses can and should be the center of a community. The core focus of the Kaloko Makai neighborhoods are its schools and adjoining parks which serve as civic spaces, neighborhood centers and gathering places for arts, culture, education and recreation.

Several schools are proposed within Kaloko Makai, each within the neighborhood pedestrian shed and easy walking distance for neighborhood residents. Kaloko Makai is setting aside approximately 42 acres for three schools, proposed to be two elementary schools and one middle school, as shown in Figure 2-11. School sites include buildings and facilities, plus school-associated playgrounds

It is envisioned that each school, in conjunction with the adjoining park, will serve as a draw to bring the community into a multi-generational learning center that provides life-long learning opportunities and interaction of the residents within the community.

Consistent with the policy on education within the Kona CDP (Public Facilities – PUB-6.3a,) Kaloko Makai will seek cooperation with the State DOE for joint use of school facilities for recreational and community uses.

The goal is to draw all segments of the community to the school, throughout the day, rather than limit their use for the children during the weekday school hours.

Rather than stand-alone, children-based facilities that tend to serve only a portion of the population, Kaloko Makai schools will seek to encourage community access and use for all of the schools, after the State DOE school day. This will make for more efficient use of limited public resources, as well as bring the community together into central, core facilities.

While the scale of fixtures and equipment in elementary schools may not be applicable for adult use, school cafeterias may serve a dual role as community gathering place and meeting halls. Likewise, school libraries and other meeting rooms may further drive wider community use.

4.8.5. Recreational Facilities

Kailua Park (aka Old Airport Park/Makaʻeo), located on the site of the former airport, is the only full-service active recreational park in the region. There are five baseball fields, two soccer fields, two football fields, and four tennis courts. Gym facilities include a full-sized basketball court, a multi-purpose room, and a small office.

The Honokōhau Small Boat Harbor is located approximately 1 mile southwest of the project site on Honokōhau Bay. Approximately 450 berthing slips are provided for both recreational and commercial vessels. The Harbor is administered by the State DLNR, Division of Boating and Ocean Recreation (DOBOR).

The 1,178-acre Kaloko-Honokōhau National Historical Park, located west of the project site, makai of Queen Kaʻahumanu Highway, is administered by the National Park Service. The Park contains extensive natural and cultural resources, such as archaeological sites, wetlands and fishponds, and is designated as a national historical landmark.

The playfields at Kealakehe High School are located approximately 1 mile south of Kaloko Makai.

Other State parks located elsewhere in Kona include Kealakekua Bay State Historical Park, Kekaha Kai State Park, and Keolonāhihi State Historical Park.

County parks in the region include Waiʻaha (Honl's) Beach Park, Laʻaloa (Magic Sands) Beach Park, Hoʻokena Beach Park, Kahaluʻu Beach Park, Miloliʻi Beach Park, and Pāhoehoe Beach Park. The Kona Community Aquatic Center, administered by the County of Hawaiʻi, provides facilities for lap swimming, and also includes a water-play area for young children.

Tennis courts are also available at Arthur L. Greenwell Park in Captain Cook, Harold H. Higashihara Park in Keauhou, and at Kailua Playground. There are also numerous private, semi-private, and resort-owned golf courses in the area which are open to the public.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The proposed project will increase demand for recreational facilities in the region. Both active and passive recreation parks are planned for the project which will comply with applicable County park dedication requirements.

Kaloko Makai will contain approximately 56 acres of neighborhood parks and recreation areas. Kaloko Makai will provide interlinking natural features, open space and cultural features as core components of the community; the historic Kohanaiki Trail (Road to the Sea) runs through the entire length of the project. It will be restored for use, and will interconnect the communities within the project.

As discussed in the previous Section 4.8.4, Kaloko Makai will seek cooperation with the State DOE for joint use of school facilities for recreational and community uses, to be consistent with the policy on education within the Kona CDP (Public Facilities – PUB-6.3a).

4.9. SOCIO ECONOMIC CHARACTERISTICS

Mikiko Corporation prepared a market assessment report and an economic and fiscal impacts report for Kaloko Makai. Essential components of this report are summarized in the following sections. Appendix A contains the full market assessment report and Appendix N contains the full economic and fiscal impact report.

4.9.1. Population

The most recent United States Census, conducted in 2010, reported Hawai'i County's resident population to number approximately 185,079 (compared to approximately 149,000 residents in 2000,) indicative of an 2.2.% annualized rate of growth since the previous census conducted in 2000.

The Kaloko Makai project is situated in the North Kona Region of Hawaiʻi, north of Kailua. This rapidly developing area comprises the northwestern portion of the North Kona district and is contained within Census Tract 215.01 (also referred to as North Kona-North.)

It already is the commercial and industrial heart of West Hawaiʻi, serving the Kona Airport and the needs of residents, visitor, agriculture, ranching, technology and other industries of the western half of the Island. The area also has a long-standing and growing residential base. This area will continue to be the focus of such developments as the Island's population grows, given its proximity to the Kona Airport and other infrastructure.

Together with the coastal portion of the adjacent South Kohala District (Census Tract 217.01,) North Kona-North was estimated to provide 23% of the Island's employment in 2009. However, as of 2010, this center of employment supported residences for only about 12% of the Island's population. This imbalance of jobs and housing leads to crowding among area households and a tremendous amount of commuting into the region by persons who live in distant areas.

Mikiko Corporation projected a conservative view of long-term growth and estimates a 2045 resident population of 295,600 persons for the Island. Based on their analysis, Census Tracts 215.01 (North Kona-North) and 217.01 (South Kohala-South) would have the following projected population, 49,800 persons in 2025 and 69,500 persons in 2045.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Kaloko Makai is one of a relatively small group of area properties that could offer a substantial solution for the imbalance of primary resident-oriented housing services and the area's existing and anticipated job base.

Proposed uses in the Kaloko Makai project are in response to the regional demand for housing by the growing population in the North Kona and South Kohala districts, as well as provide prime opportunities for existing Hawai'i residents seeking to relocate to West Hawaiʻi.

Specifically, Kaloko Makai will provide opportunities for people and families living in other regions of the island to move to homes closer in proximity to West Hawaiʻi's growing job market; resulting in a marked positive societal impact in terms of lifestyle, allowing for increased freedom, reductions in commuting, gasoline consumption, and pollution. This will comprehensively improve the general quality of life across the entire island of Hawaiʻi—for all of its residents and visitors, not just Kaloko Makai's residents.

Residential demand for homes within the North Kona and South Kohala districts is characterized by the following market segments:

- **Entry-level markets** – Those units designated as affordable units, as well as many of the multifamily market units are conceived to appeal to entry-level markets, typified by the rapidly increasing 25- to 34-year-old Echo Boom cohort in the 2010 to 2020 period.
- **Move-up markets** – Kaloko Makai's single-family products could appeal to move-up markets and growing families.
    - The first level move-up market, typified by persons aged 35 to 44, is projected to grow particularly rapidly in the 2020 to 2030 period as the Echo Boomers mature.

  - A more affluent move-up market could also be attracted to the views, convenient location and lifestyle offerings at Kaloko Makai.
- **Downsizers** – Kaloko Makai's more compact single-family and some of its multifamily units are seen to appeal to the Baby Boomer cohort that is looking to simplify its lifestyle, lessen homeowner commitments and enhance access to town amenities. This market may overlap with the retiree segment described below.
- **Retirement/senior markets** – All of the multifamily units and some of the single-family product could appeal to retiree markets. The age 70+ population will be a rapidly increasing age classification especially towards the latter years of Kaloko Makai's marketing.

Kaloko Makai is an extremely attractive option for expanding population market segments due to its proximity to major transit corridors, existing and future centers of economic growth and development, the shoreline, entertainment and retail venues, the Airport, as well as a host of ongoing regional private and public investments in infrastructure throughout the region.

Potential impacts and mitigative measures resulting from Kaloko Makai's generated population, encompassing traffic, infrastructure, and public services are discussed in other sections of this EIS. Nonetheless, it should be noted that the population of Hawai'i County is projected to increase independent of Kaloko Makai, and the resultant effects of such growth on traffic, infrastructure, and public services among other issues must be addressed regardless of whether or not Kaloko Makai is developed.

4.9.2. Economy and Employment

Kaloko Makai would generate significant, on-going economic and fiscal benefits for residents of Hawai'i, as well as for the County and State governments. Development of facilities would generate employment and consequent income and taxes. In addition, by attracting new residents to the Island of Hawai'i and generating additional real estate sales activity, the Project is expected to support long-term impacts, including additional consumer expenditures, employment opportunities, personal income and government revenue enhancement.

Highlights of the project impacts are summarized in Table 4-29.

4.9.2.1. Employment

During its buildout, Kaloko Makai is estimated to generate employment for some 300 to 400 full-time equivalent (FTE) persons annually, including positions created directly and indirectly by its development activities. These jobs would be located throughout the State, with greatest concentration on Island of Hawai'i.

The new development-related positions are expected to be associated with total personal earnings[3] of some $1.09 billion over the Project's initial buildout, or $23 to $38 million per year. The earnings

[3] Earnings are defined as wage, salary and proprietary income, plus director's fees and employer contributions to health insurance, less employee contributions to social insurance.

represent an average of about $83,000 to $87,000 per FTE job, including direct construction-related jobs as well as indirect and induced opportunities created throughout the economy

By the time of its expected completion in 2045, the Project could be expected to have generated some 3,100 direct FTE jobs on-site at its retail, office, industrial, lodge, and medical-related facilities. Because these on-site jobs would all be supported at Project components, they are all direct impacts; there are assumed to be no indirect or induced employment impacts on-site.

Considering the Project's direct, indirect and induced impacts statewide, Kaloko Makai could alternatively be seen to have generated some 1,700 permanent, on-going FTE jobs. These are positions that might not have existed had the Project not been developed. These "net new" jobs could include a small share of the professional, technical, managerial and other staff positions at the new hospital, other medical facilities, office and retail areas; sales and marketing positions supported by the on-going resales and releasing of property at the Project; positions generated at the business and kama`aina-oriented lodge; and myriad other positions generated throughout the economy.

Personal earnings from the new operational positions will increase over time as more facilities and establishments are opened. New personal earnings are projected to total about:

- $59 million in 2025,
- $88 million in 2035,
- $94 million in 2045, and
- $90 million per year after 2045, on an ongoing basis.

On average, these new FTE positions are expected to earn about $55,000 to $59,000 per year during Project buildout, and $53,000 per year after 2045. Considering the 2009-2010 observed ratio of total family earnings of 1.8 times the average County wage, these earnings could be expected to be associated with average family incomes of about $97,000, or 145% of the County median reported for fiscal year 2010, in an ongoing basis.

Opportunities created by Kaloko Makai, particularly its professional, technical and managerial career opportunities, will create incentives for some neighbor islanders or former Hawai'i residents to move back to the State and/or to the Island of Hawai'i.

In addition, some of Kaloko Makai's homes could be expected to attract some households that previously lived off-island or out-of-state. These could include retirees as well as younger households.

Table 4-29
Summary of Projected Economic and Fiscal Impacts
2010 DOLLARS

	Comment	2025	2035	2045	After 2045
FTE employment:*	***Direct, indirect and induced except as noted***				
Development-related	*Average annual since prior date*	400	400	300	0
Operations-related -	*Annual, on-going*				
On-site	*Generated at Project facilities (direct impacts only)*	1,900	2,700	3,100	3,100
Net new jobs on Island	*New to County*	1,000	1,500	1,700	1,700
Total personal earnings:**	***Direct, indirect and induced***				
Development-related	*Average annual since prior date*	$37	$38	$23	$0
Operations-related	*Annual, on-going, on net new jobs only*	$59	$88	$94	$90
Average earnings per FTE job:**	***Direct, indirect and induced (not in millions)***				
Development-related	*Average annual since prior date*	$87,000	$87,000	$83,000	NA
Operations-related	*On net new jobs only*	$58,000	$59,000	$55,000	$53,000
In-migrant resident population:	***Average daily employees, dependents, and new island residents***				
To the County		330	650	840	840
To the State	*Subset of County in-migrants*	230	480	630	630
Net additional government revenues:	***Projected revenues less projected expenditures***				
For the County		$3.9	$6.9	$8.8	$8.8
For the State		$5.4	$6.2	$4.9	$2.8
Revenue/expenditure ratio:					
For the County		6.0	6.0	6.1	6.1
For the State		5.2	3.4	2.4	1.8

Note: Other than for on-site jobs, estimates shown do not consider impacts of the planned schools, since equivalent facilities would be assumed to be developed elsewhere on the island even if the Project was not developed.

* FTE = Full-time equivalent, defined as 40 hours per week or 2,080 hours per year.

** Earnings defined to include wage, salary and proprietary incomes, plus directors' fees and employer contributions to health insurance, less employee contributions to social insurance.

Sources: SCD-TSA Kaloko Makai, LLC, 2012 and 2013; Cattaneo & Stroud, 2011; Mikiko Corporation, 2012.

The influences described above are estimated to result in perhaps 330 persons living on the Island of Hawaiʻi who might not otherwise have lived on the island (in-migration to the County) by 2025, or up to 840 after Project completion in late 2045. Of this total, some 230 and 630 persons, respectively, might be persons who had previously lived out-of-state.

4.9.2.2. Fiscal Impacts

Kaloko Makai could be expected to contribute some $8.8 million per year in net additional County revenues at its completion and annually thereafter. By 2045, new County government revenues are estimated to represent about 6.1 times the new County government operating expenditures required to support the additional population that could be attracted to the Island of Hawaiʻi by the Project. The Project's real property taxes would be the major contributor to the County net fiscal benefits.

For the State, net additional operating revenues generated by the Project are estimated at $4.9 to $6.2 million per year during buildout, when development activity would generate high gross excise and income taxes. The Project is projected to continue to contribute to gains in the State budget in the long-run, with net additional revenues of some $2.8 million per year after 2045. These fiscal impacts represent a revenue/expenditure ratio for the State of some 2.4 to 5.2 during buildout, or 1.8 by 2045 and thereafter.

These public sector contributions do not consider the value of the school sites, public parks or various off-site infrastructural improvements to be contributed by SCD-TSA. Neither do they consider the various impacts and permit fees expected to be paid to the County and State governments during the development of the Project.

The fiscal analysis did not allocate any value for infrastructure to be dedicated to the County (public).

4.9.3. Market Assessment

West Hawai'i is among the most desirable resort and residential areas in Hawaiʻi. The region is home to many full-time residents, and is also a popular vacation destination, encompassed by numerous hotels, resorts, and vacation homes. Kaloko Makai is situated in a region that is rapidly developing, with immediate access to Kona International Airport and is adjacent to the well established commercial and light industrial-service centers of North Kona and Kailua-Kona which serve the needs of the visitor, agriculture, ranching, and technology industries, among others, which populate the western half of the island.

Ascending towards Queen Kaʻahumanu Highway, to about two-thirds of the way mauka to Māmalahoa Highway, Kaloko Makai's slope affords excellent ocean and regional views throughout.

Kaloko Makai is attractively located within proximity to regions that will continue to be the focus of further development as the Island's population grows, and has the potential to be a major cornerstone of residential, commercial, and light industrial growth as a center of community, commercial, and economic activity.

4.9.3.1. Residential Market

Market Summary

The two census tracts 215.01 and 217.01 are considered Kaloko Makai's Competitive Regional Market Area for residential market conditions. North Kona and South Kohala District developments have been primarily characterized by resort and resort residential projects makai of Queen Ka'ahumanu Highway. These developments have contributed heavily to the economic activity and the creation of jobs, but have not provided housing for the workforce that they depend on.

Current housing opportunities within the market do not satisfy demand stemming from existing employment levels within the region. Together with the coastal portion of the adjacent South Kohala District (CT 217.01, also referred to herein as "South Kohala-Waikoloa"), North Kona-North was estimated to provide 23% of the Island's employment in 2009. However, as of 2010, this center of employment supported residences for only about 12% of the Island's population.

Market trends concurrent with recent data are indicative of an economic downturn, stemming largely as result of the mortgage-financing crisis that has impacted the nation in recent years.

As current economic conditions have dampened actionable pent-up demand, the market area should be poised for a significant share of the Islands' anticipated future population growth, and will lead to further growth in demand for housing within the region.

Currently entitled projects are estimated to yield up to 8,200 of the potentially demanded 17,800 new housing units in the market area by 2045, assuming all proposed and entitled projects are built out within this timeframe and developed to the maximum levels of their respective current plans and entitlements.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Kaloko Makai will support the housing imbalance within the region by offering approximately 5,000 homes to the market region. Kaloko Makai is close to major employment centers and areas of commercial and industrial activity, and its mixed use community centered design will facilitate innate commercial activity.

Furthermore, Kaloko Makai will respond to varying spectrums of demand for housing within the North Kona/South Kohala area by providing a wide range of housing opportunities inclusive of affordable housing alternatives. Kaloko Makai will seek to create and sustain a mixed-income community allowing for unparalleled social diversity.

Exact outcomes will depend on agreements to be reached with the County, but some 700 to 1,000 units, or up to 20% of Kaloko Makai's homes are assumed to be built as "affordable" housing.

The balance of homes at Kaloko Makai will be comprised of its 4,000-4,300 "market" homes, ranging from traditional single-family homes to mixed use, mid- and higher-density multifamily units.

Current forecasts allow for rough 70% of this inventory to encompass multifamily products, with the remaining 30% balance characterized by a range of single-family offerings.

The first residential product at Kaloko Makai is projected to be available for sale within a few years of receiving necessary land use approvals and permits. Thereafter, it is anticipated that the 5,000 maximum proposed units, homes and lots could be absorbed over approximately 31 years at an average rate of 170 units per year, as summarized below in Table 4-30.

Table 4-30
Illustrative Summary of Maximum Potential Residential Sales Absorption at Kaloko Makai,
2015 to 2045

	Affordable Homes	Market Homes	Maximum Total Housing
Maximum Inventory	700-1,000	4,000-4,300	5,000
Average Annual Sales*	22-32	130-140	170 (rounded)

*Assumes several but not all products are marketed simultaneously in any given year. Thus, since market home sales may extend over a longer period than affordable home sales, the overall average rate is less than the sum of the two sub-market rates shown.
Source: Mikiko Corporation, April 2012

Forecasted figures expect Kaloko Makai's 5,000 homes to be absorbed over a period of approximately 31 years, at an average rate of about 170 units per year. Actual sales would vary on a year-to-year basis depending on market cycles, financing availability, and the types of units available at any given time.

Nonetheless, the projects inventory will represent a significant answer for the anticipated future unmet demand for some 9,600 new housing units in the Consumer Residential Market Area through 2045, based on currently LUC-entitled projects and their plan maximums.

4.9.3.2. Commercial

Market Summary

The Primary Trade Area (PTA) for commercial uses at Kaloko Makai is considered to be the entire North Kona and South Kohala districts of the Island. While the proposed hospital and business park uses will create research, development, and other employment and enterprise opportunities not already evident on the island, the commercial market assessment is based on a more conservative, narrow view of retail and office-based factors as evidenced in Hawai'i County presently.

Commercial establishments in North Kona, and particularly its northern half, CT 215.01, serve broad regional markets on the Island that extend far beyond the physical boundaries of the CT in question.

Obvious examples of this are Costco and The Pottery Terrace, the latter being the largest office building on the island. Such venues anchor the region as a significant point of interest for resident and visiting consumers, as evidenced by the large daily visitor population within the PTA.

Data collected and analyzed by Mikiko Corporation demonstrates clear inadequacy of both retail and office space relative to the day-time population of the PTA. Looking forward, the increase in development and expansion within the PTA itself will further create additional need for accessible commercial retail and office space. Current projections forecast a 2.7% annual rate of growth in consumer population within the Trade Area, numbering 223,900 consumers by 2045.

Kaloko Makai proposes up to 600,000 square feet of various commercial uses at Kaloko Makai, including retail and office. If developed to the full-proposed capacity 600,000 square feet, Kaloko Makai's commercial spaces could represent some 8% of the PTA's projected total 2045 inventory.

This will include spaces in shopping centers, retail and office complexes, and mixed-use developments.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Kaloko Makai's mixed use, TOD Village design will help to alleviate vehicular activity, as establishments providing daily resident needs will always be within walking and biking distance.

As a result of the projected growth and demand for commercial within the target region, Kaloko Makai stands to further impact the market through the proposed development of a Lodge and Business center as a complementary means of promoting intelligent growth.

Specifically, the Kaloko Makai Lodge and Business Center are proposed to cater to business and leisure demands generated by general market demand and other uses in Kaloko Makai's vicinity such as the recently selected Kealakehe Judiciary site and medical complexes, its residences, and proximity to the Kona International Airport. The Lodge is envisioned to offer up to 120-rooms, a business center, and meeting and conference spaces.

The Lodge and Business Center at Kaloko Makai is planned in alignment with the goals and standards of the Kona CDP.

Development and lease-up of the proposed commercial areas are anticipated to be supported by future market conditions in the PTA as detailed in Table 4-31.

This analysis profiles market trends within the North Kona and South Kohala Districts (PTA). However, the realized demand for such lands at Kaloko might be stronger than presented herein due to further potential interest from a broader market base.

Table 4-31 Projected Supportable Commercial Market Absorption and Kaloko Makai Share of the Primary Trade Area (Cumulative square feet)			
	2025	2035	2045
Kaloko Makai proposed development phasing	430,000	560,000	600,000
Total Supportable Commercial Areas in Trade Area	5,500,000	6,800,000	7,200,000
Kaloko Makai as Share of Future Trade Area	8%	8%	8%

This analysis does not consider industrial-uses or industrial-designated lands at military bases, harbors, universities or airports.

Market trends for light industrial warehouse buildings are reflective of the current economic downturn highlighted in the residential and commercial markets. The PTA as a whole reflected a 14% vacancy in total warehouse space as of the end of 2010, according to data provided by CMF. This is up significantly from an estimated 8% in 2008. Positive space absorption was, however, reported to have resumed in 2010.

Considering the potential of future developments, plus areas in current use, the PTA could pose to offer some 1,110 gross acres of private business or industrial park lands by 2045, assuming all future projects are developed to their estimated capacity on projected time tables.

Light Industrial/Business Park Development Proposal

The Kaloko Makai plan designates 75 acres of light industrial or business park land uses in the Special District located at its makai end fronting Queen Ka‘ahumanu Highway. Approximately 25 acres of these lands have been identified by the State DOT for an eventual highway interchange at the entrance to the Project.

Thus, industrial/business activity on those lands will be interim uses and only 50 gross acres (approximately 40 net usable acres after allowing for circulation and infrastructure) are seen as long-term light industrial land uses. These 25-acres would have interim industrial use then would be available for State DOT’s interchange, when needed.

POTENTIAL IMPACTS AND MITIGATION MEASURES

With its proposed 75 acres of designated light industrial or business park land uses in the Special District located at its makai end fronting Queen Ka‘ahumanu Highway, Kaloko Makai does not stand to significantly impact market conditions for light industrial use in the Trade Area, at least in terms of raw acreage and useable space.

Due to the proximity of its designated light industrial or business park land uses to viable commercial centers of development, Kaloko Makai's limited light industrial/business park lands are poised as attractive market offerings, and offer considerable market synergy and contributory value to bordering commercial uses.

4.9.4. Social Impact Assessment

John M. Knox & Associates conducted an assessment (May and June 2011) of the potential Social Impacts of the Kaloko Makai project, assaying an array of Community interests and concerns regarding the development and outcome of the project. The report is included in its entirety as Appendix O and is summarized below.

The following issues are referenced in the Social Impact Assessment as prevalent areas of community interest and concern:

Health Care: Interviewees articulated the need for health care and education in Kona – specifically citing a lack of access to medical facilities, which reportedly lead to people having to be evacuated to Honolulu for treatment, attributing insufficient staff, lack of good doctors, nurses and health care specialists, and inadequate facilities as primary causes. Not only has this been logistically challenging, but the lack of quality care and proper facilities has incurred significant cost to the people of Kona as well. A few people said the hospital has been having funding problems, which has made it difficult to retain qualified and experienced doctors, specialists and nurses in Kona.

Current Economic Outlook: The entire nation has experienced economic hardship, and Kona's economy has been directly impacted by compounded economic decline. Issues associated with the impacts of the national economic crisis include a lack of new money coming in, local businesses suffering (even affecting the success of longtime industries ranching and cattle raising), higher cost of living, lack of local jobs (and good paying jobs), and lack of adequate housing for workers, especially low-income ones; and an overall decline in home and property values county-wide. Residents also reported a perceived imbalance between where jobs are located and the location of "affordable" housing for the local workforce.

Community and Effects of Rapid Growth Issues: Interviewees expressed concern about the prior rapid growth occurring in Kona, and the difficulties associated with managing this growth. The rate of development and population growth, were both viewed with apprehension. The ongoing influx of people and rapid development were seen as precursors of cultural, social, and environmental change. Some people said newer residents may not understand local lifestyle and have more of a "land for profit" as opposed to "land for living" mentality. Increased crime and drug use were also reported as concerns attributed to rapid growth (though it should be noted that we also often encounter the same issues in rural areas with stagnant economies).

Housing: A Lack of housing options for the local workforce is an area of primary concern for the people of Kona. Interviewees reached the general consensus that there is simply not enough affordable housing to satisfy demand by the local workforce, and that developments planned in the region often do not cater to the mainstream population, but for those interested in vacation and/or retirement homes, i.e. the affluent and wealthy. Generally speaking, the local interviewed

population base is aware that developments, by their for-profit nature, are geared primarily towards the optimized capitalization of land value, but is cognitively repulsed by the realization that such developments significantly impact their lives, but do not immediately nor specifically benefit them.

Access and Infrastructure: According to interviewees, access and infrastructure issues are a significant concern in Kona. Interviewees remarked that Kona Harbor is old, county infrastructure is aging (sewers specifically), and that access and traffic are an escalating issue in Kona. There also have been numerous problems with the Queen Kaʻahumanu Highway widening project.

Political Interests: The decades old imbalanced representative relationship between West and East Hawai'i has been a thematic point of concern for area residents. Specifically, while West Hawaiʻi is the County's prime source of growth in tax revenues, the majority of planning and infrastructure decisions are made in the East Hawaiʻi county seat (Hilo). Interviewees said they perceived a perverse incentive in the fact that Hilo benefits from developments in Kona, but Kona suffers from the resulting traffic and socio-economic impacts of these approvals. They saw this as inefficient planning, as planning projects are approved with no adequate infrastructure to support projects, from a remote place that won't feel the consequences of failing to plan properly.

Lack of strong political leadership from decision-making officials was underlined as a perceived catalyst for the frequent, rationally devoid conversion of land uses (conservation and agricultural to urban land uses), resulting in developments being allowed to move forward, with no follow-through conditions or stipulations.

Environmental Effects: Although vog and volcanic activities were of some concern to interviewees, threats *to* the environment – as opposed to threats *from* the environment – were at the forefront of interviewee concerns. Participants, however, strongly emphasized that they were seriously concerned about increasing negative impacts to the local natural environment, coastal areas and cultural resources due to development and population growth.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Kaloko Makai stands to strongly benefit areas of community interest and concern as underlined previously. On a fundamental basis, the Kaloko Makai project will directly address vested community interests in a considerably positive fashion.

From a baseline socioeconomic vantage, Kaloko Makai's planned development will serve to stimulate growth and development throughout West Hawaiʻi, as well as directly and indirectly revamp the scope and scale of services and facilities (both private and public) available to residents of West Hawai'i – through the planned and structured creation of jobs, spending, infrastructure, tax revenue, and facilities (Kona Regional Hospital/Schools/Parks).

Kaloko Makai will contribute to ameliorating Kona's housing supply issues through (a) market-priced housing aimed primarily at working families rather than off-shore buyers, and (b) 1,000 "affordable" units with pricing to be determined in consultation with government agencies. These contributions cannot totally reverse the high land and development costs that have kept Hawaiʻi among the most expensive housing markets in the nation for the past 50 or 60 years. However, failure to provide

housing supply in pace with increasing demand by local residents would worsen rather than help the overall housing affordability situation.

Continued economic and population growth in West Hawaiʻi stemming from Kaloko Makai's ongoing development will further level and balance the weight of political interests throughout the County, by virtue of representative population redistribution.

Kaloko Makai will utilize proper measures to mitigate potential environmental impacts on the natural environment, coastal areas, and cultural resources as discussed in Sections 3.3, 3.5 and 4.1.

4.10. INFRASTRUCTURE AND UTILITIES

Wilson Okamoto Corporation prepared a Preliminary Engineering Report (PER) for Kaloko Makai. For ease of reference in this document, the essential components of the PER have been included in the following sections. Appendix P contains a summary PER.

4.10.1. Water System

The Hawaiʻi County Department of Water Supply (DWS) operates and maintains public water systems on the Island of Hawaiʻi. Water system improvements, including wells, reservoirs and mains, for private development are usually dedicated to the County DWS and then put into operation.

As part of the process, private developers secure a Water Agreement with County DWS to define the improvements to be constructed and the allowable water credits and Facilities Charge for these improvements.

The County DWS's system in North Kona is the second largest system on the island. The system is supplied by ground water sources, including deep drilled wells and the Kahaluʻu Shaft. The North Kona Water System extends from the Kona International Airport south to Kealakekua Bay where interconnection to its South Kona Water System is made.

The County DWS operates and maintains drinking water supply facilities in the vicinity of the project site. The County DWS facilities include three water reservoirs (Kaloko Control Tanks, Kaloko Tank No. 1 and Hina Lani Tank No. 2) along Hina Lani Street, each with a capacity of 1.0 million gallons (MG), and each supplying a different pressure zone. The existing 20-inch transmission line along Hina Lani Street connects the water reservoirs extending the water system from Queen Kaʻahumanu Highway to Māmalahoa Highway, and completing the Hina Lani water supply system. The Hina Lani water system provides water to the nearby Kaloko Industrial Subdivision and the County Housing Development off of Hina Lani Street.

Of the three existing water reservoirs, the makai reservoir (near Queen Kaʻahumanu Highway) has been abandoned by County DWS and will be dedicated to the County Department of Environmental Management (DEM) for use as an R-1 water storage reservoir.

DWS currently has three projects planned in the vicinity of Kaloko Makai.

1. Installation of a new 16-inch water main in parallel with the existing 12-inch water main along Queen Ka'ahumanu Highway.
2. A water tank currently is in construction for the proposed Kaloko Heights project.
3. A new water tank (Hina Lani Tank No. 3) is sited mauka of the Kaloko Makai project site.

Refer to Section 3.5.1 Groundwater Resources for more information about groundwater resources and groundwater quality.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Please refer to Section 3.5.1 Groundwater Resources which presents water demand for Kaloko Makai and the proposed alternatives for developing groundwater resources to supply drinking water to meet those demands.

4.10.2. Wastewater System

Currently, there are no public or private wastewater treatment facilities on the property.

Existing properties within the nearby Kaloko Light Industrial Subdivision are serviced by septic tank and seepage pit. Planned development within Kaloko Light Industrial Subdivision and Lanihau Properties incorporate individual septic systems for short-term use and installation of dry sewers for long-term build out of North Kona Improvement District (NKID). Current development of the Kaloko Heights project proposes to incorporate a private wastewater treatment system.

The nearest wastewater treatment plant (WWTP) is the County's Kealakehe WWTP located approximately one mile southwest of Kaloko Makai.

The Kaloko Makai project area falls within the boundary of the County DEM's North Kona Sewer Master Plan. The project site is further evaluated under the North Kona Improvement District Project Sewer Master Plan – 2006 and North Kona Improvement District Implementation Report – 2008 (NKID).

The Kona CDP made sewer system hookup a priority and includes the following policy:

> *Policy PUB–4.4: Sewer Priorities. In order to protect the nearshore water quality, the requirement to hookup to the County sewer system (HCC Section 21-5) shall be strictly enforced. The highest priority in expanding the sewer system within the Kona Urban Area shall be to service any shoreline properties that do not have access to a public sewer system and then to service lots within approximately 1-mile of the shoreline* (shown in pink in Figure 4-14). *Any new subdivision within 1 mile of shoreline within the Kona Urban Area shall either hookup to the public sewer system, or provide a private treatment system, and/or install dry sewers (see Figure 4-10c Official Public Facilities and Services Map-Waste Management). Private wastewater collection systems within the 1-mile zone shall be designed and constructed to County standards to enable potential connection to County sewer system.*

> *The County shall ensure that TODs can be served by the public sewer system in a timely manner.*

In addition, the Kona CDP addresses wastewater facilities and notes the following policy related to the siting of a new facility:

> *Policy PUB–4.5: Wastewater Treatment and Effluent Reuse. The Kealakehe WWTP shall be expanded to accommodate the projected sewage volume from the Urban Area extending south of Hina Lani Street to the Keauhou WWTP. A new County wastewater treatment plant shall be located in the vicinity shown on Figure 4-10c Official Public Facilities and Services Map-Waste Management and designed to the extent feasible to utilize a natural treatment system that can double as an open space feature* (shown in green, north of Kaloko Makai in Figure 4-14).

A natural wastewater treatment plant or system is typically known as a "constructed wetland" or a "Constructed Ecosystem" and are an alternative to mechanical wastewater treatment systems, which are methods that treat and purify wastewater. Constructed wetlands simulate natural wastewater treatment systems, using flow beds to support water-loving plants. The roots of these plants help provide an aerobic environment to aggressively break down contaminants.

Representatives from the County DEM noted that there are no plans for construction of this decentralized WWTP in the immediate future. (Dora Beck and Lyle Hirota personal communication, July 2011).

Concerns are raised as to the proposed location of the proposed new wastewater facility, especially its proximity to the Kona International Airport.

The Kona Airport Manager responded to inquiries concerning this location and indicated that the FAA would probably consider constructed wetlands and wastewater treatment facilities to pose similar wildlife attractant hazards. For all airports, the FAA recommends a distance of 5-statute miles between the farthest edge of the airport's operations area and the hazardous wildlife attractant if the attractant could cause hazardous wildlife movement into or across the approach, departure and circling airspace. Therefore, State DOT-Airports would be expected to object to or discourage the creation of potential attractants in this location (Chauncey Wong-Yuen personal communication, date unknown).

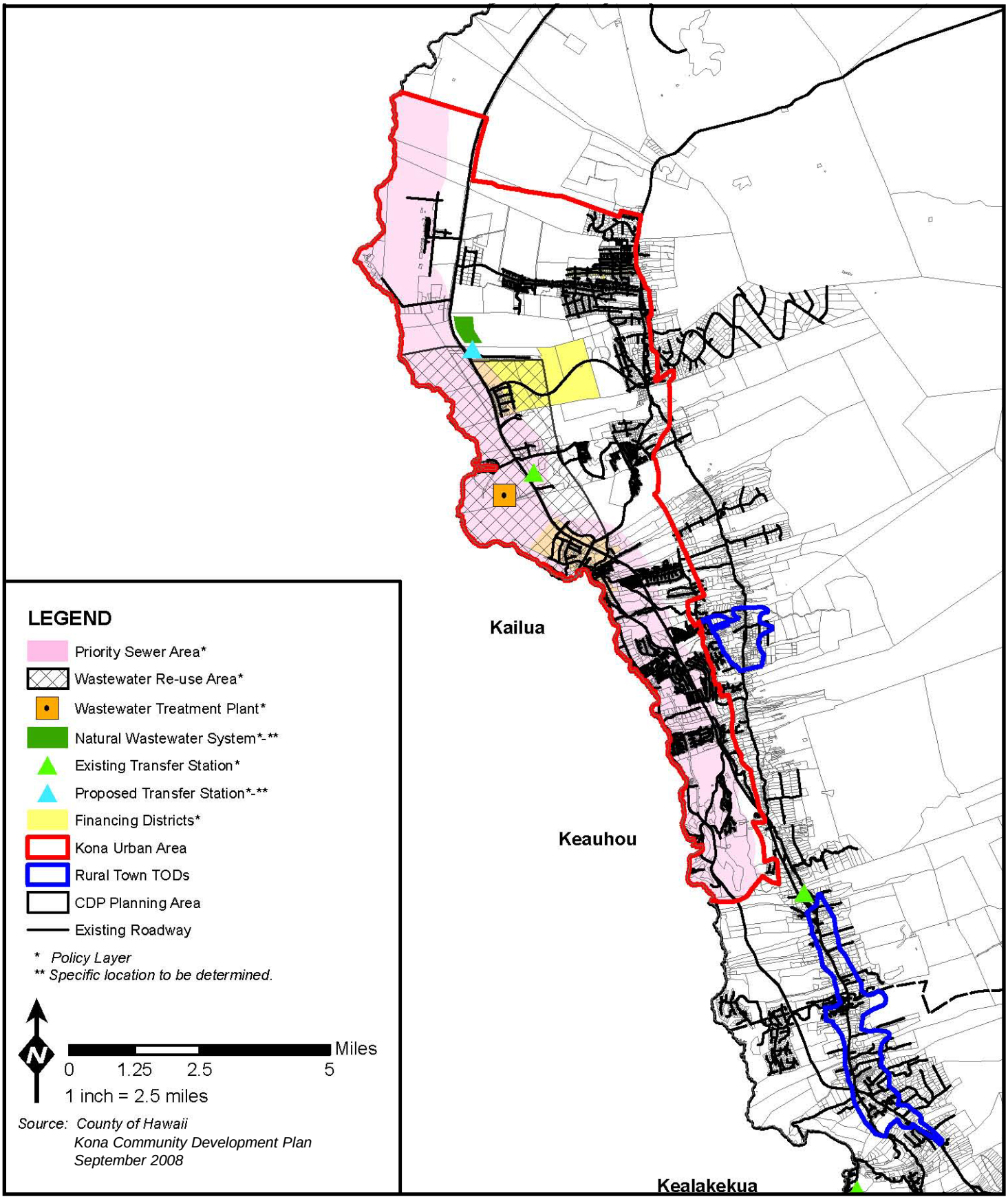


FIGURE 4-14
Kona Community Development Plan Official Public Facilities and Sewers Map Wastewater Management
Kaloko Makai

POTENTIAL IMPACTS AND MITIGATION MEASURES

Sanitary sewer volumes for the project are derived using the project's program requirements provided by SCD and generalized simulation of projected demands for similar developments. The State DOH requires that wastewater systems be designed based on county flow standards, and if applicable county standards are not established, the City and County of Honolulu standards are to be used. The County of Hawaiʻi has not yet established wastewater flow standards. Based on City and County of Honolulu flow standards, the average dry weather flow from the development at build out is 2.38 mgd. The projected design peak wastewater flow is approximately 11.80 mgd. See Appendix P PER for detailed information.

Current County DEM plan is to build a portion of NKID along with the next phase of the Queen Kaʻahumanu Widening project. The County DEM proposes to install a dry gravity force main along Queen Kaʻahumanu Highway from Hina Lani Street to the future pump station. Prior to becoming active, the County DEM needs to implement at least two more projects to connect to the Kealakehe WWTP.

The County DEM is also considering development of a decentralized treatment plant. The tributary area considered for the decentralized treatment plant includes the Kaloko Makai property. The treatment plant would likely be located on state land north of Kaloko Makai and along Queen Kaʻahumanu Highway. Detailed planning of the decentralized treatment plant with respect to treatment system and flow capacity and footprint size has not been determined.

The proposed sewer system will follow guidance and general criteria as described and outlined in the Final NKID, Sewer Master Plan Summary Report, October 2006. Line sizes will be determined during the design phase of the project.

Wastewater Treatment Alternatives

If a connection to either the Kealakehe WWTP or the proposed natural wastewater treatment system is accessible to the project prior to the County Council's approval of the Change of Zone (COZ), Kaloko Makai shall develop the project with sewer lines to be used to connect the Project to the Kealakehe WWTP.

In addition, if the connection to the Kealakehe WWTP is made, Kaloko Makai shall collaborate with the County of Hawaiʻi to include the project within an improvement district, if one is developed, to fund the connection to the Kealakehe WWTP, or to have incorporated as a condition of approval to the COZ, the requirement that the Project pay, at the time of full funding for such improvements, its fair share of the cost to fund such connection to the Kealakehe WWTP, whether or not an improvement district is established.

If the connection to the Kealakehe WWTP is not accessible to the Project prior to approval of the COZ and no connection to a public WWTP acceptable to Kaloko Makai is available prior to the completion of construction of the private WWTP, Kaloko Makai shall develop the Project to be served by an on-site Private WWTP.

Because the County DEM has indicated that the Kealakehe WWTP is not available for Kaloko Makai use, an on-site wastewater treatment plant is the preferred alternative for processing wastewater generated by Kaloko Makai.

Wastewater from the development would be delivered to an on-site WWTP approximatley 20-acre site and would be located at the makai end of the project site. The on-site WWTP is self-sufficient, water efficient, and environmentally sound. The WWTP would produce R-1 quality effluent which would be the source of supply for the project's non-drinking water system. Brown and Caldwell prepared a conceptual wastewater management report for Kaloko Makai. The report is included in the PER (Appendix P). Further discussion is also provided in Section 3.5.1 Groundwater Resources.

The WWTP will be designed to achieve the following:

a. Produce R-1 quality water in accordance with DOH regulations; and
b. Reduce phosphorus and nitrogen concentrations in the effluent to address potential impacts to the adjacent Kaloko-Honokōhau National Historical Park and the near shore environment.

The first treatment goal is readily achievable via conventional secondary treatment, followed by coagulant addition, filtration and disinfection with ultraviolet light. The second goal requires an advanced wastewater treatment process. The description that follows assumes that the NPS agrees that similar nutrient removal objectives are appropriate for the Kaloko Makai project (see Figure 4-15).

- Influent Pump Station: A pump station will be required to lift raw wastewater from the sewer system to the treatment processes.

- Headworks: The headworks would include screening systems to remove debris and grit removal to remove inorganic particles (e.g., sand) from the waste stream. Grit and screenings will be disposed at the West Hawaiʻi Landfill.

- Biological Treatment: Organic matter and nutrients will be removed using an activated sludge process. The process will incorporate biological nutrient removal (BNR). BNR incorporates aerobic and anoxic zones within the treatment process and recycle flows to facilitate biological reduction of total nitrogen (TN) and total phosphorous (TP) to 10 mg/L and 2 mg/L, respectively. Clarifiers will be used to separate the activated sludge from the secondary effluent.

- Coagulant Addition/Flocculation: Coagulants (such as aluminum sulfate and/ or polymer) will be added to the secondary effluent downstream of the secondary clarifiers and mixed to combine small particles into larger "flocs" that can be removed in the filtration process.

- Filtration: The filtration process will provide two treatment benefits: turbidity reduction to meet R-1 water recycling requirements, and additional nitrogen removal.

Denitrification filters are available that are accepted by the California Department of Public Health (CD PH) for Title-22 recycled water production and are also capable of reducing TN concentrations to 5 mg/L via denitrification. The State DOH allows the use of filtration processes that are accepted by CDPH for R-1 recycled water production. Addition of a carbon source (typically methanol) is required upstream of the filters to facilitate denitrification process. The State DOH requires that R-l quality water have effluent turbidity of less than 2.0 Nephelometric turbidity units (NTU) at all times.

- Disinfection: The effluent will be disinfected with ultraviolent light (UV) to meet R-l recycled water requirements. The State DOH requires that R-l recycled water have a median density of fecal coliform that does not exceed 2.2 per 100 mL.

- Effluent Pump Station: An effluent pump station will deliver recycled water to the R-l storage tank for reuse, or to disposal wells.

- Aerobic Digester: Waste solids (sludge) from the biological treatment and filtration systems will be pumped to an aerobic digester system for stabilization and thickening via periodic decanting.

- Mechanical Dewatering: Aerobically digested sludge will be mechanically dewatered prior being hauled offsite for disposal or composting at the West Hawai'i Landfill.

The WWTP will be designed to produce R-1 recycle water suitable for irrigation within the project boundaries. The treated effluent will be pumped to a R-1 storage tank located on-site and will be used to irrigate parks, school fields, landscaping and other allowed uses for R-1 quality water (see Figure 4-16).

Supplemental drinking water will be added to the R-1 storage tank as needed to ensure that the irrigation demands of the users can be met. During periods of wet weather, excess R-1 quality water will be disposed of via disposal wells (see Figure 4-16).

Potential acceptable uses for R-1 recycled water in the project are listed in Table 4-32. Note that irrigation of single-family residential parcels is not allowed by State DOH.

There will be times when there is more R-1 quality water available than the irrigation users require; for example, during periods of extended wet weather. The State DOH requires that a disposal system be provided for when recycled water supply exceeds the demand. The excess would be disposed of in injection wells at the WWTP if other uses for this water cannot be found.

The Kaloko Makai WWTP will be designed to reduce nitrogen and phosphorous concentrations in the treated effluent to address over nutrient impacts to the adjacent Kaloko-Honokōhau National Historical Park and the near shore environment. During the wastewater treatment process, organic matter and nutrients will be removed using an activated sludge process.

Table 4-32 Potential R-1 Recycled Water Uses at Kaloko Makai		
Landscape Irrigation • Parks • School Yards • Athletic Fields • Road sides and medians • Commercial property (if managed by irrigation supervisor) • Multi-family residential property (if managed by an irrigation supervisor)	Industrial • Commercial and public laundries • Industrial cooling • Industrial process water	Other • Toilet and urinal flushing in buildings with dual water systems • Decorative fountains • Street sweeping • Dust control

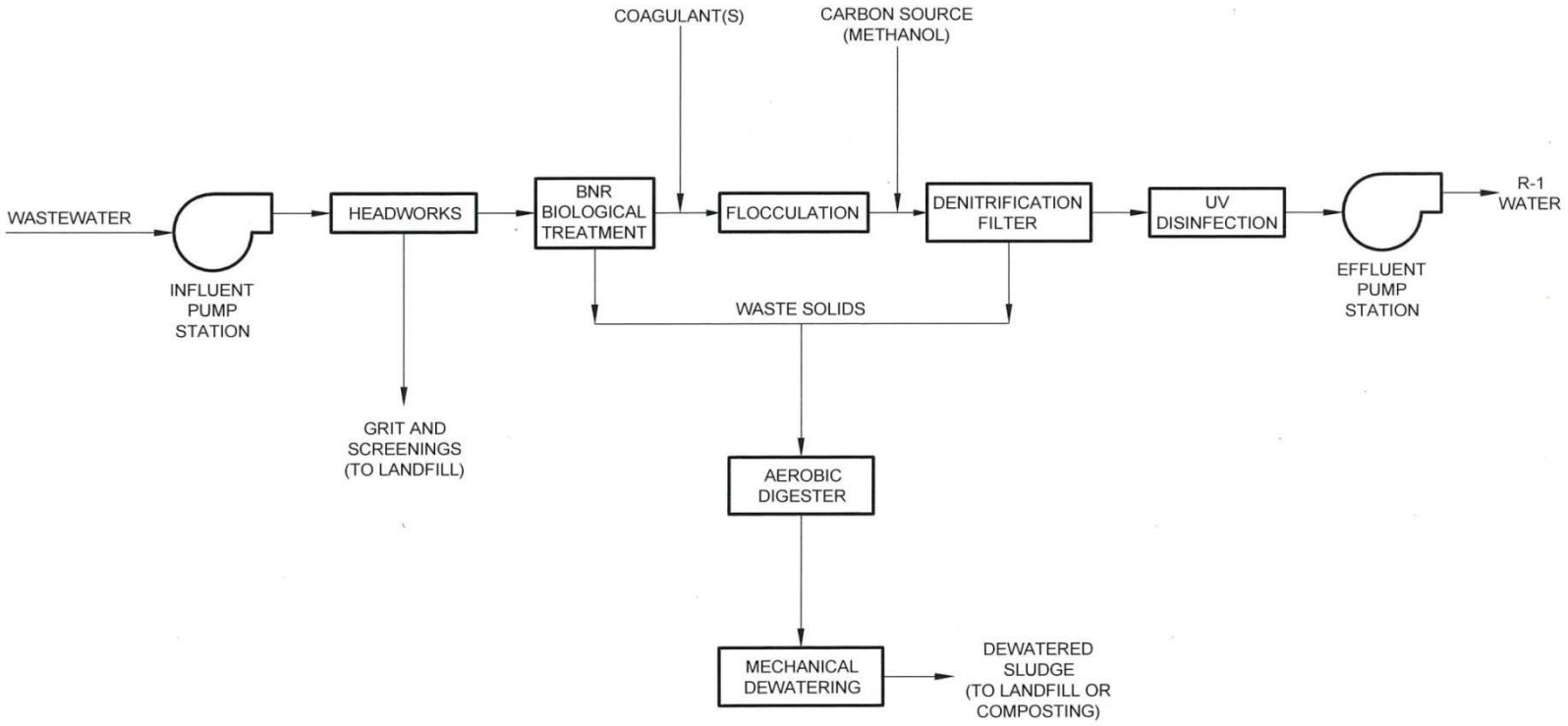
As previously mentioned, the process will incorporate BNR which incorporates aerobic and anoxic zones within the treatment process and recycle flows to facilitate biological reduction of TN and TP.

The WWTP will comply with applicable provisions of Hawaiʻi Administrative Rules (HAR), Chapter 11-62 Wastewater Systems. The WWTP will be designed to reduce the concentrations of the following compounds in the effluent of the private WWTP to: TN to a concentration of <5 mg/l, and TP to a concentration of <2 mg/l (aerobic nitrification processes combined with anoxic/anaerobic sand filters to perform denitrification, or comparable technology.) Installation of the private WWTP shall be subject to conditions of approval by the DOH, including any lower concentrations of TN and/or TP in the effluent, and HAR Chapter 11-62.

An average R-1 recycled water flow rate of 2.36 mgd has the potential to provide irrigation water for approximately 115 acres without routine supplemental water addition. The State DOH has restrictive requirements for R-1 irrigation on property located above of the underground injection control (UIC) line (e.g., groundwater or vadose zone monitoring, no excess irrigation to flush salts below the root zone allowed), and therefore R-1 reuse be limited to properties located below the UIC line.

The Kaloko Makai development includes approximately 56 acres of parks and 30 acres of schools located below the UIC Line that will likely be the largest users of the R-1 recycled water. Based on preliminary estimates, approximately 40 acres of the total park and school acreage will ultimately be irrigated.

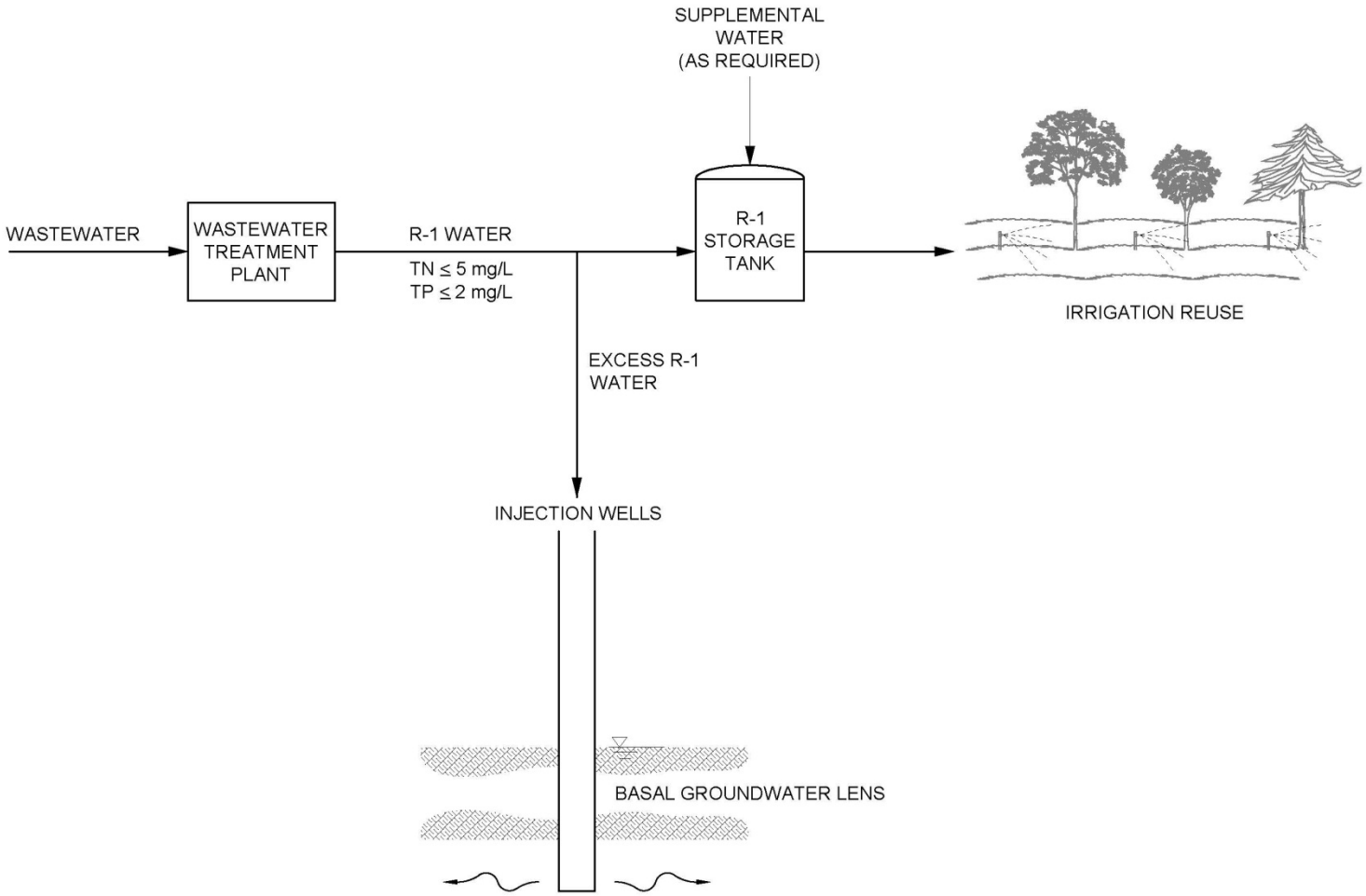
Additional recycle water users can be added to the system if they are located near the distribution lines that carry the water to the largest users. The required R-1 water storage tank size will be based on the maximum day demand of the recycled water users.



Source: Brown and Caldwell, Kaloko Makai Development – Conceptual Wastewater Management System

WILSON OKAMOTO
CORPORATION
ENGINEERS | PLANNERS | CONSULTANTS

FIGURE 4-15
Wastewater Treatment Schematic
Kaloko Makai



Source: Brown and Caldwell, Kaloko Makai Development – Conceptual Wastewater Management System

FIGURE 4-16
Wastewater Management System
Kaloko Makai

This reuse of treated wastewater is consistent with the Kona CDP which has an action designating the area below Ane Keohokālole as a reclaimed wastewater zone (Action TRAN–3.3a: Designates the reclaimed wastewater zone (Wastewater Re-use Area) on Figure 4-10c Official Public Facilities and Services Map).

Likewise, the Kona CDP identifies a "Wastewater Reuse Area" and states in its Policy PUB-4.6 Wastewater Reuse Area: Recognizing the limited drinking water supply in the Kona area, every effort should be taken to develop a feasible wastewater reclamation system for non-drinking water uses. The wastewater reuse area should be, at a minimum, located mauka of the shoreline up to Keohokālole Highway, north of Palani Road and south of Huliko'a Drive (again, noted on Figure 4-10c Official Public Facilities and Services Map-Waste Management).

4.10.3. Drainage System

According to the 2011 Rainfall Atlas of Hawaii (Giambelluca and Others, 2011), average annual rainfall across the project site varies from 15 to 25 inches a year. The land surface of the project site consists of unweathered and very permeable lavas with sparse deposits of ash soils and no defined drainageways. Essentially no rainfall runoff leaves the site, even during intense storm events. It is either lost to evaporation or percolates to the underlying groundwater.

Surface runoff mauka of the project site sheetflows toward the project site and percolates into the ground. Due to the high permeability of the natural ground surface at the project site (see Section 3.3), surface runoff does not occur. As a result, no natural gulches or waterways have been created on the project site. Runoff from off-site and on-site drainage was calculated for a 100-year 24 hour storm event. The approximate runoff is 9,806 ft^3/s (refer to Appendix P for details).

The County of Hawai'i currently operates and maintains a series of swales and drywells along Hina Lani Street. Typically, the V-type swales are 6 feet wide running along roadside shoulders. Drywells are located to intercept runoff collected in the swales and are approximately 5-foot in diameter, 20 feet deep, and capped with a catch basin/grated inlet drywell cover. Drywells allow collected storm water runoff from streets

In the vicinity of the project site, there are two existing culverts and headwalls under Queen Ka'ahumanu Highway. These appear to be sized and placed to address roadway runoff and are not part of any regional drainage system associated with mauka properties.

POTENTIAL IMPACTS AND MITIGATION MEASURES

The post development peak runoff rates for the drainage area were calculated for 100-year 24-hour storm event in accordance with the County DPW Storm Drainage Standards. The post development runoff is approximately 4,305 ft^3/s (refer to Appendix P for details).

The natural drainage pattern will be modified due onsite development, including roadways, residential lots, and commercial areas. Runoff from the offsite mauka areas is not expected to increase and will be directed away from the project site through drainage channels located on the eastern and northern borders of the project site. However, the proposed drainage system

improvements will maintain or reduce the rate of runoff discharged off the project site to equal or less than the existing rates, in compliance with County BMP requirements. The use of detention basins, and natural swales or channels will store and filter the storm runoff, removing pollutants via percolation. The passage of such runoff from the ground surface to the groundwater below, though the unsaturated (vadose) zone, provides natural filtration and adsorption. Surface runoff from most of the developed areas in Kailua-Kona is handled in a similar manner without identifiable adverse impacts to groundwater or the Makai environment.

Detention basins will be placed at each park located throughout the project site. Approximately 30% of the park is assumed as useable as a drainage basin due to the natural topography and usage of the park. Any additional runoff will be stored in an underground retention system located throughout the park. At each drainage basin, a spillway will be constructed to allow any excess storm water to overflow.

Use of an underground drainage system would consist of drainlines, drain inlets, and storm drain manholes to collect and convey storm drainage runoff to the drywells and/or detention basins. The drainage system will be designed to minimize impacts to near shore coastal waters.

An open drainage channel will be constructed along the eastern boundary (mauka) of the project site to redirect any offsite drainage away from the project site and into natural drainage paths flowing through the project site. Another drainage channel will also be placed along the eastern boundary of the Dryland Forest to prevent on-site drainage from entering the Dryland Forest. A drainage channel will also be placed along the northern boundary of the project site to capture and redirect runoff generated uphill.

All drainage improvements will be developed in accordance with the applicable State DOH and County drainage requirements and standards. In addition, the Applicant will comply with all laws and regulations regarding runoff and non-point source pollution.

4.10.4. Solid Waste

The County of Hawaiʻi currently maintains and operates two active landfills, one located in Hilo, and the other located north of Kaloko Makai at Puʻuanahulu. As of April 2008, the County of Hawaiʻi has reported that the Puʻuanahulu landfill, which meets all current EPA requirements for landfills, is anticipated to have a remaining lifespan of 47 years.

As of 2007-2008, approximately 86,442 tons or 29.2 percent of the County's total 296,473 tons of solid waste were recycled. Hawaiʻi County's 2009 Integrated Resources and Solid Waste Management Plan calls for a transition towards increased recycling, citing a 44% recyclable volume of solid waste as a goal for the 2014-2015 fiscal year.

Hawaiʻi island residents collect and transport solid waste to 21 solid waste transfer stations situated across the island. A number of communities have opted to employ private contractors to collect said waste for transit and disposal. Kailua Transfer Station is the nearest transfer station to the project site, and is approximately 2.5 miles to the southeast of the project site.
Solid waste is not being generated on the Property at present.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Waste generated through site development will consist predominantly of vegetation, and debris. Soil and debris displaced from grading and clearing will be utilized as fill throughout the site as required, minimizing disposal and transit/relocation of said materials. Concrete, waste lumber, and other associated building materials will comprise the bulk of solid construction waste resulting from the development of the site.

Throughout project construction and development, Kaloko Makai will adopt and establish a job-site waste management and recycling program geared towards the promotion and maintenance of clean construction sites, maximization of material recycling, and mitigation of required disposal transit traffic. On an effective basis, Kaloko Makai will seek to reduce, reuse, and recycle materials and waste to the greatest degree possible.

Construction materials that are rendered un-recyclable will be disposed of in the Pu‘uanahulu landfill.

Green waste resulting from the Project’s development will be chipped into mulch for on-site use or will be transported to green waste recycling centers; these operations will be scalable and planned to optimize transit and capacity.

Upon full build out and occupancy, Kaloko Makai is expected to produce approximately 12,795 tons/year of household/community waste. Measures and provisions to implement recycling, such as collection systems and storage for recyclables will be heavily incorporated to Kaloko Makai.

Kaloko Makai will work hand in hand with the County to produce feasible alternatives for residential curbside collection, including source-separated recyclables. Waste that is rendered unable to be recycled or incorporated into on-site green waste processing will be disposed of in the Pu‘uanahulu landfill. At the appropriate phase of project design and development, a Solid Waste Management Plan will be prepared and submitted to the County Solid Waste Division.

4.10.5. Electrical

Electrical power is provided to the Island of Hawai‘i by Hawai‘i Electric Light Company, Inc. (HELCO). As the project is currently undeveloped, it is not served by existing HELCO facilities at present. The nearest source of existing electrical power is the off-site Kaloko electrical substation which is served by a 12,470 volt underground distribution system along Hina Lani street.

Keahole Power Plant, the largest power producing facility on the island, is located mauka of the Airport and Queen Ka‘ahumanu Highway, and generates up to 75 percent of the power demanded by West Hawai’i, and approximately 35 percent of the island’s entire electrical demands.

As of October 2010, HELCO’s system peak load was reported to be 194,600 kilowatts, with a total generation system capability of 285,500 kilowatts and a reserve margin of 37 percent.

HELCO encourages net energy metering as an effective means of harnessing eligible renewable energy systems and technologies available to residential and commercial consumers. HELCO customers that own or lease an eligible renewable energy system (e.g. photo-voltaic solar system) may enter into an agreement with HELCO to directly feed their systems into the utility grid, allowing for a surplus sharing of produced electricity with the rest of the grid. Net energy metering essentially enables renewable energy system operators to reduce or negate their kilowatt-hours of consumption registered with HELCO, allowing for cost savings, and in some cases complete electrical power independence.

Electrical service for the project will be provided by HELCO.

POTENTIAL IMPACTS AND MITIGATION MEASURES

At full build out, the annual electrical demand for Kaloko Makai is expected to reach a maximum of approximately 210.8 million kilowatt-hours/year. This is an estimated figure that does not account for potential demand reductions corollary to energy efficiency and conservation measures, such as the use of solar photo-voltaic systems.

HELCO has specified that the current nearby Kaloko substation will not satisfy the needs of the project, and the demands of the project will require an extension of an existing 69,000 volt transmission line along Queen Kaʻahumanu Highway to a new on-site substation. Approximately 62,500 square foot area (250 ft. by 250 ft.) will be set aside for the construction of a new substation on project site. The existing off-site 12,470 volt distribution system along Hina Lani Street is not adequate to serve the Project. On-site and off-site distribution line extensions and easements will be required to service the projects anticipated load. Kaloko Makai will collaborate directly with HELCO to determine, plan, and execute any facility expansion requirements. Subterranean electrical distribution systems are expected to be standard throughout Kaloko Makai.

Pursuant to Chapter 344 (State Environmental Policy) and Chapter 226 (Hawaiʻi State Planning Act), HRS, all Kaloko Makai activities, buildings, and grounds will be designed with a significant emphasis on energy conservation and efficiency. Efficient design practices and technologies will be the cornerstone of Kaloko Makai's design phase. Buildings within Kaloko Makai will further comply with the County of Hawaiʻi Energy Code (Hawaiʻi County Code, Section 5, Article 2). Furthermore, solar water heaters will be utilized as made requisite under Section 196-6.5, HRS.

Kaloko Makai will confer with HELCO in regards to suggestions and proposals for customized demand-oriented management programs offering rebates for the installation of alternative energy-efficient technologies and measures.

To reduce net energy consumption and demand, Kaloko Makai will consider the implementation of elements of the United States Environmental Protection Agency (EPA) Energy Star Program; including efficient insulation, high performance windows, compact construction, efficient ventilation systems, and energy efficient lighting elements and appliances. Kaloko Makai will furthermore seek to harness energy conservations and technologies to facilitate the possibility of net energy metering in building design to empower residents and tenants to reduce their electricity costs and provide energy back to the grid.

Energy conservation and efficiency measures will be implemented and emphasized where applicable in the design of Kaloko Makai. Energy-efficiency technologies to be considered include:

- Solar energy for water heating
- Photovoltaic systems, fuel cells, biofuels and other renewable energy sources
- Optimal utilization of daytime sunlight
- High efficiency light fixtures
- Roof and wall insulation, radiant barriers, and energy efficient windows
- Optimized air-flow
- Installation of heat resistant roofing
- Intelligent Landscaping to provide for shading, dust control, and heat-mitigation
- Portable solar lighting (i.e. parking lots)
- Utilization of a "district cooling" system harnessing cold sea water / water frozen using off-peak electricity as a chilling agent for HVAC systems. NELHA utilizes such technologies, which require far less maintenance than conventional compressor derived systems, resulting in energy cost savings.

These measures are compliance with the following Kona CDP objective and policy:

> *Objective ENGY-1. To provide a multi-prong framework, including standards, innovations, incentives, and education, to reduce the dependency on imported fossil fuels through energy efficiency and renewable energy generation.*
>
> > *Policy ENGY-1.5: Distributed Energy and Other Innovative Technology Support. Photovoltaic systems are typically used as distributed generation when connected to the electrical grid where they have the potential to sell excess energy back to the grid. This is an emerging technology with challenges for the utility to incorporate such systems into the grid. This policy is aspirational and expresses general support in whatever way possible (e.g., permit coordination, grants) to encourage further development in this endeavor.*

4.10.6. Telephone and Cable Communications

The Kaloko Makai project area is currently not served by any telephone, dataline, or cable access facilities.

Existing utilities in the vicinity of the project site consists of overhead lines within Kaloko Industrial Park.

POTENTIAL IMPACTS AND MITIGATION MEASURES

Telephone, data line access to the Internet, and cable TV service for the project will be provided by Hawaiʻi an Telcom and Hawaiʻi Cablevision. All utility lines will be placed underground.

This page intentionally left blank..

5. RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA

5.1 STATE OF HAWAIʻI

5.1.1 Chapter 343, Hawaiʻi Revised Statutes

This Second Draft Environmental Impact Statement (EIS) is prepared pursuant to Chapter 343, Hawaiʻi Revised Statutes (HRS), and Title 11, Chapter 200, Hawaiʻi Administrative Rules, Department of Health, State of Hawaiʻi. Proposed is an Applicant action by SCD – TSA Kaloko Makai, LLC to develop Kaloko Makai, an approximately 1,139 acre master planned community in Kaloko and Kohanaiki, North Kona, Island of Hawaiʻi.

The preparation of this Second Draft EIS is being undertaken to address the proposed reclassification of the Conservation District lands, possible use of State lands or funds, anticipated use of County lands and/or funds in connection with development of project elements, including, but not limited to, roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings, and the construction of a wastewater treatment plant. While the specific nature of each improvement is not known at this time, the EIS is intended to address all current and future instances involving the use of State and/or County lands or funds relating to the project.

A previous Draft EIS for this project was prepared and its notice of availability for public review and comment was published in the August 8, 2011 issue of the Office of Environmental Quality Control's (OEQC) *The Environmental Notice*. The public comment period for that Draft EIS ended on September 21, 2011.

Subsequent to the public comment period for the 2011 Draft EIS, certain aspects of the project description changed, and additional studies were undertaken. Therefore the Applicant prepared this Second Draft EIS to address those changes and to provide an additional opportunity for agency and public review and comment. Specifically, the following changes are reflected in this Second Draft EIS:

First, the Applicant reduced the size of commercial/retail space from 1.1 million square feet to approximately 600,000 square feet. Although the market study included with the 2011 Draft EIS demonstrated a demand for the originally proposed 1.1 million square feet, the Applicant has chosen to reduce that component of the project to 600,000 square feet.

Second, the approximately 18-acre off-site potable well field mauka of Kaloko Makai is no longer being considered as a potential alternative water source for the project and has been eliminated.

Third, the originally proposed "Petition Area" for Land Use Commission reclassification has been reduced from 948.866 acres to 798.866 acres. Excluded is the 150 acres of dryland forest, which will remain in the Agricultural District .

Fourth, the Applicant has modified the project design to avoid any "take" of listed endangered and threatened plant species. This eliminates the need to prepare a Habitat Conservation Plan (HCP) and obtain an Incidental Take License (ITL).

Finally, in accordance with information provided by the County of Hawaiʻi, the Traffic Impact Assessment Report assumes that Ane Keohokālole Highway from Hina Lani Street to Kaiminani Drive (Phase III) would be completed by 2028.

Toward incorporating these changes in this Second Draft EIS, supporting studies were updated, as needed, and will be appended to the document. Responses to comments received on the 2011 Draft EIS have been prepared in the context of preparing this Second Draft EIS and have been distributed, with copies appended herein, in Appendix S.

5.1.2 State Land Use Law, Chapter 205, Hawaiʻi Revised Statutes

The State Land Use Law, Chapter 205, HRS, is intended to preserve, protect and encourage the development of lands in the State for uses which are best suited to the public health and welfare for Hawaiʻi's people. All lands in the State are classified into four land use districts by the State Land Use Commission (LUC): Urban, Agricultural, Conservation, and Rural. The standards for each district are found in Title 15, Chapter 15, Hawaiʻi Administrative Rules, which provide in relevant part as follows:

- The Urban Districts includes "*lands characterized by 'city-like' concentrations of people, structures, streets, urban level or services and other related uses."*
- The Agricultural District includes lands with a "*high capacity for agricultural production." with low capacity*."
- Rural districts include areas consisting of small farms, and activities or uses characterized by low-density residential lots of not less than *one half acre and a density of not more than one house per one-half acre.*
- Conservation Districts includes areas necessary for *protecting watersheds, water resources and water supplies, the conservation, preservation and enhancement of scenic, cultural, historic or archaeological sites, and lands necessary for conserving natural ecosystems of indigenous or endemic plants, fish and wildlife. Conservation District lands also include those necessary for providing and preserving parklands, wilderness and beach reserves.*

Presently, about 49 percent of Hawaiʻi's land area is designated Conservation, 45.7 percent Agricultural, 5 percent Urban, and less than half a percent Rural (Office of State Planning, December 13, 2012).

While the Land Use Commission (LUC) Administrative Rules describe the Conservation District in broad terms, a more specific statutory framework for Conservation lands identifies the five subzones that are possible within the Conservation District, and establishes that certain Conservation District lands are not truly intended for conservation purposes. The five subzones are: Protective (P), Limited (L), Resource (R), General (G), and Special (S). All of the Conservation District land within the project site is within the General subzone. According to the Hawaiʻi Administrative

Rules, the objective of the General subzone is to "*designate open space where specific conservation uses may not be defined, but where urban use would be premature."* HAR Sec. 13-5-14.

When the Conservation District was created in 1961 there were only two subzones – "Restricted Watershed," which was limited to water and forestry development, and "General Use," which allowed resorts and related residences, hotels, restaurants, resort ranches, county clubs, logging, and quarrying, among other uses. In 1978, the Board of Land and Natural Resources (BLNR) replaced the two tier subzone system with the current five tier system. In effect, the "General" subzone is the "General Use" designation of the 1960s.

These lands do not have the ecological, historical, cultural or geologic features found in other subzones, and at the time of designation (about 50-years ago,) they were not ready for Urban designation. A lot has changed since the initial Land Use mapping. In the past five decades, through the County General Plan, and more recently through the Kona CDP, Kona has identified the area from Kailua to the Kona Airport as the region for growth. The entire Kaloko Makai project property is within the Urban Expansion Area of the General Plan, and is within the Kona Urban Area of the Kona CDP.

5.1.2.1 State Land Use Commission Decision Making Criteria

The LUC, in accordance with Section 205-17, Hawai'i Revised Statutes (HRS), shall consider the following decision-making criteria in its review of any petition for reclassification of district boundaries:

(1) The extent to which the proposed reclassification conforms to the applicable goals, objectives, and policies of the Hawai'i state plan and relates to the applicable priority guidelines of the Hawai'i state plan and the adopted functional plans;

Comment: Kaloko Makai conforms to the applicable goals, objectives, and policies of the Hawai'i State Plan and functional plans, as discussed in Section 5.1.4 and 5.1.5.

(2) The extent to which the proposed reclassification conforms to the applicable district standards;

Comment: Kaloko Makai conforms to the Urban District standards, as discussed Section 5.1.2.2.

(3) The impact of the proposed reclassification on the following areas of state concern:
- *(A) Preservation or maintenance of important natural systems or habitats;*
- *(B) Maintenance of valued cultural, historical, or natural resources;*
- *(C) Maintenance of other natural resources relevant to Hawai'i's economy, including, but not limited to, agricultural resources;*
- *(D) Commitment of state funds and resources;*
- *(E) Provision for employment opportunities and economic development; and*
- *(F) Provisions for housing opportunities for all income groups, particularly the low, low-moderate, and gap groups;*

Comment: Natural areas within Kaloko Makai will be preserved and remain undeveloped, such as the Kaloko Makai Dryland Forest Preserve proposed along the southern portion of the project site.

Kaloko Makai has been designed to establish preservation areas to protect archaeological sites within the project site and preserve the historic Kohanaiki Trail ("Road to the Sea" Trail) in place with 10-foot buffers along each side of the trail.

As discussed in Section 3.3, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agriculturally significant lands.

SCD - TSA Kaloko Makai, LLC is the recorded fee owner of the project site. Applicant has offered to provide land area for the development of a regional hospital. However, Applicant will not be developing a regional hospital. It is anticipated that if a regional hospital is developed, it will be developed through a public-private partnership.

The project may also include the use of State and/or County lands or funds in developing the project and construction of a wastewater treatment plant. Use of State and/or County lands could include, but not be limited to roadway, traffic, water, sewer, utility and drainage facilities affecting State and/or County roadways or other lands, and anticipated trail crossings. While the specific nature of each improvement is not known at this time, the EIS is intended to address all current and future instances involving the use of State and/or County lands or funds relating to the project.

Applicant or its successors will be responsible to fund site work and the construction of on-site and off-site project-related infrastructure including roadways, potable (drinking) water wells, reservoirs, transmission lines, wastewater transmission lines, and other utilities.

The Kaloko Makai plan designates 75 acres of light industrial or business park land uses in the Special District located at its makai end fronting Queen Kaʻahumanu Highway. Approximately 25 acres of these lands have been identified by the State of Hawaiʻi Department of Transportation (DOT) for an eventual highway interchange near the intersection of Queen Kaʻahumanu Highway and Hina Lani Street.

The project contributes to economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light-industrial uses within the development.

Kaloko Makai will stimulate the local economy and provide housing opportunities for all income groups as discussed in Sections 2.2.2.1, 2.2.2.2, and 2.2.2.3.

(4) The standards and criteria for the reclassification or rezoning of important agricultural lands in Section 205-50;

Comment: As discussed in Section 3.3, there are no important agricultural lands within the subject property. Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

(5) The county general plan and all community, development, or community development plans adopted pursuant to the county general plan, as they relate to the land that is the subject of the reclassification petition; and

Comment: The project is consistent with the County General Plan, which designated the property for Urban Expansion, and with the Kona Community Development Plan (CDP), which designated the property for the development of the Kaloko Makai Transit Oriented Development (TOD) Village.

(6) The representations and commitments made by the petitioner in securing a boundary change.

Comment: SCD-TSA Kaloko Makai, LLC is committed to following through with the representations and commitments made to the community and the LUC.

5.1.2.2 Standards for Determining Urban District Boundaries

The LUC must specifically consider the extent to which the proposed reclassification conforms to the applicable District standards. The standards for determining the boundaries for the Urban District include eight (8) areas which are listed below (15-15-18, HAR). The following section is an analysis of how Kaloko Makai conforms to the Urban District standards.

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

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai‘i's General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP.

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

(A) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment;
(B) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection; and
(C) Sufficient reserve areas for foreseeable urban growth;

Comment: As discussed in Section 2.1.1, Kaloko Makai is surrounded by existing and proposed urban uses – Kaloko Industrial Park, Kohanaiki Business Park, West Hawai‘i Business Park, and residential developments, including Kaloko Heights, Kona Heavens, Kula Nei and others.

Kaloko Makai is located approximately three miles to the south and north of Kona International Airport and Kailua-Kona, respectively, and is situated in a region that is rapidly developing, with immediate access to Kona International Airport. Kaloko Makai is adjacent to the well established commercial and light industrial-service centers of North Kona and Kailua-Kona which serve the needs of the visitor, agriculture, ranching, and technology industries, among others, which populate the western half of the island.

Kaloko Makai is located within proximity to regions that will continue to be the focus of further development as the Island's population grows, and has the potential to be a major cornerstone of residential, commercial, and light industrial growth as a center of community, commercial, and economic activity.

The project includes parks and sites set aside for a hospital, schools and a fire station.

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

Comment: The project site occupies an area of relatively uniform slope, ranging from 5 to 8 percent. The lowest elevation along the makai boundary of the site is approximately 100-feet above mean sea level (msl). Along the mauka boundary, the site reaches an elevation of about 710-feet above msl.

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

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the Hawaiʻi County General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP. The property is generally surrounded by lands classified as Urban. As discussed in Section 2.1.1, Kaloko Makai is surrounded by existing and proposed urban uses – Kaloko Industrial Park, Kohanaiki Business Park, West Hawaiʻi Business Park, and residential developments, including Kaloko Heights, Kona Heavens, Kula Nei and others.

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

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the Hawaiʻi County General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP.

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

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

Comment: The property conforms to the standards in paragraphs (1) to (5).

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

Comment: The project will not contribute to scattered spot urban development. Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept, with land available for a new Kona regional hospital. Kaloko Makai is situated on land designated as "Urban Expansion" in the Hawaiʻi County General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP. In addition, Kaloko Makai is a designated Transit Oriented Development (TOD) under the Kona CDP.

As discussed in Section 2.1.1, Kaloko Makai is surrounded by existing and proposed urban uses – Kaloko Industrial Park, Kohanaiki Business Park, West Hawaiʻi Business Park, and residential developments, including Kaloko Heights, Kona Heavens, Kula Nei and others.

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

Comment: The project site occupies an area of relatively uniform slope, ranging from 5 to 8 percent. The lowest elevation along the makai boundary of the site is approximately 100-feet above mean sea level (msl). Along the mauka boundary, the site reaches an elevation of about 710-feet above msl.

5.1.3 Coastal Zone Management Act, Chapter 205A, Hawaiʻi Revised Statues

Hawaiʻi's Coastal Zone Management (CZM) Program, established pursuant to Chapter 205A, Hawaiʻi Revised Statutes (HRS), as amended, is administered by the State Office of Planning (OP) and provides for the beneficial use, protection and development of the State's coastal zone. The objectives and policies of the Hawaiʻi CZM Program encompass broad concerns such as impact on recreational resources, historic and archaeological resources, coastal scenic resources and open space, coastal ecosystems, coastal hazards, and the management of development. The following is a discussion of the conformity of Kaloko Makai with the applicable CZM objectives and policies.

(1) Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

Policies:

(B) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

(i) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters.

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources and county authorities; and crediting such dedication against the requirements of Section 46-6, HRS.

Comment: Kaloko Makai is not a coastal development project and is located approximately 0.85 miles inland from the shoreline. This objective is not applicable to Kaloko Makai. However, related to this objective is the potential water quality impacts during construction of the project which will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling.

Construction of Best Management Practices (BMPs) will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff and develop a Pollution Prevention Plan, and will implement wastewater and groundwater monitoring.

(2) Historic Resources

Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

(A) Identify and analyze significant archaeological resources;

(B) Maximize information retention through preservation of remains and artifacts or salvage operations; and

(C) Support state goals for protection, restoration, interpretation, and display of historic resources.

Comment: Of the 341 sites in the project area, a total of eighty (80) sites are subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Several of the non-burial preserve sites are major intact trail systems that run for several hundred meters, and two sites are ahupua`a walls that are recommended for preservation with breaches allowed. Other preserve sites include ceremonial enclosures and platforms (possible heiau), excellent examples of habitation complexes (some of which utilize both surface and sub-surface areas), and a few petroglyph panels.

Refer to Section 4.1 for further discussion.

(3) Scenic and Open Space Resources

Objective: Protect, preserve, and where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

(A) Identify valued scenic resources in the coastal zone management area;

(B) Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;

(C) Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources; and

(D) Encourage those developments which are not coastal dependent to locate in inland areas.

Comment: As Kaloko Makai is located approximately 0.85 miles inland from the shoreline, this objective is not applicable. The Kaloko Makai project site is located in an undeveloped area mauka of Queen Ka‘ahumanu Highway and immediately north of Kaloko Industrial Park. The development of the project site will result in the replacement of vacant and vegetated land with urban uses such as homes, a hospital, commercial/retail, and light industrial uses. Kaloko Makai will be visible almost entirely from the shoreline and Queen Ka‘ahumanu Highway looking mauka and visible from existing surrounding developments which lie to the east. The project site will appear as a continuation of the proposed Kaloko Heights and Kula Nei developments to the east or mauka and Kaloko Industrial Park to the south.

There will be approximately 293 acres of parks and open space consisting of 87 acres of open space, 56 acres of parks, and preservation of the Kaloko Makai Dryland Forest Preserve.

(4) Coastal Ecosystems

Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:
(C) Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
(D) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
(E) Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.

Comment: As discussed in Section 3.5.1, it is unlikely that there would be any effects to the nearshore environment as a result of increases in nutrient concentrations in groundwater. Results of a four-year study from two golf courses in Keauhou indicated that even with long-term input of extremely high nutrient subsidies, there are situations where there are no negative effects to the receiving environment. Similar lack of impact would be expected at the Kaloko-Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

Refer to Section 3.5.2 Nearshore Marine Environment and Ponds for more details on existing conditions, potential impacts and mitigation measures.

During a survey in early 2012 conducted for the Kaloko Makai project, evidence of groundwater input at stations within the inshore half of ʻAimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater into ʻAimakapā Pond than was previously measured. These results suggest that ʻAimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historic Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historic Park ponds.

Hence, all data indicate that while the enclosed basin of ʻAimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment, the recent detection of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has not yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combined result in greatly restricted flow of groundwater into ʻAimakapā Pond.

The restricted flow of freshwater through the ponds is evident by the almost complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half of marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff and develop a Pollution Prevention Plan, and will implement wastewater and groundwater monitoring.

(5) Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

(A) Concentrate coastal dependent development in appropriate areas;

(B) Ensure that coastal dependent developments such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

(C) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(i) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Comment: As Kaloko Makai is not a coastal dependent project, this objective is not applicable. Kaloko Makai is located near existing and proposed urban uses. According to the Kona CDP, Kaloko Makai is identified as a Neighborhood TOD. The project will provide on-site and off-site infrastructure systems that will integrate with regional public and private facilities. Internal roadways will connect to existing and future roadways. This project is consistent with the Land Use and Transportation policies described in the Kona CDP.

Kaloko Makai has also set aside land for a hospital, schools and a fire station. Refer to Sections 2.3.4, 2.3.5, and 2.3.6 for further discussion.

(6) Coastal hazards

Objectives: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies

(A) Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;

(B) Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards;

(C) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and

(D) Prevent coastal flooding from inland projects.

Comment: The project site is not subject to tsunami, storm waves, subsidence, or stream flooding, nor will the project intensify natural hazard conditions.

The Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency (FEMA) identifies the project site as lying within Zone X, areas determined to be outside the 0.2% annual chance floodplain (Community Panel 1551660684C and 1551660703C revised April 2, 2004).

All structures will be constructed in compliance with requirements of the International Building Code (IBC), appropriate to the Zone 4 Seismic Probability Rating, as well as applicable County, State, or Federal standards.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff, develop a Pollution Prevention Plan, and will implement wastewater and groundwater monitoring.

(7) Managing Development

Objective: Improve the development review process, communication and public participation in the management of coastal resource and hazards.

Policies:

(B) Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and

(C) *Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.*

Comment: Kaloko Makai is not located along the shoreline, however the Second Draft EIS is available for public review and discusses potential environmental and social impacts and mitigation measures.

(8) Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

(A) Promote public involvement in coastal zone management processes.

Comment: Kaloko Makai is not located along the shoreline, however the Second Draft EIS is available for public review and discusses potential environmental and social impacts and mitigation measures.

As discussed in Chapter 9, information regarding the proposed project has been distributed to the public through agency meetings, community consultation, publication of Environmental Impact Statement Preparation Notice (EISPN) (September 2010), the Draft EIS (July 2011) and this Second Draft EIS..

Through this Second Draft EIS, the State Land Use Boundary Amendment petition hearings, and the County permitting process, the public has additional opportunities to be involved in the public review process for Kaloko Makai.

(9) Beach Protection

Objective: Protect beaches for public use and recreation.

Policies:

(A) Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;

Comment: Kaloko Makai is not a coastal dependent project and is located mauka of Queen Ka‘ahumanu Highway. The project will not construct structures within or near the shoreline setback.

(10) Marine Resources

Objective: Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

(A) Ensure that use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

Comment: As discussed in Section 3.5.1, significant impact on marine resources is not anticipated. Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County’s grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff and develop a Pollution Prevention Plan, and will implement wastewater and groundwater monitoring.

5.1.4 Hawai'i State Plan, Chapter 226, Hawai'i Revised Statues

The Hawai'i State Plan, embodied in Chapter 226, Hawai'i Revised Statutes (HRS), serves as a guide for goals, objectives, policies, and priorities for the State. The State Plan provides a basis for determining priorities, allocating limited resources, and improving coordination of State and County plans, policies, programs, projects, and regulatory activities. The following section analyzes project impacts with respect to applicable State Plan objectives and policies.

SEC. 226-5 Objectives and policies for population.

(b)(1) Manage population growth statewide in a manner that provides increased opportunities for Hawai'i's people to pursue their physical, social, and economic aspirations while recognizing the unique needs of each county.

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

(b)(7) Plan the development and availability of land and water resources in a coordinated manner so as to provide for the desired levels of growth in each geographic area.

> **Comment:** Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept with land available for a new Kona regional hospital. A lodge and business center will support the commercial needs within the TOD, including the hospital. In addition, lands will be set aside for two elementary schools, one middle school and fire station.
>
> Kaloko Makai will utilize R-1 quality water from its on-site wastewater treatment plant (WWTP) for general irrigation of common landscaping features, including the district-scale park, neighborhood parks, open spaces (as necessary), and the schools. The average R-1 recycled water flow rate of 2.3 mgd has the potential to provide irrigation water for approximately 115 acres without routine supplemental water addition.
>
> As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site. In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline groundwater at a lower elevation (363-feet) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

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

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

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

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

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

(b)(15) Promote and protect intangible resources in Hawai'i, such as scenic beauty and the aloha spirit, which are vital to a healthy economy.

> **Comment:** The project contributes to economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light-industrial uses within the development.
>
> There will be approximately 293 acres of parks and open space, including the preservation of the Kaloko Makai Dryland Forest.

SEC. 226-7 Objectives and policies for the economy – agriculture.

(a)(3) An agricultural industry that continues to constitute a dynamic and essential component of Hawai'i's strategic, economic, and social well-being.

(b)(2) Encourage agriculture by making best use of natural resources.

(b)(16) Facilitate the transition of agricultural lands in economically nonfeasible agricultural production to economically viable agricultural use.

> **Comment:** As discussed in Section 3.3, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

SEC. 226-11 Objectives and policies for the physical environment – land-based, shoreline, and marine resources.

(a)(1) Prudent use of Hawai'i's land-based, shoreline, and marine resources.

(a)(2) Effective protection of Hawai'i's unique and fragile environmental resources.

(b)(1) Exercise an overall conservation ethic in the use of Hawai'i's natural resources.

(b)(2) Ensure compatibility between land-based and water-based activities and natural resources and ecological systems.

(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.

(b)(4) Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.

(b)(6) Encourage the protection of rare or endangered plant and animal species and habitats native to Hawai'i.

(b)(8) Pursue compatible relationships among activities, facilities, and natural resources.

(b)(9) Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.

Comment: As discussed in Section 3.5.2, it is unlikely that there would be any effects to the nearshore environment as a result of increases in nutrient concentrations in groundwater. Results of a four-year study from two golf courses in Keauhou indicated that even with long-term input of extremely high nutrient subsidies, there were situations where the receiving environment experienced no negative effects. Similar lack of impacts would be expected at the Kaloko-Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

Refer to Section 3.5.2 Nearshore Marine Environment and Ponds for more details on existing conditions, potential impacts and mitigation measures.

During a survey in early 2012 conducted for the Kaloko Makai project, evidence of groundwater input at stations within the inshore half of 'Aimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater

into ‘Aimakapā Pond than was previously measured. These results suggest that ‘Aimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historic Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historic Park ponds.

Hence, all data indicate that while the enclosed basin of ‘Aimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment. The recent detection of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has no yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combine to result in greatly restricted flow of groundwater into ‘Aimakapā Pond.

The restricted flow of freshwater through the ponds is evident by the near complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County’s grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff, pollution prevention and will implement a wastewater and groundwater monitoring program.

Natural areas within Kaloko Makai will be preserved and remain undeveloped, such as the Kaloko Makai Dryland Forest Preserve along the southern portion of the project site.

Kaloko Makai has been designed to establish preservation areas to protect archaeological sites within the project site and preserve the historic Kohanaiki Trail (“Road to the Sea” Trail).

SEC. 226-12 Objectives and policies for the physical environment – scenic, natural beauty, and historic resources.

(b)(1) Promote the preservation and restoration of significant natural and historic resources.

(b)(2) Provide incentives to maintain and enhance historic, cultural, and scenic amenities.

(b)(3) Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.

(b)(4) Protect those special areas, structures, and elements that are an integral and functional part of Hawai'i's ethnic and cultural heritage.

(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai'i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Several of the non-burial preserve sites are major intact trail systems that run for several hundred meters, and two sites are *ahupua'a* walls that are recommended for preservation with breaches allowed. Other preserve sites include ceremonial enclosures and platforms (possible *heiau*), excellent examples of habitation complexes (some of which utilize both surface and sub-surface areas), and a few petroglyph panels.

Kohanaiki Trail ("Road to the Sea" Trail) is a long *mauka/makai* trail originating in the Kohanaiki Homesteads. The *mauka-makai* alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.

The Kaloko Makai project site is located in an undeveloped area mauka of Queen Ka'ahumanu Highway and north of Kaloko Industrial Park. The development of the project site will result in the replacement of vacant and vegetated land with urban uses such as homes, a hospital, commercial / retail, and light industrial uses. Kaloko Makai will be visible almost entirely from the shoreline and Queen Ka'ahumanu Highway looking mauka and visible from existing surrounding developments which lie to the east. The project site will appear as a continuation of the proposed Kaloko Heights and Kula Nei developments to the east and Kaloko Industrial Park to the south.

There will be approximately 293 acres of parks and open space consisting of 87 acres of open space, 56 acres of parks, and preservation of the 150-acre Kaloko Makai Dryland Forest Preserve. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity. Refer to Section 3.6 for further discussion.

SEC. 226-13 Objectives and policies for the physical environment – land, air and water quality.
(a)(1) Maintenance and pursuit of improved quality in Hawai'i's land, air, and water resources.

(a)(2) Greater public awareness and appreciation of Hawai'i's environmental resources.

(b)(1) Foster educational activities that promote a better understanding of Hawai'i's limited environmental resources.

(b)(2) Promote the proper management of Hawai'i's land and water resources.

(b)(3) Promote effective measures to achieve desired quality in Hawai'i's surface, ground, and coastal waters.

(b)(4) Encourage actions to maintain or improve aural and air quality levels to enhance the health and well-being of Hawai'i's people.

(b)(5) Reduce the threat to life and property from erosion, flooding, tsunamis, hurricanes, earthquakes, volcanic eruptions, and other natural or man-induced hazards and disasters.

(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawai'i's communities.

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

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai'i's General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP.

The project site is not subject to tsunami, storm waves, subsidence, or stream flooding, nor will the project intensify natural hazard conditions.

As discussed in Section 3.5.2, it is unlikely that there would be any effects to the nearshore environment as a result of increases in nutrient concentrations in groundwater. Results of a four-year study from two golf courses in Keauhou indicated that even with long-term input of extremely high nutrient subsidies, there are situations where there are no negative effects to the receiving environment. Similar lack of impact would be expected at the Kaloko-Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

Refer to Section 3.5.2 Nearshore Marine Environment and Ponds for more details on existing conditions, potential impacts and mitigation measures.

During a survey in early 2012 conducted for the Kaloko Makai project, evidence of groundwater input at stations within the inshore half of ʻAimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater into ʻAimakapā Pond than was previously measured. These results suggest that ʻAimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historic Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historic Park ponds.

Hence, all data indicate that the enclosed basin of ʻAimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment. The recent detection of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has no yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combine to result in greatly restricted flow of groundwater into ʻAimakapā Pond.

The restricted flow of freshwater through the ponds is borne out by the near complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff and pollution prevention, and will implement wastewater and groundwater monitoring.

Short-term impacts to regional air quality will likely arise from construction, and construction related activities. For a project of this nature, there are two potential types of air pollution 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. Fugitive dust emissions may result from grading and dirt-moving activities associated with site clearing and preparation work. Furthermore, project construction activities may potentially obstruct the normal flow of traffic to such an extent that overall vehicular emissions in the project area will temporarily increase. All construction and construction related activities will comply with the provision set forth in Chapter 11-60.1-33 of the HAR on fugitive dust.

In the long-term (post-construction), the increase in regional population and internal community traffic may potentially result in a long-term increase in emissions; however, it is anticipated that concentrations will fall well within State and Federal standards. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide, and also emit nitrogen oxides among other contaminants.

As discussed in Section 4.6 Air Quality, the air quality assessment was based on future traffic conditions and proposed configurations described in the Traffic Impact Assessment Report (TIAR) (see Section 4.4 Roadways and Traffic).

The worst-case 1-hour carbon monoxide concentrations without the project in 2025, 2035 and 2045 are within the National Ambient Air Quality Standards (AAQS) of 35 parts per million (ppm) and the State standard of 9 ppm.

With the project and assuming the roadway improvements identified in the TIAR are implemented, estimated worst-case 1-hour carbon monoxide concentrations in the year 2025 were predicted to increase compared to the without project scenario at all locations studied. However, the predicted worst-case concentrations remained within the standards. This trend continues in 2035 and 2045 With Project.

All predicted worst-case 8-hour concentrations for the 2011 scenario were within both the National AAQS of 9 ppm and the State standard of 4.4 ppm. The predicted concentrations for 2025 without the project increased slightly or remain nearly unchanged compared to the 2011 scenario. Analysis also shows that this trend would continue through 2035 and 2045 without the Project, and worst-case 8-hour concentrations should remain within the standards through 2045.

For 2025 with Project scenario, worst-case 8-hour concentrations increased at all locations studied. Worst-case concentrations for 2035 and 2045 were predicted to increase slightly or remain nearly unchanged, but still remain within the standards.

The air quality study concludes that implementing any air quality mitigation measures for long-term traffic-related impacts is probably unnecessary and unwarranted.

No significant impacts on air quality are anticipated with appropriate mitigation during the construction phase and no violations of federal and state air quality standards are anticipated in the long-term.

Refer to Section 4.6 Air Quality for detailed discussion on existing conditions, potential impacts, and mitigation measures.

SEC. 226-14 Objectives and policies for facility systems – general.

(b)(2) Encourage flexibility in the design and development of facility systems to promote prudent use of resources and accommodate changing public demands and priorities.

(b)(3) Ensure that required facility systems can be supported within resource capacities and at a reasonable cost to the user.

(b)(4) Pursue alternative methods of financing programs and projects and cost-saving techniques in the planning, construction, and maintenance of facility systems.

Comment: Kaloko Makai does not involve planning for the State's facility systems. However, Kaloko Makai is setting aside land for a hospital, two elementary schools, one middle school, a County fire station, and a future DOT interchange near Queen Ka'ahumanu Highway and Hina Lani Street.

SEC. 226-15 Objectives and policies for facility systems – solid and liquid wastes.

(a)(2) Provision of adequate sewerage facilities for physical and economic activities that alleviate problems in housing, employment, mobility, and other areas.

(b)(1) Encourage the adequate development of sewerage facilities that complement planned growth.

(b)(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

(b)(3) Promote research to develop more efficient and economical treatment and disposal of solid and liquid wastes.

Comment: Kaloko Makai will construct and operate a private wastewater treatment plant (WWTP) within the project, which would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of drinking water for irrigation. Design and construction will be in accordance with State DOH and County of Hawai‘i standards. Section 4.10.2 contains further discussion.

To reduce solid waste generation, Kaloko Makai will incorporate waste diversion and reduction facilities into its design and recycling will be encouraged. Section 4.10.4 contains further discussion.

SEC. 226-16 Objective and policies for facility systems – water.

(a) Planning for the State's facility systems with regard to water shall be directed towards achievement of the objective of the provision of water to adequately accommodate domestic, agricultural, commercial, industrial, recreational, and other needs within resource capacities.

(b)(1) Coordinate development of land use activities with existing and potential water supply.

(b)(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.

(b)(3) Reclaim and encourage the productive use of runoff water and wastewater discharges.

(b)(4) Assist in improving the quality, efficiency, service, and storage capabilities of water systems for domestic and agricultural use.

(b)(5) Support water supply services to areas experiencing critical water problems.

(b)(6) Promote water conservation programs and practices in government, private industry, and the general public to help ensure adequate water to meet long-term needs.

Comment: Kaloko Makai's water demand will require additional water source, storage and transmission facilities. As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site. In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline

groundwater at a lower elevation (363 ft.) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

As mentioned previously, Kaloko Makai will construct and operate a private WWTP within the project. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of drinking water for irrigation. Section 4.10.2 contains further discussion.

SEC. 226-17 Objective and policies for facility systems – transportation.

(b)(1) Design, program, and develop a multi-modal system in conformance with desired growth and physical development as stated in this chapter.

(b)(2) Coordinate state, county, federal and private transportation activities and programs toward the achievement of statewide objectives.

(b)(3) Encourage a reasonable distribution of financial responsibilities for transportation among participating governmental and private parties.

(b)(6) Encourage transportation systems that serve to accommodate present and future development needs of communities.

(b)(9) Encourage the development of transportation systems and programs which would assist statewide economic growth and diversification.

(b)(10) Encourage the design and development of transportation systems sensitive to the needs of affected communities and the quality of Hawai'i's natural environment.

(b)(11) Encourage safe and convenient use of low-cost, energy-efficient, non-polluting means of transportation.

(b)(12) Coordinate intergovernmental land use and transportation planning activities to ensue the timely delivery of supporting transportation infrastructure in order to accommodate planned growth objectives.

Comment: Consistent with the policies and goals stated in the Kona CDP, Kaloko Makai will utilize TOD and Traditional Neighborhood Development (TND) to promote transit-oriented and pedestrian oriented development, decreasing vehicular transit use and facilitating the management of traffic congestion.

A transit station and compact TOD Village on Ane Keohokālole Highway is an integral part of the multi-modal transit corridor called for in the Kona CDP; Kaloko Makai incorporates multiple road interconnections with neighbors; Kaloko Makai is committed to concurrent construction of the Ane Keohokālole Highway and Kamanu Street extension.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile).

Kaloko Makai will minimize trips onto area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic.

Kaloko Makai will provide roadway connections to existing and/or future developments on adjacent lands, thereby improving regional circulation.

SEC-226-18 Objectives and policies for facility systems – energy.
(a)(2) Increased energy self-sufficiency where the ratio of indigenous to imported energy use in increased.

(a)(4) Reduction, avoidance, or sequestration of greenhouse gas emissions from energy supply and use.

(c)(4)(C) Adoption of energy-efficient practices and technologies.

(c)(6) Support research, development, and demonstration of energy efficiency, load management, and other demand-side management programs, practices, and technologies.

(c)(7) Promote alternate fuels and transportation energy efficiency.

(c)(8) Support actions that reduce, avoid, or sequester greenhouse gases in utility, transportation, and industrial sector applications.

Comment: Energy conservation measures will be implemented where appropriate in the design of Kaloko Makai, as discussed in Section 2.5.

SEC. 226-18.5 Objectives and policies for facility systems – telecommunications.
(c)(2) Encourage public and private sector efforts to develop means for adequate, ongoing telecommunications planning;

(c)(3) Promote efficient management and use of existing telecommunications systems and services

Comment: Kaloko Makai is not involved with the planning of the State's telecommunications facility systems. However, coordination with various utility companies will be undertaken to develop the telecommunications systems required to service the project.

SEC. 226-19 Objectives and policies for socio-cultural advancement – housing.

(a)(1) 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 nonprofit 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.

(a)(2) The orderly development of residential areas sensitive to community needs and other land uses.

(a)(3) The development and provision of affordable rental housing by the State to meet the housing needs of Hawai'i's people.

(b)(1) Effectively accommodate the housing needs of Hawai'i's people.

(b)(2) Stimulate and promote feasible approaches that increase housing choices for low-income, moderate-income, and gap-group households.

(b)(3) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.

(b)(5) Promote design and location of housing developments taking into account the physical setting, accessibility to public facilities and services, and other concerns of existing communities and surrounding areas.

(b)(6) Facilitate the use of available vacant, developable, and underutilized urban lands for housing.

(b)(7) 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.

(b)(8) Promote research and development of methods to reduce the cost of housing construction in Hawai'i.

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai'i's General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around an initial urgent care medical facility with land available for a new Kona regional hospital. Kaloko Makai has been designated as a Neighborhood TOD in the Official Kona Land Use Map of the *Kona Community Development Plan* (September 2008).

Over the 30-year projected development schedule, 5,000 homes will be integrated into transit- and pedestrian-oriented urban and traditional neighborhood centers.

SEC. 226-20 Objective and policies for socio-cultural advancement – health.

(a)(1) Fulfillment of basic individual health needs of the general public.

(a)(2) Maintenance of sanitary and environmentally healthful conditions in Hawai'i's communities.

Comment: On-site infrastructure improvements will be constructed to comply with DOH and County standards. The on-site improvements will ensure sanitary and healthful conditions are maintained for the benefit of area residents.

As discussed in Section 2.3.1.1 Kaloko Makai is strategically located to incorporate a new hospital into its master plan and is actively pursuing a hospital developer/operator for the new facility.

Kaloko Makai will set aside approximately 40-acres of land for the development of a hospital/medical care facility, which Kaloko Makai is prepared to transfer at no cost to a hospital developer/operator.

The Kaloko Makai hospital helps to promote and protect health and wellness, while also serving to diversify and strengthen the local economy.

SEC. 226-21 Objective and policies for socio-cultural advancement – education.
(b)(2) Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.

Comment: Kaloko Makai has set aside 42.0 acres of land for two elementary schools and one middle school.

SEC. 226-23 Objectives and policies of socio-cultural advancement – leisure.
(b)(1) Foster and preserve Hawai'i's multi-cultural heritage through supportive cultural, artistic, recreational and humanities-oriented programs and activities.

(b)(3) Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.

(b)(4) Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.

(b)(5) Ensure opportunities for everyone to use and enjoy Hawai'i's s recreational resources.

(b)(6) Assure the availability of sufficient resources to provide for future cultural, artistic, and recreational needs.

Comment: Kaloko Makai will contain approximately 293 acres of parks and open space, including preservation of the Kaloko Makai Dryland Forest Preserve. Kaloko Makai will provide interlinking natural features, open space and cultural features as core components of the community; the historic Kohanaiki Trail ("Road to the Sea" Trail) runs through the

entire length of the project. It will be restored for use, and will interconnect the communities within the project.

SEC. 226-25 Objectives and policies of socio-cultural advancement – culture.

(a) Planning for the State's socio-cultural advancement with regard to culture shall be directed toward the achievement of the objective of enhancement of cultural identities, traditions, values, customs, and arts of Hawai'i's people.

(b)(1) Foster increased knowledge and understanding of Hawai'i's ethnic and cultural heritages and history of Hawai'i.

(b)(2) Support the activities and conditions to promote cultural values, customs, and arts that enrich the lifestyles of Hawai'i's people and which are sensitive and responsive to family and community needs.

(b)(3) Encourage increased awareness of the effects of the proposed public and private actions on the integrity and quality of cultural and community lifestyles in Hawai'i.

Comment: Archaeological research shows the project area contains hundreds of culturally and historically significant sites. Sites in the project area include permanent and temporary habitation structures—many of which incorporate natural features of subterranean lava tubes into their design, agricultural features (including extensive rock mounds used to plant sweet potatoes), at least 65 burials located in approximately two dozen burial sites, ahu (stone markers), trails, petroglyphs, ahupua'a boundary walls, papamū (traditional gaming site), and others.

All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawai'i Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval. Section 4.1 contains further discussion.

There were no specific on-going traditional cultural practices identified relative to the land within the Property. The historic Kohanaiki Trail ("Road to the Sea" Trail) runs through (mauka-makai) the entire length of the project; it will be restored and will interconnect the communities within the project. Refer to Sections 4.1, 4.2 and 4.3 for further discussion.

SEC. 226-103 Economic priority guidelines.

(a)(1)(A) Encourage investments which:

(i) Reflect long term commitments to the State;
(ii) Rely on economic linkages within the local economy;
(iii) Diversify the economy;
(iv) Reinvest in the local economy;
(v) Are sensitive to community needs and priorities

(e)(1) Maintain and improve water conservation programs to reduce the overall water consumption rate.

(e)(2) Encourage the improvement of irrigation technology and promote the use of non-potable water for agricultural and landscaping purposes.

(e)(3) Increase the support for research and development of economically feasible alternative water resources.

(e)(4) Explore alternative funding sources and approaches to support future water development programs and water system improvements.

(f)(4) Encourage the development and use of energy conserving and cost-efficient transportation systems.

Comment: The project contributes to economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light-industrial uses within the development.

Kaloko Makai will construct and operate a private WWTP within the project. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of drinking water for irrigation. Design and construction will be in accordance with State DOH and County of Hawaiʻi standards. Section 4.10.2 contains further discussion.

Kaloko Makai's water demand will require additional water source, storage and transmission facilities. As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site. In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline groundwater at a lower elevation (363 ft.) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

Kaloko Makai will minimize trips onto area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic.

Energy conservation measures will be implemented where appropriate in the design of Kaloko Makai. Refer to Section 2.5 for further discussion.

SEC. 226-104 Population growth and land resources priority guidelines.

(a)(1) Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawai'i's people.

(a)(3)Ensure that adequate support services and facilities are provided to accommodate the desired distribution of future growth throughout the State.

(a)(4) Encourage major state and federal investments and services to promote economic development and private investment to the neighbor islands, as appropriate.

(b)(1) Encourage urban growth primarily to existing urban areas where adequate public facilities are already available or can be provided with reasonable public expenditures, and away from areas where other important benefits are present, such as protection of important agricultural land or preservation of lifestyles.

(b)(2) Make available marginal or non-essential agricultural lands for appropriate urban uses while maintaining agricultural lands of importance in the agricultural district.

(b)(5) In order to preserve green belts, give priority to state capital-improvement funds which encourage location of urban development within existing urban areas except where compelling public interest dictates development of a noncontiguous new urban core.

(b)(6) Seek participation from the private sector for the cost of building infrastructure and utilities and maintaining open space.

(b)(9) Direct future urban development away from critical environmental areas or impose mitigating measures so that negative impacts on the environment would be minimized.

(b)(10) Identify critical environmental areas in Hawai'i to include but not be limited to the following: watershed and recharge areas; wildlife habitats (on land and in the ocean); areas with endangered species of plants and wildlife; natural streams and water bodies; scenic and recreation shoreline resources; open space and natural areas; historic and cultural sites; areas particularly sensitive to reduction in water and air quality; and scenic resources.

(b)(12) Utilize Hawai'i's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline, conservation lands, and other limited resources for future generations.

(b)(13) Protect and enhance Hawai'i's shoreline, open spaces, and scenic resources.

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai‘i’s General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP.

The project is intended to accommodate projected growth rates on Hawai‘i Island, as well as the demand for homes in West Hawai‘i. The proposed project could affect population through the in-migration of State and County residents.

As discussed in Section 3.3, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

As part of the project proposal, approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity. Refer to Section 3.6 for further discussion.

SEC. 226-106 Affordable housing priority guidelines.

(a)(2) Encourage the use of alternative construction and development methods as a means of reducing production costs.

(a)(4) Create incentives for development which would increase home ownership and rental opportunities for Hawai‘i’s low – and moderate – income households, gap-group households, and residents with special needs.

(a)(6) Encourage public and private sector cooperation in the development of rental housing alternatives.

(a)(8) Give higher priority to the provision of quality housing that is affordable for Hawai‘i’s residents and less priority to development of housing intended primarily for individuals outside of Hawai‘i.

Comment: Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at a variety of densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), hospital, two elementary schools, a middle school and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai‘i requirements.

SEC. 226-108 Sustainability priority guidelines.

(1) Encouraging balanced economic, social, community, and environmental priorities;
(2) Encouraging planning that respects and promotes living within the natural resources and limits of the State;
(3) Promoting a diversified and dynamic economy;
(4) Encouraging respect for the host culture;
(5) Promoting decision based on meeting the needs of the present without compromising the needs of future generations’;

(6) Considering the principles of the ahupuaʻa system; and
(7) Emphasizing that everyone, including individuals, families, communities, businesses, and government, has the responsibility for achieving a sustainable Hawaii

Comment: Kaloko Makai is being developed to meet sustainable and smart growth principles as described in the Kona CDP. Most of the future growth in Kona will be directed to an Urban Area as defined in the Kona CDP's Official Kona Land Use Map. Within the Urban Area growth would be directed to compact villages along proposed transit routes or to infill areas within, or adjacent to existing development. Kaloko Makai is identified as one of ten compact villages (TOD) where growth would be directed. The TOD villages are located at a minimum one mile apart, between major transit stations along Ane Keohokālole Highway.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around an initial urgent care medical facility with land available for a new Kona regional hospital. In addition, lands will be set aside for two elementary schools, one middle school and fire station.

The project is intended to accommodate projected growth rates on Hawaiʻi Island, as well as the demand for homes in West Hawaiʻi. The proposed project could affect population through the in-migration of State and County residents. Kaloko Makai will include up to 5,000 new single- and multi-family residential lots and units at a variety of densities.

Kaloko Makai is balancing economic, social, community, and environmental resources by:

- Providing 293 acres of open space, including 56 acres of parks and preservation of approximately 150 acre native Dryland Forest. Through the establishment of the Native Dryland Forest Preserve, a variety of species will have continued protection and their habitat set aside in perpetuity.
- Preserving the Kohanaiki Trail ("Road to the Sea" Trail).
- Preserving 72 sites and data recovery of 80 sites.
- Preserving endangered flora species including hala pepe, uhiuhi, maʻaloa, and ʻaiea
- Contributing economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light industrial uses within the development.

In the design and construction of Kaloko Makai, SCD – TSA Kaloko Makai, LLC will implement feasible measures to promote energy conservation and environmental stewardship, such as the standards and guidelines promulgated by the US Green Building Council, the United States Environmental Protection Agency (EPA) ENERGY STAR Program or other similar programs. Refer to Section 2.5 and Appendix Q.

5.1.5 State Functional Plans

State Functional Plans serve as the primary implementing vehicle for goals, objectives and policies of the Hawai‘i State Plan. The functional plans guide implementation of State and County actions in the following thirteen areas: agriculture, transportation, conservation lands, tourism, water resources development, energy, recreation, historic preservation, health, housing, higher education, employment, and human services. The functional plans applicable to the proposed Kaloko Makai project, along with each plan’s applicable objectives, policies, and actions are discussed below.

State Agriculture Functional Plan

Issue Area: Land and Water

Policy (H)(2) Conserve and protect important agricultural lands in accordance with the Hawai‘i State Constitution.

> **Comment:** As discussed in Section 3.3, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

State Conservation Lands Functional Plan

Issue Area II: Management

Policy IIB(1): Develop protection and preservation of habitats of rare and endangered wildlife and native ecosystems in Hawai‘i.

Policy IID(3): Develop recreational and archaeological resources on the shoreline and mauka areas.

> **Comment:** As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai‘i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.
>
> Kohanaiki Trail (“Road to the Sea” Trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.
>
> Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.
>
> As part of the project, 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity. Refer to Section 3.6 for further discussion.

State Education Functional Plan

A(4): Services and Facilities Policy: Ensure the provision of adequate and accessible educational services and facilities that are designed to meet individual and community needs.

B(1) Alternatives for Funding and Delivery: Explore alternatives for funding and delivery of educational services to improve the overall quality of education.

> **Comment:** Kaloko Makai has set aside approximately 42.0 acres for two elementary schools and one middle school.

State Historic Preservation Functional Plan

Policy B.1: Provide timely historic property reviews which are integrated effectively into the land use regulatory system.

Policy C.2: Encourage the preservation and maintenance of historic properties through economic incentives and support.

Policy E.1: Provide support and coordination to activities involved with the collection and conservation of historic records and materials.

> **Comment:** As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawaiʻi Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.
>
> Kohanaiki Trail ("Road to the Sea" trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.
>
> Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.

State Housing Functional Plan

Issue Area: Homeownership

Policy A(2): Encourage increased private sector participation in the development of affordable for-sale housing units.

Policy A(3): Ensure that (1) housing project and (2) projects which impact housing provide a fair share/adequate amount of affordable homeownership opportunities.

Issue Area: Rental Housing

Policy B(2): Encourage increased private sector participation in the development of affordable rental housing.

Policy B(3): Ensure that projects which impact housing provide affordable rental opportunities for employees.

Issue Area: Rental Housing for the Elderly and Other Special Need Groups

Policy C(7): Integrate special needs housing in new and existing neighborhoods.

> **Comment:** Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at low- and medium-densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), hospital, two elementary schools, a middle school and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai`i requirements.

State Recreation Functional Plan

Policy I-A(4): Develop areas mauka of existing beach parks to increase their capacities to diversify and encourage activities away from the shoreline.

Policy II-A(1): Plan and develop facilities and areas that feature the natural and historic/cultural resources of Hawai'i. Develop interpretive programs for these areas.

Policy II-C(1): Meet the demand for recreational opportunities in local communities.

> **Comment:** Kaloko Makai will contain approximately 293 acres of open space and parks, including preservation of historic trails and creation of the Kaloko Makai Dryland Forest Preserve. Kaloko Makai will provide interlinking natural features, open space and cultural features as core components of the community; the historic Kohanaiki Trail ("Road to the Sea" Trail) runs through the entire length of the project. It will be restored and used, and will interconnect the communities within the project.

State Transportation Functional Plan

Policy I.A.1: Increase transportation capacity and modernize transportation infrastructure in accordance with existing master plans and laws requiring accessibility for people with disabilities.

Policy I.A.2: Improve regional mobility in areas of the State experiencing rapid urban growth and road congestion.

Policy I.A.3: Promote the development of public transportation systems.

Policy I.B.1: Close the gap between where people live and work through decentralization, mixed zoning and related initiatives.

Policy I.C.1: Increase the capacity of the existing transportation infrastructure.

Policy III.A.2: Pursue private sector participation in the financing of transportation systems, developments and projects.

Comment: Kaloko Makai will utilize TOD and TND to promote transit-oriented and pedestrian oriented development, decreasing vehicular transit use and facilitating the management of traffic congestion.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

Kaloko Makai will minimize trips onto area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic.

Kaloko Makai will provide roadway connections to existing and/or future developments on adjacent lands, thereby improving regional circulation.

State Water Resources Functional Plan

Policy B(2): Manage surface drainage areas and ground water aquifers to prevent contamination of sources of water supply.

Policy D(1): Promote the planning and development of new water supplies, giving priority support to areas experiencing critical water problems.

Policy E(2): Increase the use of treated sewage effluent and other nonpotable water for irrigation purposes.

Comment: Kaloko Makai will construct and operate a private WWTP within the project. An on-site WWTP would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of potable water for irrigation. Design and construction will be in accordance with State DOH and County of Hawai‘i standards. Section 4.10.2 contains further discussion.

Kaloko Makai’s water demand will require additional water source, storage and transmission facilities. As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site.

In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline groundwater at a lower elevation (363 ft.) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures. Kaloko Makai will implement mitigation measures to address storm and surface water runoff, pollution prevention, and will implement wastewater and groundwater monitoring.

5.2 COUNTY OF HAWAIʻI

5.2.1 County of Hawaiʻi General Plan

The General Plan designation for the Kaloko Makai site is "Urban Expansion" and Conservation (for the area of the Dryland Forest.) The "Urban Expansion Area "allows for a mix of high density, medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined" (see Figure 2-7).

The County of Hawaiʻi General Plan was adopted by the Hawaiʻi County Council in February 2005 (amended in December 2006). The County of Hawaiʻi's General Plan is the policy document for the long-range comprehensive development of the island of Hawaiʻi. The General Plan provides the direction for the future growth of the County. It brings into focus the relationship between residents and their pursuits and institutions, offering policy statements that embody the expressed goals for present and future generations.

The Plan contains goals, policies and standards to guide the development of the County in 13 areas: economic, energy, environmental quality, flood control and drainage, historic sites, natural beauty, natural resources and shoreline, housing, public facilities, public utilities, recreation, transportation, and land use. The goals, policies, and standards related to the proposed project are discussed below:

Economic

Goals:

(a) Provide residents with opportunities to improve their quality of life through economic development that enhances the County's natural and social environments.

(b) Economic development and improvement shall be in balance with the physical, social, and cultural environments of the island of Hawai'i

(c) Strive for diversity and stability in the economic system.

(d) Provide an economic environment that allows new, expanded, or improved economic opportunities that are compatible with the County's cultural, natural and social environment.

(e) Strive for an economic climate that provides its residents an opportunity for choice of occupation.

(f) Strive for diversification of the economy by strengthening existing industries and attracting new endeavors.

Policies

(d) Require a study of the significant cultural, social, and physical impacts of large developments prior to approval.

(g) Capital improvements program shall improve the quality of existing commercial and industrial areas.

(h) The land, water, air, and people shall be considered as essential resources for present and future generations and should be protected and enhanced through the use of economic incentives.

(l) Identify and encourage primary industries that are consistent with the social, physical, and economic goals of the residents of the County.

(p) Identify the needs of the business community and take actions that are necessary to improve the business climate.

(x) Encourage the health/wellness industry.

Comment: The project contributes to economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light-industrial uses within the development.

Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at low- and medium-densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), hospital, two elementary schools, a middle school and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems).

ENERGY

Goals

(a) Strive towards energy self-sufficiency.

(b) Establish the Big Island as a demonstration community for the development and use of natural energy resources.

Policies

(a) Encourage the development of alternate energy resources.

(e) Ensure a proper balance between the development of alternative energy resources and the preservation of environmental fitness and ecologically significant areas.

(k) Strive to diversify the energy supply and minimize the environmental impacts associated with energy usage.

(n) Encourage energy saving design in the construction of buildings.

Comment: Energy conservation measures will be implemented where appropriate in the design of Kaloko Makai. Refer to Section 2.5 for further discussion.

ENVIRONMENTAL QUALITY

Goals:

(a) Define the most desirable use of land within the County that achieves an ecological balance providing residents and visitors the quality of life and an environment in which the natural resources of the island are viable and sustainable.

(b) Maintain and, if feasible, improve the existing environmental quality of the island.

(c) Control pollution.

Policies:

(a) Take positive action to further maintain the quality of the environment.

(g) Participate in watershed management projects to improve stream and coastal water quality and encourage local communities to develop such projects.

(h) Work with appropriate agencies to adopt appropriate measures and provide incentives to control point and nonpoint sources of pollution.

Comment: As discussed in Section 3.5.2, it is unlikely that there would be any effects to the nearshore environment as a result of increases in nutrient concentrations in groundwater. Results of a four-year study from two golf courses in Keauhou indicated that even with long-term input of extremely high nutrient subsidies, there are situations where there are no negative effects to the receiving environment. Similar lack of impact would be expected at the Kaloko-Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the

soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

Refer to Section 3.5.2 Nearshore Marine Environment and Ponds for more details on existing conditions, potential impacts and mitigation measures.

During a survey in early 2012 conducted for the Kaloko Makai project, evidence of groundwater input at stations within the inshore half of ʻAimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater into ʻAimakapā Pond than was previously measured. These results suggest that ʻAimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historic Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historic Park ponds.

Hence, all data indicate that the enclosed basin of ʻAimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment, the recent detection of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has no yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combine to result in greatly restricted flow of groundwater into ʻAimakapā Pond.

The restricted flow of freshwater through the ponds is borne out by the near complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and

minimizing the discharge of pollutants associated with soil disturbing activities in grading, grubbing and stockpiling.

Construction of BMPs will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will implement mitigation measures to address storm and surface water runoff and development of a Pollution Prevention Plan, and will implement wastewater and groundwater monitoring.

FLOODING AND OTHER NATURAL HAZARDS

Goals:

(a) Protect human life.
(b) Prevent damage to man-made improvements.
(c) Control pollution.
(d) Prevent damage from inundation.
(e) Reduce surface water and sediment runoff.
(f) Maximize soil and water conservation.

Policies:

(g) Development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws.
(j) The County and the private sector shall be responsible for maintaining and improving existing drainage systems and constructing new drainage facilities.
(m) Encourage grassed shoulder and swale roadway design where climate and grade are conducive.
(n) Develop drainage master plans from a watershed perspective that considers non-structural alternatives, minimizes channelization, protects wetlands that serve drainage functions, coordinates the regulation of construction and agricultural operation, and encourages the establishment of floodplains as public green ways.
(q) Consider natural hazards in all land use planning and permitting.
(r) Discourage intensive development in areas of high volcanic hazard.

Comment: Kaloko Makai is located mauka of Queen Ka‘ahumanu Highway. The project area is not subject to tsunami, storm waves, subsidence, or stream flooding, nor will the project intensify natural hazard conditions.

The FIRM prepared by FEMA identifies the project site as lying within Zone X, areas determined to be outside the 0.2% annual chance floodplain (Community Panel 1551660684C and 1551660703C revised April 2, 2004).

All structures will be constructed in compliance with requirements of the IBC, appropriate to the Zone 4 Seismic Probability Rating, as well as applicable County, State, and Federal standards.

HISTORIC SITES

Goals:

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai'i.

(b) Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

(c) Enhance the understanding of man's place on the landscape of understanding the system of ahupua'a.

Policies:

(c) Require both public and private developers of land to provide historical and archaeological surveys and cultural assessments, where appropriate, prior to the clearing or development of land when there are indications that the land under consideration has historical significance.

(d) Public access to significant historic sites and objects shall be acquired, where appropriate.

(f) Encourage the restoration of significant sites on private lands.

(g) Collect and distribute historic sites information of public interest and keep an inventory of sites.

(h) Aid in the development of a program of public education concerning historic sites.

(i) Signs explaining historic sites, buildings and objects shall be in keeping with the character of the area or the cultural aspects of the feature.

(n) Consider requiring Cultural Assessments for certain developments as part of the rezoning process.

(o) Recognize the importance of certain natural features in Hawaiian culture by incorporating the concept of "cultural landscapes" in land use planning.

Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai'i Register. Of the 341 sites in the project area, a total of eighty (80) sites are subject to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Kohanaiki Trail ("Road to the Sea" Trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.

NATURAL BEAUTY

Goals:

(a) Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

(b) Protect scenic vistas and view planes from becoming obstructed.

(c) Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

Policies

(a) Increase public pedestrian access opportunities to scenic places and vistas.

(d) Access easement to public or private lands that have natural or scenic value shall be provided or acquired for the public.

(e) Develop standard criteria for natural and scenic beauty as part of the design plans.

(f) Consider structural setback from major thoroughfares and highways and establish development and design guidelines to protect important viewplanes.

(h) Protect the views of areas endowed with natural beauty by carefully considering the effects of proposed construction during all land use reviews.

(i) Do not allow incompatible construction in areas of natural beauty.

Comment: Kaloko Makai will conform to all County ordinances regarding building heights, mass, and setbacks. The project will use appropriate materials, colors, site design standards, and landscaping for the area. Kaloko Makai will be in character with surrounding uses.

NATURAL RESOURCES AND SHORELINE

Goals

(a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.

(b) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.

(c) Protect and promote the prudent use of Hawai'i's unique, fragile, and significant environmental and natural resources.

(d) Protect rare or endangered species and habitats native to Hawai'i.

(e) Protect and effectively manage Hawai'i's open space, watersheds, shoreline, and natural areas.

(f) Ensure that alterations to existing land forms, vegetation, and construction of structures cause minimum adverse effect to water resources, and scenic and recreational amenities and minimum danger of floods, landslides, erosion, siltations, or failure in the event of an earthquake.

Policies

(a) Require users of natural resources to conduct their activities in a manner that avoids or minimizes adverse effects on the environment.

(h) Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.

(i) Encourage an overall conservation ethic in the use of Hawai'i's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawai'i.

(g) Promote sound management and development of Hawai'i's land and marine resources for potential economic benefit.

(h) Encourage and public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.

(i) Encourage an overall conservation ethic in the use of Hawai'i's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawai'i.

(j) Encourage the protection of watersheds, forest, brush, and grassland from destructive agents and uses.

(n) The installation of utility facilities, highways, and related public improvements in natural and wildland areas should avoid the contamination or despoilment of natural resources where feasible by design review, conservation principles, and by mutual agreement between the County and affected agencies.

(p) Encourage the use of native plants for screening and landscaping.

(r) Ensure public access provided to the shoreline, public trails and hunting areas, including free public parking where appropriate.

(s) Establish a system of pedestrian access trails to places of scenic, historic, cultural, natural, or recreational values.

(t) Preserve and protect significant lava tube caves.

Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai'i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Kohanaiki Trail ("Road to the Sea" Trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.

As part of the project proposal, approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity. Refer to Section 3.6 for further discussion.

As discussed in Section 3.5.2, it is unlikely that there would be any effects to the nearshore environment as a result of increases in nutrient concentrations in groundwater. Results of a four-year study from two golf courses in Keauhou indicated that even with long-term input of extremely high nutrient subsidies, there are situations where there are no negative effects to the receiving environment. Similar lack of impact would be expected at the Kaloko-Honokōhau region where nutrient subsidies would be far less than have occurred at Keauhou.

A potential mechanism for negative impact to nearshore marine and pond systems is increased sedimentation from wind and surface runoff as a consequence of grading and changes in land use. There appears to be little potential for alteration to the pond and marine communities offshore from increased sedimentation associated with the project for several reasons.

The climate of the Kaloko area is one of the driest in the Hawaiian Islands. On an annual basis, rainfall is likely to be far exceeded by evaporation at the proposed project site. The basaltic composition of the land surface is highly porous and is capable of absorbing rainfall with little or no surface runoff. Even in the event of heavy rainfall, the porous nature of the soil ground cover is such that sheet flow carrying suspended sediment toward the ocean would be expected to be relatively small. Rather, most rainwater that would enter the ocean as runoff would do so following percolation through the surface rock layers to the water table, followed by groundwater extrusion at the shoreline.

In addition, the predominant direction of wind is inland, and not toward the ocean and thus there is little potential for significant input of sediment to the marine and pond environment.

Refer to Section 3.5.2 Nearshore Marine Environment and Ponds for more details on existing conditions, potential impacts and mitigation measures.

During a survey in early 2012 conducted for the Kaloko Makai project, evidence of groundwater input at stations within the inshore half of ʻAimakapā Pond was detected as steep horizontal gradients of salinity and inorganic nutrients found in groundwater. To determine whether this situation was an anomaly, another sampling was conducted in November 2012. Results of this sampling indicated an even stronger flux of groundwater into ʻAimakapā Pond than was previously measured. These results suggest that ʻAimakapā Pond may be experiencing either increased groundwater input, or at least not a decrease in groundwater input relative to a decade earlier. As the existing development in the Kaloko Industrial area upslope of the Kaloko-Honokōhau National Historic Park ponds has been in place for the last decade, water quality in the ponds changes can be assumed to be influenced by the present level of development upslope from the Kaloko-Honokōhau National Historic Park ponds.

Hence, all data indicate that the enclosed basin of ʻAimakapā is characterized by long water residence time, resulting in continued deposition of organic sediment, the recent detection

of increased groundwater flux suggests that the pond is still functioning in part as an anchialine system, and has no yet reached a final stage of senescence.

Substantial data also indicates that groundwater flow is predominantly around, rather than through the ponds, and that water is actually flowing landward out of the ponds as a result of offset tidal gradients. These factors combine to result in greatly restricted flow of groundwater into ʻAimakapā Pond.

The restricted flow of freshwater through the ponds is borne out by the near complete lack of both vertical and horizontal gradients within the ponds, as well as substantial damping and lag of tidal oscillations (TNWRE 2002). Thus while the pond consists of water that has salinity less than one half marine waters, the brackish condition is not a result of high input of freshwater, but rather of more restricted exchange with the ocean water than groundwater.

HOUSING

Goals:

(a) Attain safe, sanitary, and livable housing for the residents of the County of Hawaiʻi.

(b) Attain a diversity of socio-economic housing mix throughout the different parts of the County.

(c) Maintain a housing supply that allows a variety of choices.

(d) Create viable communities with affordable housing and suitable living environments.

(e) Improve and maintain the quality and affordability of the existing housing inventory.

(f) Seek sufficient production of new affordable rental and fee-simple housing in the County in a variety of sizes to satisfactorily accommodate the needs and desires of families and individuals.

(g) Ensure that housing is available to all persons regardless of age, sex, marital status, ethnic background and income.

(h) Make affordable housing available in reasonable proximity to employment centers.

(i) Encourage and expand home ownership opportunities for residents.

Policies:

(a) Encourage a volume of construction and rehabilitation of housing sufficient to meet growth needs and correct existing deficiencies.

(k) Increase rental opportunities and choices in terms of quality, cost, amenity, style and size of housing, especially for low and moderate income households.

(t) Ensure that adequate infrastructure is available in appropriate locations to support the timely development of affordable housing.

(v) Work with, encourage and support private sector efforts in the provision of affordable housing.

(x) Vacant lands in urban areas and urban expansion areas should be made available for residential uses before additional agricultural lands are converted into residential uses.

(y) Aid and encourage the development of a wide variety of housing to achieve a diversity of socio-economic housing mix.

Comment: Kaloko Makai will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at low- and medium-densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), hospital, urgent care medical facility, two elementary schools, a middle school and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai`i requirements.

PUBLIC FACILITIES

Goals:

(a) Encourage the provision of public facilities that effectively service the community and visitor needs and seek ways of improving public service through better and more functional facilities in keeping with the environmental and aesthetic concerns of the community.

Policies:

(b) Coordinate with appropriate State agencies for the provision of public facilities to serve the needs of the community.

Comment: According to the Kona CDP Policy LU-2.6: TOD/TND Public Infrastructure and Facilities, states: "To encourage the development of TODs and TNDs, public financing sources shall pay 100% for:

- Major proposed trunk transit route,
- A transit station (or transit station component if the transit station is part of a private mixed-use project) within the Urban Core,
- A major park or plaza within the urban core."

Likewise, the Kona CDP states: "Public Financing of Infrastructure. In recognition of the regional benefits of major roads and transit stations, these types of improvements within TODs shall be funded with general revenue funding sources." (Kona CDP, Page 4-34). Refer to Sections 4.4 and 5.2.3 for further discussion.

PUBLIC FACILITIES – EDUCATION

Policies:

(a) Encourage continuous joint pre-planning of schools with Department of Education and University of Hawai'i to ensure coordination with roads, water, and other support facilities and considerations such as traffic and safety, and access for vehicle, bicycle, and pedestrian. Encourage master planning of present and proposed public and private institutions.

(b) Encourage combining schoolyards with county parks and allow school facilities for afterschool use by the community for recreational, cultural, and other compatible uses.

Comment: Kaloko Makai has set aside approximately 42.0 acres for two elementary schools and one middle school. The core and focus of the Kaloko Makai neighborhoods are schools

and adjoining parks which serve as civic spaces, neighborhood centers and gathering places for arts, culture, education and recreation.

PUBLIC FACILITIES – HEALTH AND SANITATION

Policies:

(e) Encourage the establishment or expansion of community health centers and rural health clinics.

(f) Continue to encourage programs such as recycling to reduce the flow of refuse deposited in landfills.

(h) Encourage the full development and implementation of a green waste recycling program.

Comment: On-site infrastructure improvements will be constructed to comply with State DOH and County standards. The on-site improvements will ensure sanitary and healthful conditions are maintained for the benefit of area residents.

To reduce solid waste generation, Kaloko Makai will incorporate waste diversion and reduction facilities into its design and recycling will be encouraged. Section 4.10.4 contains further discussion.

As discussed in Section 2.3.1.1 Kaloko Makai is strategically located to incorporate a new hospital into its master plan and is actively pursuing a hospital developer/operator for the new facility.

Kaloko Makai will set aside approximately 40-acres of land for the development of a hospital/medical care facility, which Kaloko Makai is prepared to transfer at no cost to a hospital developer/operator.

PUBLIC UTILITIES

Goals:

(a) Ensure that properly regulated, adequate, efficient and dependable public and private utility services are available to users.

(b) Maximize efficiency and economy in the provision of public utility services.

(c) Design public utility facilities to fit into their surroundings or concealed from public view.

Policies:

(a) Public utility facilities shall be designed to complement adjacent land uses and shall be operated to minimize pollution or disturbance.

(b) Provide utilities and service facilities that minimize total cost to the public and effectively service the needs of the community.

(c) Utility facilities shall be designed to minimize conflict with the natural environment and natural resources.

(e) Encourage the clustering of developments in order to reduce the cost of providing utilities.

Comment: Kaloko Makai is located adjacent to existing and proposed urban uses. The site will provide for utilities needed for the project.

PUBLIC UTILITIES – WATER

Policies:

(a) Water system improvements shall correlate with the County's desired land use development pattern.

(b) All water systems shall be designed and built to Department of Water Supply standards.

(d) Water sources shall be adequately protected to prevent depletion and contamination from natural and man-made occurrences or events.

(f) A coordinated effort by County, State and private interests shall be developed to identify sources of additional water supply and be implemented to ensure the development of sufficient quantities of water for existing and future needs of high growth areas and agricultural production.

(g) The fire prevention systems shall be coordinated with water distribution systems in order to ensure water supplies for fire protection purposes.

(k) Promote the use of groundwater sources to meet State Department of Health water quality standards.

(n) Develop and adopt a water master plan that will consider water yield, present and future demand, alternative sources of water, guidelines and policies for the issuing of water commitments.

Comment: Potable water demand for Kaloko Makai will be limited to consumption, general household and commercial use and irrigation of landscaping within individual lots. The potable water demand for Kaloko Makai at full build-out is estimated to be approximately 3.2 mgd (average demand) and 4.8 mgd (maximum demand.)

As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site. In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline groundwater at a lower elevation (363 ft.) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

Kaloko Makai will utilize R-1 quality water from its on-site WWTP for general irrigation of common landscaping features, including the district-scale park, neighborhood parks, open spaces (as necessary), and the schools. The average R-1 recycled water flow rate of 2.37 mgd has the potential to provide irrigation water for approximately 273 acres without routine supplemental water addition.

There are no significant water commitments for the Kaloko Makai project. Additional sources will be required to support the project. The County of Hawai'i has water storage

and distribution along Hina Lani Street, running through the Kaloko Makai project. Some of the water needs at Kaloko Makai will be addressed through the County system.

PUBLIC UTILITIES – TELECOMMUNICATIONS

Policies:

(a) Encourage underground telephone lines where they are economically and technically feasible.

(d) Work closely with the telephone company to provide all users with efficient service.

Comment: Coordination with various communication companies will be undertaken to develop telecommunications systems required to service the project.

PUBLIC UTILITIES – ELECTRICITY

Policies:

(a) Power distribution shall be placed underground when and where practical. Encourage developers of new urban areas to place utilities underground.

(b) Route selection of high voltage transmission lines should include consideration for setbacks from major thoroughfares and residential areas. Where feasible, delineate energy corridors for such high voltage transmission lines.

Comment: Coordination with utility companies will be undertaken, as discussed in Section 4.10.5. Energy conservation measures will be implemented where possible in the design of Kaloko Makai.

PUBLIC UTILITIES – GAS

Policies:

(a) Gas storage facilities shall be located to minimize danger to commercial and residential areas.

Comment: If it is determined that a gas storage facility is needed at the project site, it will comply with this policy.

PUBLIC UTILITIES – SEWER

Policies:

(b) Private systems shall be installed by land developers for major resort and other developments along shorelines and sensitive higher inland areas, except where connection to nearby treatment facilities is feasible and compatible with the County's long-range plans, and in conformance with State and County requirements.

(e) Plans for wastewater reclamation and reuse for irrigation and biosolids composting shall be utilized where feasible and needed.

(f) Require major developments to connect to existing sewer treatment facilities or build their own.

Comment: Kaloko Makai will construct and operate an on-site private WWT. The on-site WWTP would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of potable water for irrigation. Design and construction will be in accordance with State DOH and County of Hawai'i standards. Section 4.10.2 contains further discussion.

RECREATION

Goals:

(a) Provide a wide variety of recreational opportunities for the residents and visitors of the County.

(b) Maintain the natural beauty of recreation areas.

(c) Provide a diversity of environments for active and passive pursuits.

Policies:

(a) Strive to equitably allocate facility-based parks among the districts relative to population, with pubic input to determine the locations and types of facilities.

(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.

(d) The use of land adjoining recreation areas shall be compatible with community values, physical resources, and recreation potential.

(g) Facilities for compatible uses shall be provided.

(h) Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.

(m) Develop a network of pedestrian access trails to places of scenic, historic, natural or recreational values. This system of trails shall provide, at a minimum, an islandwide route connecting major parks and destinations.

(n) Establish a program to inventory ancient trails, cart roads and old government roads on the island in coordination with appropriate State agencies.

(o) Develop facilities and safe pathway systems for walking, jogging, and biking activities.

(p) Develop a recreation information dissemination system for the public's use.

Comment: The residential-focused Kaloko Makai TOD neighborhoods are centered and focused on schools, each school has its own DOE-scaled playground; in addition to approximately 10-acres of added recreational space adjoining each of the Kaloko Makai School sites. This additional area will be available for community recreation, meeting and other uses.

Varied active and passive uses include soccer fields, baseball fields, community meeting areas, tot lots, daycare centers, senior centers among others will be included in these additional parks adjoining each school site.

To further complement the recreational opportunities, Kaloko Makai will include a makai district-scale park that will include playfields, multi-purpose building, courts (basketball, tennis, volleyball), tot lot, etc.

As noted previously, the Kohanaiki Trail ("Road to the Sea" Trail) and other trails function as important transportation alternatives throughout Kaloko Makai, and as recreational features, in and of themselves.

Likewise, these trails interconnect the schools and their adjoining parks within the various residential-focused neighborhoods in Kaloko Makai. These parks serve as focal points in each neighborhood.

TRANSPORTATION

Goals:

(a) Provide transportation system whereby people and goods can more efficiently, safely, comfortably and economically.

(b) Make available a variety of modes of transportation that best meets the needs of the County.

Policies:

(c) The improvement of transportation service shall be encouraged.

(d) Consider the provision of adequate transportation systems to enhance the economic viability of a given area.

Comment: Kaloko Makai will utilize TOD and TND to promote transit-oriented and pedestrian oriented development, decreasing vehicular transit use and facilitating the management of traffic congestion.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

Kaloko Makai will minimize trips onto area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic.

Kaloko Makai will provide roadway connections to existing and/or future developments on adjacent lands, thereby improving regional circulation.

TRANSPORTATION – ROADWAYS

Goals:

(a) Provide a system of roadways for the safe, efficient and streamlined movement of people and goods.

(b) Provide an integrated State and County transportation system so that all new major routes will complement and encourage proposed land use policies.

Policies:

(a) Encourage the programmed improvement of existing roadways by both public and private sectors.

(b) Investigate alternative methods of funding road improvements, including private sector participation, to meet the growing transportation needs of the island.

(e) Coordinate with appropriate Federal and State agencies for the funding of transportation project for areas of anticipated growth.

(f) Consider the development of alternative means of transportation, such as mass transit and/or, bicycle and pedestrian systems as a means to increase arterial capacity.

(g) There shall be coordinated planning of Federal, State, and County street systems to meet program goals of the other elements such as historic, recreational, environmental quality and land use.

(h) Provisions for on-street parking shall be incorporated into the design of street systems.

(j) Transportation and drainage systems shall be integrated where feasible.

(l) Adopt street design standards that accommodate, where appropriate, flexibility in the design of streets to preserve the rural character of an area and encourage a pedestrian friendly design, including landscaping and planted medians.

(n) Encourage the development of walkways, jogging, and bicycle paths within designated areas of the community.

(o) Explore means and opportunities to enhance the shared use of the island's roadways by pedestrians and bicyclists, in coordination with appropriate government agencies and organizations.

Comment: Kaloko Makai will utilize TOD and TND to promote transit-oriented and pedestrian oriented development, decreasing vehicular transit use and facilitating the management of traffic congestion.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

Kaloko Makai will minimize trips onto area roads, as many essential services needed by Kaloko Makai residents will be within walking and biking distance. Section 4.4 contains further discussion regarding traffic.

Kaloko Makai will provide roadway connections to existing and/or future developments on adjacent lands, thereby improving regional circulation.

TRANSPORTATION – MASS TRANSIT

Goals:

(a) Provide residents with a variety of public transportation systems that are affordable, efficient, accessible, safe, environmentally friendly, and reliable.

Policies:

(a) Improve the integration of transportation and land use planning in order to optimize the use, efficiency, and accessibility of existing and proposed mass transportation systems.

(c) Incorporate, where appropriate, bicycle routes, lanes, and paths within road rights-of-way in conformance with the Bikeway Plan for the County of Hawai'i.

Comment: Kaloko Makai will develop TOD and TND that promote transit-oriented and pedestrian oriented development, increase transit use and management of traffic congestions.

The TOD and TND within Kaloko Makai are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile.)

The proposed Ane Keohokālole Highway will bisect the Kaloko Makai project. According to the Kona CPD, Ane Keohokālole Highway shall function as a trunk transit route. The trunk route connects Kailua Village with the airport, along which TOD villages will be located. As the trunk transit route, there will be future allowance for dedicated transit-way and the headways will be of the highest among other transit routes in Kona. A transit station will also be centrally located within Kaloko Makai.

LAND USE

Goals:

(a) Designate and allocate land uses in appropriate proportion and mix and in keeping with the social, cultural, and physical environments of the County.

(c) Protect and preserve forest, water, natural and scientific reserves and open areas.

Policies:

(a) Zone urban-types of uses in areas with ease of access to community services and employment centers and with adequate public utilities and facilities.

(b) Promote and encourage the rehabilitation and use of urban areas that are serviced by basic community facilities and utilities.

(c) Allocate appropriate requested zoning in accordance with the existing or projected needs of neighborhood, community, region and County.

(e) Incorporate innovations such as the "zone of mix" and mixed use zones" into the Zoning Code.

(f) Encourage the development and maintenance of communities meeting the needs of its residents in balance with the physical and social environment.

(j) Encourage urban development within existing zoned areas already served by basic infrastructure, or close to such areas, instead of scattered development.

Comment: A reclassification to the Urban District would allow the subject property to 1) conform with the County's General Plan Land Use Pattern Allocation Guide (LUPAG), which designates the majority of the property for Urban Expansion; 2) support the objectives and policies of the County's Kona CDP and Keāhole to Kailua Development Plan (K-to-K Plan); and 3) accommodate projected population growth of the County.

The Urban Expansion Area "allows for a mix of high density, medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined."

As discussed in Section 2.1.1, Kaloko Makai is surrounded by existing and proposed urban uses – Kaloko Industrial Park, Kohanaiki Business Park, West Hawaiʻi Business Park, and residential developments. Kaloko Makai is located approximately three miles to the south and north of Kona International Airport and Kailua-Kona, respectively.

Kaloko Makai has been designated as a Neighborhood TOD in the Official Kona Land Use Map of the Kona CDP.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept with land available (at no cost) for a new Kona regional hospital.

LAND USE – AGRICULTURE

Goals:

(a) Identify, protect and maintain important agricultural lands on the island of Hawaiʻi.

Policies:

(d) Agricultural land may be used as one form of open space or green belt.

(f) In order to minimize the potential conflicts between agricultural and non-agricultural uses, standards and guidelines for the establishment of well defined buffer areas as part of new, non-agricultural development that are located adjacent to important agricultural lands shall be developed.

Comment: As discussed in Section 3.3, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

LAND USE – COMMERCIAL

Goals:

(a) Provide for commercial developments that maximize convenience to users.

(b) Provide commercial developments that complement the overall pattern of transportation and land usage within the island's regions, communities, and neighborhoods.

Policies:

(a) Urban renewal, rehabilitation, and/or redevelopment programs shall be undertaken in cooperation with communities, businesses and government agencies.

(b) Commercial facilities shall be developed in areas adequately served by necessary services, such as water, utilities, sewers, and transportation systems. Should such services not be available, the development of more intensive uses should be in concert with a localized program of public and private capital improvements to meet the expected increased needs.

(c) Distribution of commercial areas shall meet the demands of neighborhoods, community and regional needs.

(e) Encourage the concentration of commercial uses within and surrounding a central core area.

(f) The development of commercial facilities should be designed to fit into the locale with minimal intrusion while providing the desired services. Appropriate infrastructure and design concerns shall be incorporated into the review of such developments.

(g) Applicable ordinances shall be reviewed and amended as necessary to include considerations for urban design, aesthetic quality and protection of amenities in adjacent areas through landscaping, open space and buffer areas.

(h) Require developers to provide basic infrastructure necessary for development.

(i) Encourage commercial areas to develop on an axis perpendicular to the highway.

Comment: The project contributes to economic development by providing employment opportunities for construction work, increased revenues to the State and County in the form of taxes, and long-term employment related to the commercial, retail, and light-industrial uses within the development.

Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept with land available for a new Kona regional hospital. Mixed-use areas of the project are designed to include residential and commercial uses within close proximity of each other (this may include affordable residential on top of a variable commercial component).

LAND USE – INDUSTRIAL

Goals:

(a) Designate and allocate industrial areas in appropriate proportions and in keeping with the social, cultural, and physical environments of the County.

Policies:

(d) Improve the aesthetic quality of industrial sites and protect amenities of adjacent areas by requiring landscaping, open spaces, buffer zones, and design guidelines.

(g) Industrial-commercial mixed used districts shall be provided in appropriate locations.

(h) Require developers to provide basic infrastructure necessary for development.

Comment: The Kaloko Makai plan designates 75 acres of light industrial or business park land uses in the Special District located at its makai end fronting Queen Ka‘ahumanu Highway. Approximately 25 acres of these lands have been identified by the State DOT for

an eventual highway interchange near the intersection of Queen Ka'ahumanu Highway and Hina Lani Street. The proposed light industrial or business park land uses at this location is an appropriate extension of the existing Kaloko Industrial Park Phases III and IV, located south of the project site (across Hina Lani Street from the project site).

LAND USE – MULTIPLE RESIDENTIAL

Goals:

(a) To provide for multiple residential developments that maximize convenience for its occupants.

(b) To provide for suitable living environments that accommodate the physical, social and economic needs for the island residents.

(c) To enhance the overall quality of life in our residential communities.

Policies:

(a) Appropriately zoned lands shall be allocated as the demand for multiple residential dwellings increases. These areas shall be allocated with respect to places of employment, shopping facilities, educational, recreational and cultural facilities, and public facilities and utilities.

(b) Incorporate reasonable flexibility in applicable codes and ordinances to realize a diverse socio-economic housing mix.

(c) Encourage flexibility in the design of residential sites, buildings and related facilities to achieve a diversity of socio-economic housing mix.

(f) Applicable codes and ordinances shall be reviewed and amended as necessary to include consideration for urban design, and aesthetic quality through landscaping, open space, and buffer areas.

(g) Support the rezoning of those multiple residentially zoned lands that are used for other purposes to a more appropriate zoning designation.

(h) Require developers to provide basic infrastructure necessary for development.

Comment: Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept with land available for a new Kona regional hospital. Approximately 5,000 new single- and multi-family residential units and lots, at low (3 units per acre) and medium/high (up to 30 units per acre) densities will be developed.

Kaloko Makai will offer a broad range of housing types including affordable, as well as "market-priced" housing units. Offerings will range from traditional single-family homes and lots, to mid- and higher-density multi-family homes, and will include live-work and mixed- use developments.

LAND USE – SINGLE-FAMILY RESIDENTIAL

Goals:

(a) To maximize choices of single-family residential lots and/or housing for residents of the County.

(b) To ensure compatible uses within and adjacent to single-family residential zones areas.

(d) To provide single-family residential areas conveniently located to public and private services, shopping, other community activities and convenient access to employment centers that takes natural beauty into consideration.
(e) To enhance the overall quality of life in our residential communities.

Policies:
(a) Encourage innovative uses of land with respect to geologic and topographic conditions through the use of residential cluster and planned unit development.
(b) Encourage and coordinate with the State in providing fee simple and leasehold single-family residential lots to the residents through State and/or County Housing Programs.
(c) Incorporate reasonable flexibility in codes and ordinances to achieve a diversity of socio-economic housing mix and to permit aesthetic balance between single-family residential structures and open spaces.
(d) Re-evaluate existing undeveloped single-family residential zoned areas and reallocate zoned lands in appropriate locations.
(e) Designate and allocate single-family residential zoned lands at varying densities for future use in accordance with the needs of the communities and the stated goals, policies, and standards.
(i) Require developers to provide basic infrastructure necessary for development.

Comment: Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability, with a variety of businesses and employment opportunities, focused around a TOD concept with 40 acres of land available for a new Kona regional hospital. Approximately 5,000 new single- and multi-family residential units and lots, at low (3 units per acre) and medium/high (up to 30 units per acre) densities will be developed.

In the event a hospital developer and operator is not arranged for the 40-acre site, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). This means there will be a slight reduction in densities in some of the existing residential properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Kaloko Makai will offer a broad range of housing types including affordable, as well as "market-priced" housing units. Offerings will range from traditional single-family homes and lots, to mid- and higher-density multifamily homes, and will include live-work and mixed- use developments.

LAND USE – OPEN SPACE

Goals:
(a) Provide and protect open space for the social, environmental, and economic well-being of the County of Hawai'i and its residents.
(b) Protect designated natural areas.

Policies:

(a) Open Space shall reflect and be in keeping with the goals, policies, and standards set forth in the other elements of the General Plan.

(b) Open Space in urban areas shall be established and provided through zoning and subdivision regulations.

(c) Encourage the identification, evaluation, and designation of natural areas.

(d) Zoning, subdivision and other applicable ordinances shall provide for and protect open space areas.

Comment: The residential-focused Kaloko Makai TOD neighborhoods are centered and focused on schools, each school has its own DOE-scaled playground; in addition to approximately 10-acres of added recreational space adjoining each of the Kaloko Makai School sites. This additional area will be available for community recreation, meeting and other uses.

Varied active and passive uses include soccer fields, baseball fields, community meeting areas, tot lots, daycare centers, senior centers among others will be included in these additional parks adjoining each school site.

To further complement the recreational opportunities, Kaloko Makai will include a makai district-scale park that will include playfields, multi-purpose building, courts (basketball, tennis, volleyball), tot lot, etc.

Natural areas within Kaloko Makai will be preserved and remain undeveloped, such as the Kaloko Makai Dryland Forest Preserve along the southern portion of the project site.

Kaloko Makai has been designed to establish preservation areas to protect archaeological sites within the project site and preserve the historic Kohanaiki Trail ("Road to the Sea" Trail) in place with 10-foot buffers along each side of the trail. As noted previously, the Kohanaiki Trail and other trails function as important transportation alternatives throughout Kaloko Makai, and as recreational features, in and of themselves.

Likewise, these trails interconnect the schools and their adjoining parks within the various residential-focused neighborhoods in Kaloko Makai. These parks serve as focal points in each neighborhood.

5.2.1.1 General Plan Land Use Pattern Allocation Guide Map

The General Plan Land Use Pattern Allocation Guide Map (LUPAG) delineates broad-brush boundaries that are graphic expressions of the General Plan policies, particularly those relating to land uses. The land use pattern is a broad, flexible design intended to guide the direction and quality of future developments in a coordinated and rational manner. These maps delineate a number of land use categories for each area.

The General Plan designation for the Kaloko Makai site is "Urban Expansion" and Conservation (for the area of the Dryland Forest.) The Urban Expansion Area "allows for a mix of high density,

medium density, low density, industrial, industrial-commercial and/or open designations in areas where new settlements may be desirable, but where the specific settlement pattern and mix of uses have not yet been determined" (see Figure 2-7).

5.2.2 Keahole to Kailua Development Plan

According to the Keahole to Kailua Development Plan (K-to-K Plan) Land Use Plan, the Kaloko Makai project site is designated "Urban Expansion, Residential Village, and Golf Course". "Urban Expansion" denotes the land's general suitability for urban development, although no specific urban uses have been recommended in the Plan. The residential villages depicted in the Land Use Plan are characterized by a distinct village center focused on neighborhood parks, and some kind of public school. The proposed project is consistent with the Development Plan designations for the project site.

K-to-K Plan, prepared by the County of Hawaiʻi Planning Department, was adopted by resolution by the Hawaiʻi County Council on April 3, 1991 (Resolution No. 296). In adopting the Plan, the County Council stated that the *Keāhole* to Kailua area was a major future urban growth area and they recognized the need for such a plan to serve as an implementing tool for the General Plan of the County of Hawaiʻi.

The K-to-K Plan was not designed to be a regulatory measure but instead should be utilized as a guide for future infrastructure and land development of the area. It is intended to carry out the goals, policies and standards of the Hawaiʻi County General Plan and be a flexible guide for the future growth and development of an area of approximately 17,000 acres in the North Kona District extending from the Kau ahupuaʻa to the north, Māmalahoa Highway to the east, Palani Road and Kailua Village to the south, and the shoreline to the west.

The overall goal established for the Development Plan is as follows:

"To develop a mixed residential, commercial, resort, industrial and recreational community, with approximately 8,000 or more residential units, in a functional, attractive, and financially viable manner. The community will include appropriate shoreline uses, public facilities, and infrastructure and will be built out over the next 20 years."

The K-to-K Plan included a proposed network of three north-south collector/arterial roadways. The lowest elevation collector road is identified as "Main Street" running parallel to Queen Kaʻahumanu Highway from Kealakehe Parkway.) Kamanu Street in the Kaloko Light Industrial Subdivision becomes "Main Street."

The extension of Kamanu Street to the north of Hina Lani Street takes advantage of a road right-of-way reserve in the Kohanaiki Business Park for further extension to the north. "Main Street" then extends north to Kaiminani Drive and on to serve the proposed University of Hawaiʻi campus and Palamanui.

A "Mid-Level Arterial" runs at approximately the 800-foot elevation. This is the present Ane Keohokālole Highway, which has been completed from Palani Road to Hina Lani Street. Ane

Keohokālole Highway is planned to be four-lane divided roadways at full build-out. However, the current project is limited to construction of two lanes.

A third north-south roadway, Kealakaʻa Street - Holoholo Street Extensions, passes at approximately the 1,000-foot elevation (it is presently noted on maps within the Kula Nei and Kaloko Heights projects.)

The intent of this parallel roadway system is to facilitate traffic circulation between the Urban Expansion areas to the north and south, keeping local traffic off of Queen Kaʻahumanu Highway.

Kaloko Makai is consistent with the K-K Plan which supports a mixed residential, commercial and recreational community.

5.2.3 Kona Community Development Plan

The Kaloko Makai site is designated as one of the Neighborhood TODs on the Official Kona Land Use Map of the Kona Community Development Plan (CDP) (see Figure 2-9). As noted, Kaloko Makai also proposes to incorporate a regional hospital into the development. Consistent with the Kona CDP economic policy ECON-1.1, the Neighborhood TOD at Kaloko Makai would automatically be designated a Regional Center TOD, upon receiving a commitment by a hospital developer/operator.

Whether a hospital developer/operator comes forward or not, land uses and densities within Kaloko Makai will remain consistent with a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the "neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included, then some of the proposed space will address regional medical needs as well as other commercial demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

The County of Hawaiʻi General Plan section 15.1 (February 2005, as amended) established and called for the preparation of Community Development Plans (CDPs) to translate broad General Plan goals, policies, and standards into implementation actions as they apply to specific geographical regions around the Island. The General Plan requires CDPs be adopted as an "ordinance", giving the plans force of law.

The Hawaiʻi County Mayor and the Hawaiʻi County Council appointed 15 citizens to serve on the Kona CDP Steering Committee, representing a cross-section of the Kona community. Several large community meetings were held. In recognition that the process needed to go to the people, meetings were held at people's homes, churches, and community centers.

One-hundred-and-nine meetings were held throughout Kona from November 2005 through January 2006. All these meetings received input from a balanced demographic and geographic representation of the North and South Kona Districts. Over 800 residents participated in the individual meetings.

Three-hundred-and-fifty people attended the Mapping the Future Workshop to brainstorm where future growth should occur. Breakout groups also addressed critical questions such as housing choice and affordability, agriculture, transportation and land use, congestion, parks/recreation/open space, protection of the environment, hazard mitigation, protection of ancestral and historic sites, community character, retail and tourism.

There were two charrettes, the first held in March 2006 and the other in June 2006. In the first charrette, the public identified alternative growth scenarios and selected a preferred scenario. In the second charrette, the public articulated desired principles to provide details for a preferred scenario.

Eleven working groups made up of citizens and community stakeholders met monthly, from May 2006 – September 2006, to focus in more detail on specific issue areas. Finally, the draft plan was recommended for approval by the Steering Committee, and then it was approved by the County Council and signed into law by the Mayor.

On September 25, 2008, *Mapping the Future: Kona Community Development Plan Volume 1* (Kona CDP) was adopted by the County Council (Ordinance 08-131,) subject to later amendments. The planning area for the Kona CDP encompasses the judicial districts of North and South Kona.

The Kona CDP addresses elements included in the *General Plan* such as transportation; land use; environmental resources; cultural resources; housing; public facilities, infrastructure, and services; energy; and economic development.

The Kona CDP is a long-term plan with a planning horizon to year 2020, consistent with the General Plan. The plan consists of two volumes—Volume 1 is adopted by County Council; Volume II contains more detailed or technical material for informational purposes.

The Land Use section of the Kona CDP serves as policy guide for County decisions regarding physical development. It establishes a physical framework for future growth by identifying the County's major policies concerning the type and location of future development in order to meet the goals and objectives of the Kona CDP.

Most of the future growth in Kona will be directed to the Urban Area. Within this Kona Urban Area, growth would be directed to compact villages located along proposed transit routes or to infill areas within, or adjacent to, existing development. The general locations of these villages are within the TODs. The Official Kona Land Use Map defines the Kona Urban Area and the general locations, spacing and type of TOD Villages (see Figure 2-9).

TOD is defined in the Kona CDP as the development of compact, mixed-use villages which would integrate housing, employment, shopping, and recreation opportunities. Villages would be designed around transit stations/stops which would reduce the need for daily trips and financially support the expanded transit system. TOD Urban Villages are located a minimum of one mile apart, between major transit stations, along Keohokālole Highway trunk route in order to preserve the transit efficiency of this route.

To encourage growth towards the TODs, the Kona CDP promotes Design Flexibility, Streamlined Permit Processing, Increased Range of Permitted Uses and Densities, prioritized Essential Infrastructure, Public Financing of Infrastructure, Concurrency Requirements and Vested Rights (as an incentive, the TODs substantially increase the permitted uses and densities).

Transect Zones (T-Zones) organize the density, complexity and intensity of the land use within the TOD Village. The operating principle is that there is an urban core with a main center focus such as a transit station and plaza. This urban core area, which is spatially defined based on walkable distances called Pedestrian Sheds, has the highest density, complexity, and intensity of uses. The land uses transition to less dense uses moving away from the center.

The Transect Zones that correspond to the urban core, secondary area and greenbelt referred to in the Kona CDP and Village Design Guidelines are as follows (also noted are the allowable residential densities in each transect zone):

i. Urban Core
   1. T-5 Urban Center (30 units per acre)
      (Mix of residential units, such as townhouses, and apartments mixed with commercial, offices and retail)
   2. T-4 General Urban (12 units per acre)
      (Neighborhood commercial uses with single-family and multi-family residential)
ii. Secondary Area: T-3 Suburban (6 units per acre)
   (Single-family units, with ancillary community and public uses, and neighborhood and convenience-type commercial uses)
iii. Greenbelt: GB1, GB2 (.25 units per acre)
iv. Mixed-Use Industrial: SD1 (12 units per acre)

The Kona CDP incorporates several “official” maps: Official Kona Land Use Map, Official Concurrency Map, Official Transportation Network Map (Proposed Roads and Transit, Pedestrian and Bike Paths) Official Public Facilities and Services Map (Public Safety, Community Facilities, and Waste Management.

The proposed project is identified as a Neighborhood TOD in the Kona CDP (see Figure 2-9). Kaloko Makai will be setting aside land for development of a regional hospital. A hospital developer/operator is being pursued.

An economic policy noted in the Kona CDP (ECON-1.1) incentivizes a hospital as a stimulus for the healthcare industry. That policy states: "Kona needs a new hospital to replace its existing outdated and out-of-place facility. The new hospital should be located on Ane Keohokālole Highway (Mid-Level Road) for optimum accessibility by automobile or transit. To encourage the private sector to negotiate a site for the hospital, the TOD in which the hospital decides to locate within shall be automatically designated a Regional Center TOD if the Official Kona Land Use Map has designated it as a Neighborhood TOD. As a Regional Center TOD, there are incentives for medical offices and other hospital-related businesses to develop in the vicinity."

Kaloko Makai has been designated as a Neighborhood Transit Oriented Development (TOD) in the Official Kona Land Use Map of the *Kona Community Development Plan* (County Ordinance No. 08-131, September 2008). As mentioned previously, the Applicant is setting aside land in anticipation of a regional hospital being sited within Kaloko Makai TOD[1]. Whether or not the identified land is developed with a regional hospital, this Second Draft EIS assesses the proposed project as a Neighborhood TOD

In the event a hospital developer and operator is not arranged for the 40-acre site noted in the project site plan, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). This means there will be a slight reduction in densities in some of the existing residential and commercial properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Whether a hospital developer/operator comes forward or not, the Kaloko Makai TOD will remain as a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the "neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included then some of the proposed space will address regional medical needs, as well as other commercial demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

Per the Kona CDP, the Planning Director, Planning Commission, and County Council shall review the TOD application with a rebuttable presumption that the project furthers the intent of Chapter 25 Zoning Code and is consistent with the goals, objectives, and policies of the County General Plan and Kona CDP, provided that the proposed location is generally consistent with the Official Kona Land Use Map and the master plan consistent with the Village Design Guidelines.

5.2.3.1 Kona CDP Guiding Principles

In order to achieve the Kona CDP's vision, the following principles, derived from public meetings and working groups, are the foundation of the goals, objectives, and policies, and implementation actions. The following section analyzes project impacts with respect to the Kona CDP Guiding Principles.

1. ***Protect Kona's natural resources and culture.***

   Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai`i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved.

[1] *Pursuant to Policy ECON-1.1 of the Kona Community Development Plan, if a hospital is located within a Neighborhood TOD, that TOD shall automatically be designated a Regional Center TOD.*

The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion on archaeological, historical and cultural resources.

As part of the project proposal, 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity. Refer to Section 3.6 for further discussion.

The Kaloko Makai project also integrates the natural features of the area, including the preservation of Kohanaiki Trail ("Road to the Sea" Trail) as a neighborhood pedestrian way.

2. *Provide connectivity and transportation choices.*

Comment: Kaloko Makai will be transit-ready and is located along Ane Keohokālole Highway, a key alignment for regional transportation. Ane Keohokālole Highway will function as the primary transit route connecting Kailua Village with the Kona International Airport and constitutes a significant influence on the shaping of Kaloko Makai; a transit station will be incorporated into the TOD village near the central part of the property. As the primary transit route, there will be future allowance for dedicated transit-way and a transit station will be located within the TOD. Internal roads, trails and paths will interconnect within the various neighborhoods and will allow residents, whether in vehicles, pedestrians and on bicycles, a variety of choices in travelling throughout the project.

In addition, multiple interconnections with adjoining properties are included in the Kaloko Makai master plan. At the request of State DOT, the project layout and uses on the makai side of the property will allow for future development of an interchange intersection with Queen Kaʻahumanu Highway.

3. *Provide housing choices.*

Comment: Kaloko Makai will offer a broad range of housing types including affordable, gap, workforce and market-priced housing units. Offerings will range from traditional single-family homes to mid- and higher-density multifamily homes, and will include senior, live-work and mixed-use developments.

Over the 30-year projected development schedule, 5,000 homes will be integrated into transit- and pedestrian-oriented urban and traditional neighborhood centers.

While current economic conditions have dampened actionable pent-up demand, the market area Kaloko Makai serves should be poised for a significant share of the Islands' anticipated future population growth, and this will lead to growing demand for homes in the region.

4. ***Provide recreation opportunities.***

   Comment: The residential-focused Kaloko Makai TOD neighborhoods are centered and focused on schools, each school site has its own DOE-scaled playground; in addition, approximately 10-acres of added recreational space adjoin each of the Kaloko Makai School sites. This additional area will be available for community recreation, meeting and other uses.

   Varied active and passive uses include soccer fields, baseball fields, community meeting areas, tot lots, daycare centers, senior centers among others will be included in these additional parks adjoining each school site.

   To further complement the recreational opportunities, Kaloko Makai will include a makai district-scale park that will include playfields, multi-purpose building, courts (basketball, tennis, volleyball), tot lot, etc.

   As noted previously, the Kohanaiki Trail ("Road to the Sea" Trail) and other trails function as important transportation alternatives throughout Kaloko Makai, and as recreational features, in and of themselves.

   Likewise, these trails interconnect the schools and their adjoining parks within the various residential-focused neighborhoods in Kaloko Makai. These parks serve as focal points in each neighborhood.

5. ***Direct future growth patterns toward compact villages, preserving Kona's rural, diverse and historical character.***

   Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai'i's General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP. Kaloko Makai is designated a Neighborhood TOD, as shown in Figure 2-9.

   Kaloko Makai will be a compact, mixed-use village that integrates diverse housing alternatives, shopping, employment, civic uses and recreational opportunities. Kaloko Makai will utilize TOD and TND to promote transit-oriented and pedestrian oriented development, decreasing vehicular transit use and facilitating the management of traffic congestion.

   The central TOD village is designed around a transit station and made up of three neighborhoods, centered on a regional hospital and/or schools/parks. An additional TND neighborhood is linked to the TOD through interconnecting roads and trails.

6. ***Provide infrastructure and essential facilities concurrent with growth.***

   Comment: A transit station and compact village on Ane Keohokālole Highway is an integral part of the multi-modal transit corridor called for in the Kona CDP; Kaloko Makai

incorporates multiple road interconnections with neighbors; Kaloko Makai is committed to concurrent construction of the Ane Keohokālole Highway and Kamanu Street extension.

Kaloko Makai's water demand will require additional water source, storage and transmission facilities. As discussed in Sections 3.5.1 and 4.10.1, the preferred alternative is Alternative 1 – On-site wells at 710-foot Elevation on the mauka portion of the project site. In the event the water source is too saline for State DOH water quality standards, the alternative of reverse osmosis (RO) treatment of this water would be considered (Alternative 2). If the first two alternatives are not feasible, desalinization of on-site saline groundwater at a lower elevation (363 ft.) would be undertaken (Alternative 3). On-site wells would draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt.

The proposed project will construct the required water system facilities which may be dedicated to the County's Department of Water Supply.

Kaloko Makai will construct and operate a private WWTP within the project. An on-site WWTP would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of potable water for irrigation. Section 4.10.2 contains further discussion.

In addition to the recreational and transportation contributions previously discussed, Kaloko Makai set aside lands for a Hospital and medical complex, Lodge and Business Center, two Elementary Schools and a Middle School, and a County fire station.

7. ***Encourage a diverse and vibrant economy emphasizing agriculture and sustainable economies.***

   Comment: Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

8. ***Promote effective governance.***

   Comment: The Kona CDP encourages cooperation among public, private and civic partners to manage the impacts of growth and meet the needs of the Kona community. Kaloko Makai is setting aside lands for a hospital, two elementary schools, one middle school, and a fire station.

   Kaloko Makai seeks to have the schools located with the project to serve as gathering and meeting places for the residents. These schools will serve as hubs for the community and the school sites and adjoining parks where community-based programs can be developed and implemented by the residents.

5.2.3.2 Goals, Objectives, Policies, and Actions

The Kona CDP presents the goals, objectives, policies, and actions for eight (8) elements: transportation; land use; environmental resources; cultural resources; housing; public facilities, infrastructure, and services; energy; and economic development. Kaloko Makai is consistent with many of the Kona CDP's goals, objectives, policies, and implementation actions, presented in the following section. A discussion of the proposed project's consistency with the applicable goals, objectives, policies, and actions is included in the following section.

TRANSPORTATION

Objective TRAN-1: Transportation and Land Use. *To organize growth on a regional level in Kona, growth should be compact and transit-supportive. Compact mixed-use villages along transit routes provide sufficient densities to support transit feasibility and enable people to meet a variety of daily needs within walking distance.*

> ***Policy TRAN-1.1: Official Transportation Network Map****. The Official Transportation Network Map shall show proposed transit routes, proposed arterials and collectors, and pedestrian/bicycle paths.*
>
> ***Policy TRAN-1.2: Trunk Line****. The new Ane Keohokālole Highway (Mid-Level Road) shall function as the trunk transit route connecting Kailua Village with the airport, along which transit-oriented developments (TODs) will be located.*
>
> ***Policy TRAN-1.3: Spacing of TODs along Trunk line.*** *Transit-Oriented Development (TOD) Urban Villages shall be located a minimum of one mile apart, between major transit stations, along Keohokālole e Highway trunk route in order to preserve the transit efficiency of this route.*
>
> **Comment:** The Kona CDP identifies the Kaloko Makai project site, as one of the TOD's located along the proposed Ane Keohokālole Highway trunk route. Kaloko Makai will develop the TOD and TND that promote transit-oriented and pedestrian oriented development, increase in transit use and management of traffic congestions. The transit station will be centrally located and surrounded by mixed-use development.

Objective TRAN-2 Street Network Connectivity. *To develop a system of interconnected roads in Kona that will provide alternative transportation routes that will disperse automobile trips and reduce their length, while not compromising the through functions of arterials and major collectors with excessive intersections.*

> ***Policy TRAN-2.1: Connectivity Standards****. Connectivity refers to the directness of links and the density of connections that make up the transportation network. Within the Kona Urban Area (UA) new development shall contribute to this interconnected transportation network of streets, pedestrian, and bicycle access that work to disperse traffic and connect and integrate new development with the existing fabric of the community. Proposals for new development or redevelopment within Kona's UA shall meet the following connectivity standards:*

1. *Maximum Block Size. In lieu of Hawai'i County Code (HCC) Section 23-29(c), the maximum length of blocks for predominantly residential subdivisions shall be 800 feet, unless unfeasible due to natural topography, protected resources, or surrounding development patterns.*

2. *Connection to Adjoining Development. The road system for new development shall contribute to the local transportation network. To supplement HCC Section 23-40, at a minimum, new subdivisions shall incorporate and continue all collector streets, and selected local streets to adjoining property. If a portion of the stub-out is not improved, the current developer shall improve the stub-out portion. Connection to adjoining properties may not be required if seriously constrained by topography or other physical hindrances, or in cases where through travel cannot occur because the property is bounded by development with private streets previously allowed.*

3. *Gated Entry. In the Kona UA, gates will be prohibited across new roadways identified to service the local transportation network.*

4. *Cul-de-sacs Discouraged. Cul-de-sacs are discouraged based on Policy TRAN-2.1 (1) Maximum Block Size and Policy TRAN-2.1 (2) Connection to Adjoining Property unless construction of a through street is found to be impracticable. Where cul-de-sacs or dead-end streets are allowed, they shall meet the prevailing standards in the Chapter 23 Subdivision Code.*

5. *Future Extensions. Roads serving future transportation interconnectivity will be identified for any proposed subdivision located adjacent to a vacant parcel. To supplement HCC Section 23-44, where necessary to give access to or permit a satisfactory future subdivision of adjoining land, or to conform with the Official Transportation Network Map, a street stub-out or pedestrian path improved to the boundary is required unless financially guaranteed to enable the County to coordinate the stub-out construction as a regional project or in coordination with the development of the adjoining property. Applicants submitting preliminary development plans shall provide for extension of selected local streets to adjoining undeveloped properties and eventual connection with the existing street system. Within phased subdivisions, temporary stub-outs shall be required.*

6. *Connectivity. In the Kona UA, all new roads that will serve as part of the interconnecting roadway system shall be dedicated to the County.*

***Policy TRAN-2.2: Access Management**. To preserve the through functions of arterials and major collectors, driveway access along new arterials and major collectors shall be minimized to the greatest extent consistent with the need to provide access to adjoining property. Access to such adjoining properties shall be planned to occur from local streets, and not from the arterial or collector road, whenever possible. On existing arterials and major collectors, the number of access driveways currently permitted shall not be increased, and when development is proposed that would increase the usage of an existing driveway*

access, every effort should be made to eliminate the driveway access in favor of access at an existing or planned intersection. Four-way intersections with arterials and major collectors shall be permitted only as shown on the Official Transportation Network Map, in order to preserve the through functions of arterials and major collectors.

Comment: Kaloko Makai will provide roadway connectivity with surrounding land uses, as shown in Figure 2-1. Major internal roadways will be connected to the Kaloko Heights development and the Kealakaʻa-Holoholo Street extension located to the north of the Project; Kaloko Industrial Park to the south by extending Kamanu Street to Hulikoʻa Road; and other roadways will have north-south connections.

Objective TRAN-3. Multi-Modal System. *To develop a multi-modal transportation system to encourage walking, biking, transit, and other non-vehicular modes of travel. A multi-modal system needs to be attractive, safe, comfortable, convenient, accessible, environmentally friendly, and affordable. Such a system would reduce congestion, improve air quality, reduce fuel consumption, and increase healthy activity. Not only would the system enhance the mobility of the elderly and youth, who do not drive, it would also make it possible for residents to divert automobile ownership expenses to other daily needs, such as a homeownership mortgage or insurance. The network could connect pathways within and outside of street rights-of-way. The system should provide convenient transfers between* modes of transportation.

Policy TRAN–3.1: Street Standards*. County street standards should be pedestrian-friendly, safely accommodate bicycles, accessible to the disabled, and appropriate for its surrounding land use context.*

Policy TRAN-3.3: Right-of-Way Landscaping*. Recognizing that the availability of water should dictate the nature of landscaping within public rights-of-way, lusher landscaping shall be provided on streets where reclaimed wastewater will be available for irrigation as noted on the Official Public Facilities and Services Map, and xeriscape landscaping shall be the preference where reclaimed wastewater is not available.*

Comment: A transit station and compact TOD Village on Ane Keohokālole Highway is an integral part of the multi-modal transit corridor called for in the Kona CDP; Kaloko Makai incorporates multiple road interconnections with neighbors; Kaloko Makai is committed to concurrent construction of the Ane Keohokālole Highway and Kamanu Street extension.

The roadway network within Kaloko Makai will be designed according to County street standards. Appropriate landscaping will be used within the project and where feasible, R-1 water from the on-site WWTP will be used for irrigation.

Objective TRAN-6 Concurrency. *To manage the timing of growth so as to avoid overloading the arterial system.*

Policy TRAN–6.1: Official Concurrency Map. *The Kona UA shall be designated as a "critical road area", as defined in HCC 25-2-46. Rezonings within the Kona UA shall comply with the Official Concurrency Map, which identifies the road segments to be constructed concurrent*

with occupancy of units as the minimum "area mitigation", as defined in HCC 25-2-46 (Zoning Code).

Comment: Official Concurrency Map identifies the road segments to be constructed concurrent with occupancy of units as the minimum "area mitigation", as defined in Hawai'i County Code (HCC) 25-2-46, Zoning Code.

According to the Official Concurrency Map, the following road segments should be constructed concurrent with occupancy of units as the minimum "area mitigation":

- 5B – Ane Keohokālole Highway, Hina Lani Street to Ane Keohokālole Arterial
- 5C – Ane Keohokālole Highway, Hina Lani Street to Kealakehe Parkway
- 5D - Ane Keohokālole Highway, Kealakehe Parkway to Palani Street

Ane Keohokālole Highway from Palani Road to Hina Lani Street (5C and 5D) is completed and Ane Keohokālole Highway from Hina Lani Street to Ane Keohokālole Arterial (beyond Huliko'a Street) will be constructed as part of the Kaloko Makai development.

A portion of the "Main Street" (3B-Kamanu Street extension) from Kamanu Street/Hina Lani Street to Huliko'a Road will be constructed as part of the Kaloko Makai development.

LAND USE

Objective LU-1: Overall Growth Pattern*. To identify areas where higher intensity growth areas should occur and areas where the rural character and open space along the shoreline should be preserved.*

Policy LU-1.2: Urban Area. *The majority of future growth in Kona shall be directed to the Kona Urban Area shown on the Official Kona Land Use Map, which spans from the Kona International Airport to Keauhou subject to the policies set forth under Objective LU-2 Urban Area Growth Management.*

Policy LU-1.4: Consistency with Land Use Pattern Allocation Guide (LUPAG)*. The current LUPAG accommodates the vision and needs for the Kona CDP area planning horizon and should be amended only for compelling reasons. Any rezoning application shall be consistent with the LUPAG.*

Comment: Kaloko Makai is situated on land designated as "Urban Expansion" in the County of Hawai'i's General Plan and in the "Kona Urban Area" on the "Official Kona Land Use Map" of the Kona CDP, as shown in Figures 2-7 and 2-9.

The LUPAG Conservation designation is due to the Kaloko Makai Dryland Forest located within the project site. The Kaloko Makai Dryland Forest will be preserved, as discussed in Section 3.6.

Objective LU-2: Urban Area Growth Management*. Recognizing that the LUPAG Urban Area is larger than needed in order to accommodate the projected growth within the planning horizon,*

future growth within the Urban Area shall be encouraged in a pattern of compact villages at densities that support public transit.

Policy LU–2.1: Village Types Defined—Transit-Oriented Developments (TODs) vs. Traditional Neighborhood Developments (TNDs). *Both TODs and TNDs are compact mixed-use villages, characterized by a village center within a higher-density urban core, roughly equivalent to a 5-minute walking radius (1/4 mile), surrounded by a secondary mixed-use, mixed-density area with an outer boundary roughly equivalent to a 10-minute walking radius from the village center (1/2 mile).*

Policy LU-2.2: TOD/TND Components*. The components of a TOD/TND include Urban Core, Secondary Core, and Greenbelt. A TOD/TND contains a higher density urban core surrounded by a lower density secondary area. A greenbelt will, in turn, surround and define the outer edge of the secondary area.*

Policy LU-2.3: TODs Identified*. To control the spacing of transit stations in support of Policy TRAN-1.2, TOD floating zones, identifying the general location of TOD, shall be limited to the following, as shown on the Official Kona Land Use Map.*

Policy LU-2.4: Transit-Oriented Development (TOD) Floating Zones Established. *The TOD's extent and locations on the Official Kona Land Use Map are approximate and become fixed pursuant to the Project District rezoning procedures…..*

Policy LU-2.5: Village Design Guidelines*. The Village Design Guidelines apply to the development of master plans for TODs and TNDs, as well as subsequent projects implementing the master plans.*

Policy LU-2.6: TOD/TND Public Infrastructure and Facilities*. To encourage the development of TODs and TNDs, public financing sources shall pay 100% for:*

- *Major proposed trunk transit route,*
- *A transit station (or transit station component if the transit station is part of a private mixed-use project within the Urban Core,*
- *A major park or plaza within the Urban Core.*

In the preparation of the master plan, the Applicant shall coordinate input of appropriate agencies to identify sites and financing of appropriate public facilities such as schools, libraries, and post offices, with respective financial commitments between the public and private sources documented in the master plan. The County water allocation and capital improvement policies in Section 4.6 Public Facilities, Infrastructure and Services, Policy PUB-4.1 shall further support the development of TODs.

Policy LU-2.7: Traditional Neighborhood Development (TND) Floating Zone Established. *Where as the locations of TODs are conceptually determined by the Official Kona Land Use Map, the locations of TNDs are proposed by Applicants outside of the TODs, but within the Kona Urban Area. Because of need to review the specific suitability at the time of the*

proposal, TND floating zones shall not have the rebuttable presumption of a TOD; otherwise, rezoning procedures shall be the same s a TOD Project District.

Comment: The Kaloko Makai site is designated as one of the Neighborhood TODs on the Official Kona Land Use Map in the Kona CDP. As noted, Kaloko Makai will provide land for a hospital operator to develop a regional hospital on-site. If such a development occurs, under Kona CDP economic policy ECON-1.1, the Kona CDP states that a Neighborhood TOD will automatically be designated a Regional Center TOD.

Kaloko Makai has been designated as a Neighborhood Transit Oriented Development (TOD) in the Official Kona Land Use Map of the *Kona Community Development Plan* (County Ordinance No. 08-131, September 2008). As mentioned previously, the Applicant is setting aside land in anticipation of a regional hospital being sited within Kaloko Makai TOD[2]. Whether or not the identified land is developed with a regional hospital, this Second Draft EIS assesses the proposed project as a Neighborhood TOD.

However, In the event a hospital developer and operator is not arranged for the 40-acre site noted in the project site plan, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). This means there will be a slight reduction in densities in some of the existing residential and commercial properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Due to the scale of the Kaloko Makai land area, the project is broken down into a Neighborhood TOD centered on the Ane Keohokālole Highway, Mauka Elementary School TND mauka of the Kaloko Makai Dryland Forest Preserve (the TND connects via roads and trails to the TOD) and Special District Mixed-use Industrial area makai of the TOD.

ENVIRONMENTAL RESOURCES

Objective ENV-1: Managing Impacts. *In order to minimize impacts on the land, make use of best management planning practices for any land-based endeavor by balancing public and private rights, and taking advantage of an ever-improving knowledge or resource sensitivity and natural processes.*

Policy ENV-1.5: Sensitive Resources. *In the context of Kona's ecology and history, the following natural and cultural resources shall be considered sensitive and therefore shall be inventoried, as part of any permit application to the County Planning Department:*

- *Critical habitat areas as identified by the U.S. Fish & Wildlife Service or County General Plan;*
- *Predominantly native ecosystems, which may not be considered endangered but are valued because of their nearly pristine condition;*
- *Anchialine ponds subject to a Management Program addressed in Policy ENV-1.10: Non-Degradation of Anchialine Ponds;*

[2] *Pursuant to Policy ECON-1.1 of the Kona Community Development Plan, if a hospital is located within a Neighborhood TOD, that TOD shall automatically be designated a Regional Center TOD.*

- *High-level groundwater recharge area which shall initially be defined as all lands mauka of the 1,500 foot elevation and which may be refined by the Kona Mauka Watershed Management Program;*
- *Historic trails;*
- *Archaeological and historic sites subject to protection under HRS Chapter 6E; and*
- *Enhanced shoreline setback (see Policy LU-1.5).*

Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai`i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the

Kohanaiki Trail ("Road to the Sea" Trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion.

As part of the project proposal, approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve, in Phase 1 of the project. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

CULTURAL RESOURCES

Objective CR-3: Preservation of Kanaka Maoli Culture and Island Values. *Ensure that our Kanaka Maoli and island values and cultures are preserved and perpetuated.*

Policy CR-3.1: Honor Kanaka Maoli culture and heritage*. The Kanaka Maoli culture is the foundation of Hawai'i's living culture. We must ensure that the Kanaka Maoli people are supported and that this part of our culture is perpetuated. The success of this endeavor will ensure that the way of the Kanaka Maoli will guide our actions and behaviors in the years ahead.*

Comment: As stated previously in Section 4.1.3, the proposed project will affect historic properties recommended eligible to the Hawai`i Register. Of the 341 sites in the project area, a total of eighty (80) sites will be subjected to a program of data recovery to address scientific and informational concerns and a total of seventy-two (72) sites will be preserved. The seventy-two sites to be preserved are recommended for preservation based on the presence of a burial (confirmed or probable) and/or association with a burial.

Kohanaiki Trail ("Road to the Sea" Trail) is a long mauka/makai trail originating in the Kohanaiki Homesteads. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity across Kaloko Makai. Section 4.3 contains further discussion.

Refer to Sections 4.1, 4.2 and 4.3 for further discussion.

HOUSING

Objective HSG-4: Build More Units*. To build more units that offer a variety of housing types, tenures, and affordability.*

> ***Policy HSG-4.4: Housing Variety****. The housing in TODs and TNDs shall be designed to mix the types, tenures, and affordability at the block level, to the extent practicable. An additional credit of 0.5 (beyond the credits specified in HCC Section 11-5) shall be recognized for senior or disability housing units (e.g., assisted living) and affordable live-work units.*
>
> ***Policy HSG-4.6: Accessory Units.*** *Accessory (ʻohana dwelling) units are encouraged in order to increase the supply of rentals. For TODs and TNDs, any provisions in the Project District rezoning ordinance relating to accessory units may preempt the zoning code ohana dwelling provisions (HCC Chapter 25, Article 6, Division 3). For existing residences in conventional zoning districts that want to add an accessory unit, the ʻohana dwelling requirements of the zoning code apply.*
>
> **Comment:** Kaloko Makai is a compact, mixed-use, master-planned community offering a wide range of housing types and affordability. Over the course of development 5,000 homes will be integrated into transit- and pedestrian-oriented urban and traditional neighborhood centers. Homes will consist of new single- and multi-family residential lots and units at low- and medium-densities. Affordable homes will be provided on-site and consistent with the Hawaiʻi County requirements.

PUBLIC FACILITIES, INFRASTRUCTURE AND SERVICES

Objective PUB-2: Public Safety. *To establish a minimum level of service for public safety resources in order to identify deficiencies and plan for future growth, and to recognize that how we design our communities can help prevent crime.*

> ***Policy PUB-2.3: Fire Protection, EMS, Rescue, HazMat Level of Service.*** *Until superceded by a county-wide standard, fire station locations should be planned to provide a response time of 8 minutes in the Urban Area (10 mile radius with 5 mile overlap) and 12 minutes in the rural areas……*
>
> **Comment:** As discussed in Section 4.8, fire protection services are provided by the Kailua-Kona Fire Station located approximately 3.6 miles to the southeast near the intersection of Palani Avenue and Queen Kaʻahumanu Highway. The station services areas within a 30-mile radius extending from Keauhou to the Kona Village Resort. Kaloko Makai will set aside land for a proposed county fire station and potentially with a police substation.

Objective PUB-4: Growth Management. *To prioritize and locate growth-supporting infrastructure (water, sewer, drainage) to support the TODs and infill development and to minimize the environmental impacts of such growth.*

***Policy PUB–4.1: Water for TODs**. To encourage and direct development to the TODs, a priority shall be to provide an appropriately sized water transmission line within the Ane Keohokālole Highway Corridor, and to flexibly enable water allocation policies to support the Kona CDP land use policy to concentrate growth within the TODs, in lieu of sprawl.*

***Policy PUB–4.5: Wastewater Treatment and Effluent Reuse**. The Kealakehe Wastewater Treatment Plant shall be expanded to accommodate the projected sewage volume from the Urban Area extending south of Hina Lani Street to the Keauhou Wastewater Treatment Plant service area. A new County wastewater treatment plant shall be located in the vicinity shown on the Official Public Facilities and Services Map-Waste Management and designed to the extent feasible to utilize a natural treatment system that can double as an open space feature.*

***Policy PUB-4.6 Wastewater Reuse Area:** Recognizing the limited drinking water supply in the Kona area, every effort should be taken to develop a feasible wastewater reclamation system for non-potable uses. Also refer to Policy TRAN-3.3. The wastewater reuse area should be, at a minimum, located mauka of the shoreline up to Ane Keohokālole Highway (Mid-Level Road), north of Palani Road and south of Hulikoʻa Drive (see Official Public Facilities and Services Map-Waste Management).*

Comment: Kaloko Makai's water demand will require additional water source, storage and transmission facilities. The proposed project will construct the required water system facilities which will be dedicated to the County's Department of Water Supply. Section 4.10.1 contains further discussion.

Kaloko Makai will construct and operate a private WWTP within the project. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) standards for general irrigation within Kaloko Makai, reducing use of potable water for irrigation.

A portion of Kaloko Makai is also located within the wastewater reuse area, as shown in Figure 4-20.

***Objective PUB-5. Zero Waste.** To maximize recycling, reuse and reduction.*

Comment: To reduce solid waste generation, Kaloko Makai will incorporate waste diversion and reduction facilities into its design and recycling will be encouraged. Section 4.10.4 contains further discussion.

Energy conservation measures will be implemented where appropriate in the design of Kaloko Makai.

***Objective PUB-6. Quality of Life.** To foster a sense of community and health through the public realm such as gathering places, parks, pedestrian networks, and open spaces.*

***Policy PUB–6.1: Gathering Places**. TODs shall include appropriate public gathering areas, such as plazas, in accordance with the Village Design Guidelines. The planning and design of such public spaces shall address any maintenance requirements. (Enacted by plan)*

***Policy PUB–6.2: Active Recreation Opportunities**. A range of recreational opportunities shall be provided to encourage physical activity and interaction among toddlers, youth, teens, adults, and seniors.*

Comment: The core and focus of the Kaloko Makai neighborhoods are schools and adjoining parks which serve as civic spaces, neighborhood centers and gathering places for arts, culture, education and recreation. Kaloko Makai proposes one middle school and two elementary schools within the project.

Varied active and passive uses include soccer fields, baseball fields, community meeting areas, tot lots, daycare centers, senior centers among others will be included in these additional parks adjoining each school site.

To further complement the recreational opportunities, Kaloko Makai will include a makai district-scale park that will include playfields, multi-purpose building, courts (basketball, tennis, volleyball), tot lot, etc.

As noted previously, the Kohanaiki Trail ("Road to the Sea" Trail) and other trails function as important transportation alternatives throughout Kaloko Makai, and as recreational features, in and of themselves.

Likewise, these trails interconnect the schools and their adjoining parks within the various residential-focused neighborhoods in Kaloko Makai. These parks serve as focal points in each neighborhood.

ECONOMIC DEVELOPMENT

***Objective ECON-1. Strategic Public Facilities and Business Opportunities as Economic Stimuli.** To optimize the potential of certain public facilities and policies to stimulate ancillary economic growth that is desirable because they are environmentally clean, diversify the economy (i.e., not visitor-dependent), pay decent wages, and demand skills and intellect that challenge Kona's existing and upcoming workforce.*

***Policy ECON–1.1: Hospital as Stimulus for Healthcare Industry**. Kona needs a new hospital to replace its existing outdated and out-of-place facility. The new hospital should be located on Ane Keohokālole Highway (Mid-Level Road) for optimum accessibility by automobile or transit. To encourage the private sector to negotiate a site for the hospital, the TOD in which the hospital decides to locate within shall be automatically designated a Regional Center TOD if the Official Kona Land Use Map has designated it as a Neighborhood TOD. As a Regional Center TOD, there would be incentives for medical offices and other hospital-related businesses to develop in the vicinity.*

Comment: The West Hawaiʻi community needs a new centrally-located regional hospital. As discussed in Section 2.3.1.1 Kaloko Makai is strategically located to incorporate a new hospital into its master plan and is actively pursuing a hospital developer/operator for the new facility.

Kaloko Makai will set aside approximately 40-acres of land for the development of a hospital/medical care facility, which Kaloko Makai is prepared to transfer at no cost to a hospital developer/operator.

5.2.4 County of Hawaiʻi Zoning

The Hawaiʻi County Zoning Code, as contained in Chapter 25 of the Hawaiʻi County Code, regulates the use of lands within the State Urban, Agricultural and Rural Districts. The project site is zoned Open and Agricultural (A-5a) District according to the Hawaiʻi County Zoning Code (see Figure 2-8):

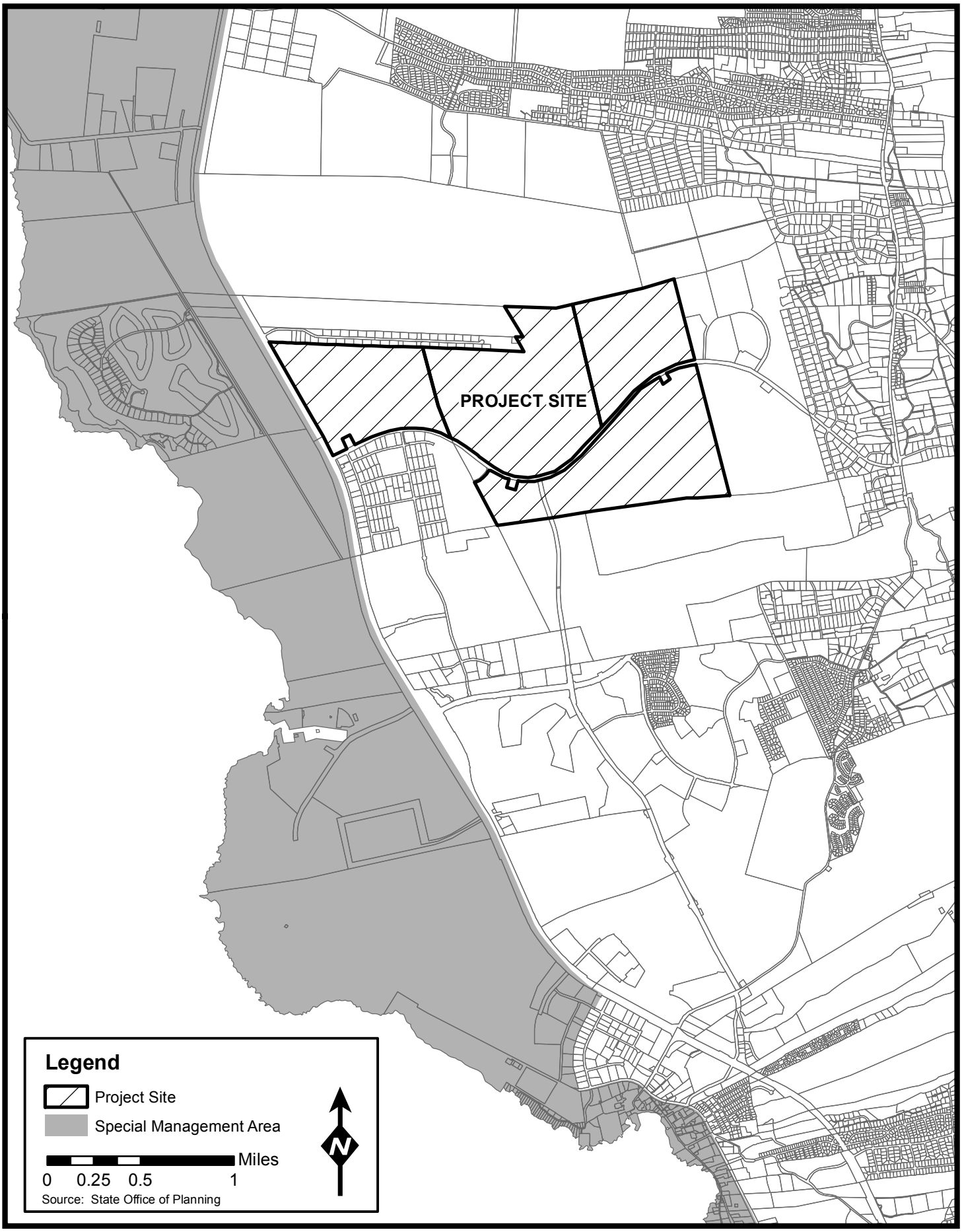
> *Agricultural district provides for agricultural and very low density agriculturally-based residential use, encompassing rural areas of good to marginal agricultural and grazing land, forest, land, game habitats, and areas where urbanization is not found to be appropriate.*
>
> *Open district applies to areas that contribute to the general welfare, the full enjoyment , or the economic well-being of open land type use which has been established, or is proposed. The object of this district is to encourage development around it such as a golf course and park, and to protect investments which have been or shall be made in reliance upon the retention of such open type use, to buffer an otherwise incompatible land use or district, to preserve a valuable scenic vista or an area of special historical significance, or to protect and preserve submerged land, fishing ponds, and lakes (natural or artificial tide lands).*

The land uses proposed for the project site are not consistent with the permitted uses of Open and Agriculture (A-5a). A zone change will be requested to reclassify the project site from Open and A-5a Districts to Project District (PD). Project Districts are intended to provide for a flexible planning approach. The rezoning process described in the Kona CDP calls for rezonings within TODs to be rezoned to Project District, see Policy LU-2.4. Permitted uses generally include those permitted in the Single Family Residential Districts (RS), Double-Family Residential Districts (RD), Multi-Family Residential Districts (RM), Residential-Commercial Mixed Use Districts (RCX), Neighborhood Commercial Districts (CN), General Commercial Districts (CG), Village Commercial Districts (CV) or Resort-Hotel Districts (V).

5.2.5 County of Hawaiʻi Special Management Area

The Coastal Zone Management Act contains the general objectives and policies upon which all counties within the State have structured specific legislation, which created Special Management Areas (SMA). Any development located within the SMA requires a SMA Use Permit, which is administered by the County of Hawaiʻi Planning Department.

The project site is located outside the boundaries of the County of Hawaiʻi's SMA and therefore no SMA Permit (Use Permit or Minor Permit) is required (see Figure 5-1).



WILSON OKAMOTO CORPORATION

FIGURE 5-1
Special Management Area
Kaloko Makai

6. APPROVALS AND PERMITS

The following is a list of permits and approvals which may be required prior to construction and operation of the proposed project.

State of Hawai‘i
Land Use Commission
- State Land Use District Boundary Amendment

Department of Health
- Approval of Wastewater Treatment Facility
- National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Associated with Construction Activity
- NPDES Individual Permit for Storm Water Associated with Construction Activity
- NPDES for Hydrotesting
- NPDES for Dewatering
- Noise Permits
- Air Quality Permits
- Underground Injection Control Permits
- Certificate of Need (for medical facilities)
- Approval of private water system / desalination system

Department of Land and Natural Resources (DLNR)
- Trail Crossings

Department of Land and Natural Resources Commission on Water Resource Management
- Well Construction and Pump Installation Permits

Department of Land and Natural Resources Historic Preservation Division
- Chapter 6E, HRS Historic Preservation

Department of Transportation
- Permits to Perform Work Within State Right-of-Way

County of Hawai‘i
Planning Department
- Project District Rezoning
- Subdivision
- Kona CDP Design Center
- Plan Approval

Department of Public Works
- Grading, Grubbing and Stockpiling Permits
- Building Permits
- Permit to Perform Work within County Right-of-Way

Other
Utility Companies
Utility Service Requirements
Permits Regarding Work on Utility Lines

7. ALTERNATIVES TO THE PROPOSED ACTION

Under HAR Title 11, Department of Health, Chapter 200, Environmental Impact Statement Rules, Section 11-200-17(F), a Draft EIS must contain a section discussing alternatives that could attain the project objectives, regardless of cost, in sufficient detail to explain why the specific alternative was rejected.

This section presents other alternatives and potential impacts that have been considered during the planning process.

Kaloko Makai Objectives: The objectives of Kaloko Makai are integral to SCD – TSA Kaloko Makai, LLC's desire to create an attractive master-planned residential community with a variety of housing opportunities and mixed uses, as well as abundant recreational resources. As a mixed-use community, the objectives of Kaloko Makai are to:

- Create a diverse, sustained community of mixed uses, including residential, retail and commercial spaces, light industrial areas, recreational spaces, and open space.
- Cultivate intrinsic respect for the land and natural surroundings, develop an inherent Hawaiian sense of place and nourish a sustaining living environment.
- Provide housing for the working families of Hawai'i nearby areas of workforce demand, resultantly improving overall quality of life through the reduction of commuting and facilitation of everyday function.
- Openly embrace a diversity of people and activities through offering mixed uses and housing types.
- Contribute to the social fabric of the community by providing infrastructure and facilities, and by including school, hospital, recreational, and civic sites.
- Engender and incorporate intelligent, planned sustainability by design.
- Emphasize non-vehicular transit for mainstream community-wide travel.

Alternatives for Kaloko Makai EIS

In addition to the Preferred Alternative of a Neighborhood TOD With Hospital and 600,000 Sq.Ft. of Commercial Use which is analyzed throughout this document, the following are other alternatives included in this review.

7.1 No Action
7.2 Neighborhood TOD (Without Hospital and 600,000 Sq. Ft. Commercial Use)
7.3 Neighborhood TOD with Maximum Density Permitted Under Kona CDP Design Guidelines
7.4 Existing Zoning (5-acre Agricultural Lots, Golf, Conservation)
7.5 Conventional Subdivision Development (5-units/acre; Some Commercial and Industrial)
7.6 Alternate Location

7.1 NO ACTION

This alternative assumes that no action will be taken and there will be no change in uses on the property. In this case, the no action alternative also serves as an alternative that postpones action

pending further study. Because the project impacts have been analyzed thoroughly in this EIS and no additional studies are necessary, the No Action alternative and postponing action pending further study are discussed under this heading.

The No Action alternative would not meet any of the objectives of the Kaloko Makai project. No housing, no mixed uses, no retail or commercial space, no schools and no transit oriented improvements would be provided.

Similarly, the environmental impacts of the No Action would be much less than under the Preferred Alternative. However, in light of the anticipated population growth, shortage in residential housing, and strong desire within the Kona community to emphasize public transit, the No Action alternative would compound the anticipated housing shortage, and continue the status quo of long distance non-public transit commuting. The No Action alternative means the services, products, facilities and amenities associated with the Kaloko Makai project will not be realized.

The following summarizes descriptions, potential impacts and mitigation measures for the No Action alternative:

Construction - No residential construction would occur at the site. The 5,000 single- and multi-family units, including affordable housing units would not be built. The Hospital would not be constructed within the Kaloko Makai project. Retail and commercial space would not be constructed. The 120-room Kaloko Makai Lodge and Business Center would not be built.

Groundwater Resources and Nearshore Marine Environment - There would be no change in groundwater resources and the nearshore marine environment.

Flora and Fauna - Impact on flora and fauna would be neutral in that while the habitat would remain relatively undisturbed by man, trends in the current "natural" processes would result in the slow loss of habitat from alien species encroachment and predation from rats and feral animals. Preservation and management of the Kaloko Makai Dryland Forest Preserve would not be realized.

Archaeological and Cultural Resources - Archaeological and Cultural preserves would not be created and these resources will slowly deteriorate due to lack of management. These resources would remain generally inaccessible.

Trails and Access - The Kohanaiki Trail would not be affected.

Traffic and Transportation - Traffic trip generation will not increase. This is a positive effect. However, traffic in the North Kona region will continue to increase due the ambient growth in traffic in the region from population growth and development.

Roads - Various road improvements would not be made, including widening of Hina Lani Street, construction of the Ane Keohokālole Highway through the Kaloko Makai property, and other intersection and road improvements that would benefit the local and regional traffic patterns.

Noise - There will be no change in noise impacts. With no construction, there will be no temporary noise impacts.

Air Quality - There will be no change in air quality.

Visual - The No Action alternative would retain visual resources in the area. Open space would be retained.

Water – The No Action alternative would not contribute to the improvement of the Department of Water Supply's system for the region by building additional water system facilities to serve the Kona area.

Wastewater - With no development, no wastewater would be generated, resulting in no impact on natural resources in the area.

Soils, Topography and Drainage - The No Action Alternative would have little or no impacts to soils, topography or drainage. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata.

Solid Waste - With no construction of residential, commercial and industrial development, there will be no added solid waste.

Infrastructure/Power/Communications - This alternative would not generate the need for public or private infrastructure. There will be no need for power or tele-communication services.

Parks - The district-scale park and TOD parks would not be realized.

Housing - The 5,000 single- and multi-family units, including affordable housing units, would not be built.

Education - No new students will be generated and there will be no need for new public schools. No new school sites will be made available for the DOE.

Economic and Fiscal/Public Services - No new jobs would be created, no additional tax and other revenues to the local and state government would be realized and there would be no increased need for public services.

7.2 NEIGHBORHOOD TOD (WITHOUT HOSPITAL AND 600,000 SQ. FT. COMMERCIAL USE)

This alternative assumes the same number of residential units and commercial square footage as the Preferred Alternative, however, in this alternative no hospital will be included in the project. This alternative would still include a 120-room Lodge and Business Center; 75-acres of Light Industrial (SD-1); and the proposed Dryland Forest Preserve.

This alternative would achieve many of the Kaloko Makai objectives. However, it would not generate the economic diversification and increased employment anticipated from the hospital development contemplated under the Preferred Alternative

This alternative would generate similar impacts and require similar mitigation measures as anticipated under the Preferred Alternative.

Groundwater Resources and Nearshore Marine Environment – As with the Preferred Alternative, a Neighborhood TOD at Kaloko Makai is not anticipated to impact groundwater, marine waters or ocean biology, as noted in the conclusions of groundwater and marine water analysis reports that prepared on behalf of the project. This conclusion is based on analysis of potential impacts of Kaloko Makai's proposed water, wastewater, irrigation (including fertilizer application) and drainage systems, as noted in this EIS.

Flora – As with the Preferred Alternative, this alternative will not impact botanical species currently listed as endangered under either the federal or the State of Hawai`i's endangered species programs. None of the plants that are listed will be "taken" in the development and construction of the project.

Three individual listed endangered plants (two hala pepe and one 'aiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. buffer between the two hala pepe and one 'aiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

Approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

Fauna/Invertebrates – As with the Preferred Alternative, this alternative will not impact avian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawai`i's endangered species programs which were observed during the course of the survey. No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

The principal potential impact that the project pose to Hawaiian hoary bat is during the clearing and grubbing phases of the project. Clearing of dense vegetation should not occur between June 1 – September 15, when bats may be carrying young and potentially could be at risk as a result of such clearing activities. In addition, the clearing of dense vegetation, including woody plants beyond 15 feet should also not be cleared during this period.

Archaeological Resources – As with the Preferred Alternative, this alternative will not negatively impact archaeological resources. All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawai'i Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval.

Cultural Resources – As with the Preferred Alternative, this alternative will not impact cultural resources. With the possible exception of intermittent gathering of plant materials, there are no other traditional or customary native Hawaiian rights being exercised within the project area. The historic Kohanaiki Trail (Road to the Sea) runs through (*mauka-makai*) the entire length of the project; it will be restored and will interconnect the communities within the project.

Trails and Access – As with the Preferred Alternative, this alternative will incorporate the Kohanaiki Trail into the project. The *mauka-makai* alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity. The Trail will be at least 10-feet wide and will be bordered by perpetual open space buffers of at least 10-feet wide on each side. In combination with the buffers, the total width of this perpetual public right of way will be at least 30-feet throughout its length across Kaloko Makai. Kaloko Makai proposes to incorporate the trail into the Kaloko Makai project, interconnecting the communities and providing pedestrian access throughout the project.

Traffic – As with the Preferred Alternative, this alternative is consistent with the policies of the Kona CDP. As a Neighborhood TOD, the project would be developed as a TOD with TND principles, consistent with Village Design Guidelines that promote transit-oriented and pedestrian oriented development, increase in transit use and management of traffic congestions.

Noise – As with the Preferred Alternative, this alternative, in the short-term, will create unavoidable construction noise during the duration of the construction of the proposed project. Operation of construction equipment and vehicles will raise ambient noise levels in the project vicinity. Mitigation measures such as the use of properly muffled construction equipment and incorporation of State Department of Health (DOH) construction noise limits pursuant to the provisions of the State DOH Hawaiʻi Administrative Rules, Title 11, Chapter 46, Community Noise Control are applicable to the project. In the long-term, traffic-generated noise to the community will be mitigated by adequate setbacks from the highway, in conformance with federal highway standards.

Air Quality - As with the Preferred Alternative, this alternative will create potential air quality impacts during construction of the project; these will be mitigated by complying with the State DOH Hawaiʻi Administrative Rules, Title 11, Chapter 60, Air Pollution. The construction contractor(s) is responsible for complying with the State DOH regulations that prohibit visible dust emissions at property boundaries. Compliance with State regulations will require adequate measures to control airborne dust by methods such as water spraying and sprinkling of loose or exposed soil or ground surface areas and dust-generating equipment, and the use of wind screens in sensitive areas during construction. In the long-term, air quality concerns are expected to remain below State and Federal standards.

Water – As with the Preferred Alternative, a Neighborhood TOD at Kaloko Makai will require development of additional water sources, storage and transmission facilities As noted in

4.10.1 of this EIS, several alternatives are considered, with utilization of wells (at approximate 710-ft elevation) as the preferred alternative.

Wastewater – As with the Preferred Alternative, this alternative will create an on-site wastewater treatment plant for processing Kaloko Makai wastewater. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) water standards for general irrigation within Kaloko Makai, thus reducing the use of potable water for irrigation.

Drainage – As with the Preferred Alternative, this alternative will not impact drainage. There are no streams or natural drainageways in or near the project site. The surrounding area consists of barren *a`ā* and *pāhoehoe* lava fields which are highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata. Stormwater over Kaloko Makai will either percolate directly into the ground (in natural and landscaped areas) or will be collected in a system of catch basins and drain lines and disposed of in drywells located throughout the community.

Likewise, Kaloko Makai proposes a 100-foot wide natural greenbelt that will adjoin the north side of Hina Lani Street, from Ane Keohokālole Highway to Queen Kaʻahumanu Highway. In addition, the makai district-scale park may serve as a collection basin for any excess water. Drainage from Kaloko Makai is not expected to have an adverse effect on groundwater or coastal marine waters.

Solid Waste – As with the Preferred Alternative, this alternative will generate solid waste. To reduce solid waste generation, Kaloko Makai will incorporate waste diversion and reduction facilities into its design and recycling will be encouraged. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the Puʻuanahulu landfill.

Electrical – As with the Preferred Alternative, electrical power supply for this alternative will be provided by the existing power grid that traverses through the project site. Kaloko Makai will seek to incorporate alternative energy generation strategies such as use of solar power or photovoltaic systems. Kaloko Makai will also consider possibilities for net energy metering in building design to allow residents and businesses to lower electricity costs and provide energy back into the system.

Housing – As with the Preferred Alternative, this alternative will provide a variety of housing options in the residential, commercial and industrial heart of West Hawaiʻi. This alternative will include the proposed development of up to 5,000 new single- and multi-family residential lots and units at a variety of densities, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), 120-room Lodge and Business Center, urgent care medical facility, three schools sites and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawaiʻi requirements.

Education - Since the number of residential units remains the same as the Preferred Alternative, there is no difference on impacts to education facilities between this alternative and the preferred alternative.

Economic and Fiscal - This alternative would provide a variety of economic benefits, as well as tax and other revenue to various governmental entities. Due to the reduced scale of the commercial development, there will be fewer benefits to governmental agencies in the form of real property and other taxes and fees. This alternative would not generate the fiscal impacts anticipated from the hospital development.

Public Services – As with the Preferred Alternative, this alternative will contribute to increased State and County tax revenues in the form of increased property, general excise and increased income taxes from increased employment. However, it would not generate the hospital-related jobs.

As with the Preferred Alternative, this alternative is consistent with the Hawai'i County General Plan (Urban Expansion) and Kona CDP (Transit Oriented Development). However, this alternative is not selected because it is preferred that the hospital is situated in Kaloko Makai.

In the event a hospital developer/operator is not arranged for the 40-acre site, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). The Kaloko Makai Neighborhood TOD uses will be redefined as a commercial core (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) to serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project, as compared to the Preferred Alternative.

7.3 NEIGHBORHOOD TOD WITH MAXIMUM DENSITY PERMITTED UNDER KONA CDP GUIDELINES

This alternative assumes the existing Kaloko Makai layout (Figure 2-11,) including the GB, T3, T4, T5 and SD1 transects, and the Traditional Neighborhood Design component in the mauka-south portion of the property, are allocated units to each "T" transect according to the maximum allowable density permitted in the Kona CDP.

The maximum densities for the three primary development transects of the Kona CDP are as follows:

- T3 - Sub-Urban Zone, 6-units/acre
- T4 - General Urban Zone, 12-units/acre
- T5 - Urban Center Zone, 30-units per acre

This equates to approximately 11,400 residential units.

In addition, as supported by the market analysis and consistent with the Kona CDP, 600,000 square feet of Commercial (Office/Retail); 120-room Lodge and Business Center; 75-acres of SD-1 and a Dryland Forest Preserve will make up the balance of the development.

This alternative would attain the Kaloko Makai project objectives. The following summarizes descriptions, potential impacts and mitigation measures for this alternative:

Groundwater Resources and Nearshore Marine Environment – While the scale of the development is greater than the Preferred Alternative, this alternative is not anticipated to impact groundwater, marine waters or ocean biology. More wells will be required for potable water source; however, since the mid-level wells are drawing from a confined water source, drawing from this source is not expected to impact coastal hydrology nor affect the sustainable yield. If the water requires treatment, a larger facility will need to be constructed and the source distribution lines, also constructed at a larger scale.

Flora – While the scale of the development is greater than the Preferred Alternative, this alternative will not impact botanical species currently listed as endangered under either the federal or the State of Hawaiʻi's endangered species programs. None of the listed endangered plants will be "taken" in the development and construction of the project.

Three individual endangered plants (two hala pepe and one ʻaiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. buffer between the two hala pepe and one ʻaiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve. Through the establishment of this preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

Fauna/Invertebrates – While the scale of the development is greater than the Preferred Alternative, this alternative will not impact avian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawaiʻi's endangered species programs were observed during the course of the survey. No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

The principal potential impact that the project pose to Hawaiian hoary bat is during the clearing and grubbing phases of the project. Clearing of dense vegetation should not occur between June 1 – September 15, when bats may be carrying young and potentially could be at risk as a result of such clearing activities. In addition, the clearing of dense vegetation, including woody plants beyond 15 feet should also not be cleared during this period.

Archaeological Resources – While the scale of the development is greater than the Preferred Alternative, this alternative will not negatively impact archaeological resources. All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawaiʻi Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval.

Cultural Resources – While the scale of the development is greater than the Preferred Alternative, this alternative will not impact cultural resources. With the possible exception of intermittent gathering of plant materials, there are no other traditional or customary native Hawaiian rights being exercised within the project area. The historic Kohanaiki Trail (Road to the Sea) runs through (mauka-makai) the entire length of the project; it will be restored and will interconnect the communities within the project.

Trails and Access – While the scale of the development is greater than the Preferred Alternative, this alternative will incorporate the Kohanaiki Trail into the project. The *mauka-makai* alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity.

Traffic – This alternative is consistent with the policies of the Kona CDP; however, under this scenario significantly more traffic will be generated and more roadway and intersection improvements will be required.

This alternative would be designed to be consistent with the TND concepts of having compact mixed-use villages to allow for easy walkability. However, this alternative would result in many more cars due to the significant increase of residential units, putting greater demands on existing roads.

Noise – This alternative is greater than the Preferred Alternative. Thus, the duration of the short-term, unavoidable construction noise, will be longer. Appropriate mitigation measures, as called for in the Preferred Alternative, will be implemented.

Air Quality – The scale of the development is greater than the Preferred Alternative, therefore the construction-related air quality impacts will be extended over a longer period of time. However, all such impacts will be mitigated by complying with the State DOH Hawaiʻi Administrative Rules, Title 11, Chapter 60, Air Pollution. In the long-term, air quality concerns are expected to remain below State and Federal standards.

Water – As with the Preferred Alternative, this alternative will require development of additional water sources, storage and transmission facilities. Several alternatives are being explored, including utilization of onsite wells (at approximate 710-ft. elevation) and possible desalination to potable water. Dedication of water facilities to the County DWS would be sought.

Wastewater – As with the Preferred Alternative, this alternative will generate wastewater, which would be processed at an on-site wastewater treatment. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) water standards for general irrigation within Kaloko Makai, thus reducing the use of potable water for irrigation. Since the facility will need to be scaled larger than under the Preferred Alternative; disposal of treated wastewater effluent will also need to be dispersed to other areas.

Drainage – While the scale of the development is greater than the Preferred Alternative, this alternative will not impact drainage. There are no streams or natural drainageways in or near the project site. The surrounding area consists of barren *a`ā* and *pāhoehoe* lava fields which are highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata. Stormwater over Kaloko Makai will either percolate directly into the ground (in natural and landscaped areas) or will be collected in a system of catch basins and drain lines and disposed of in drywells located throughout the community.

The 100-foot wide natural greenbelt that will adjoin the north side of Hina Lani Street, from Ane Keohokālole Highway to Queen Kaʻahumanu Highway, and the makai district-scale park, could serve as a collection basin for any excess water. Drainage from Kaloko Makai is not expected to have an adverse effect on groundwater or coastal marine waters.

Solid Waste – More solid waste would be generated under this alternative. Kaloko Makai will work with the County to identify and implement feasible alternatives for residential curbside collection, including source-separated recyclables. Waste diversion and reduction facilities would be incorporated into the project design, and recycling will be encouraged. Waste that cannot be recycled or incorporated into on-site green waste processing will be disposed of in the Puʻuanahulu landfill. Due to the scale of the residential development, the project may need to incorporate a transfer station (to be situated with the wastewater treatment facility,) as well as provide residential refuse collection.

Electrical – As with the Preferred Alternative, electrical power supply for this alternative will be provided by the existing power grid that traverses through the project site. Kaloko Makai will seek to incorporate alternative energy generation strategies such as use of solar power or photovoltaic systems. Kaloko Makai will also consider possibilities for net energy metering in building design to allow residents and businesses to lower electricity costs and provide energy back into the system.

Housing – As with the Preferred Alternative, this alternative will provide a variety of housing options, consistent with the Kona CDP. Kaloko Makai is strategically located along the major regional traffic corridor Queen Kaʻahumanu Highway, between the town of Kailua-Kona and the Kona International Airport. This area has a long-standing and growing residential base and will continue to be the focus of residential and related development as the Island's population grows.

This alternative will include the proposed development of up to 11,400 new single- and multi-family residential lots and units, centralized commercial and neighborhood centers, recreational facilities (e.g. parks, trails, open spaces), 120-room Lodge and Business Center, urgent care medical facility, necessary school sites, and associated infrastructure (e.g., new roadways, utilities, drainage, wastewater and potable water distribution systems). Affordable housing will be provided in accordance with County of Hawai`i requirements. All of this is consistent with the Kona CDP.

Education: Since the quantity of residential units offered is significantly higher than the Preferred Alternative, the impacts to education facilities under this alternative are significantly greater than the Preferred Alternative. According to BOE Policy, it is likely that at least two elementary schools, one middle school and a high school, would be required.

Economic and Fiscal - This alternative would provide a variety of economic benefits, as well as tax and other revenue to various governmental entities. Due to the significantly greater scale of the development, there will be more benefits to governmental agencies in the form of real property and other taxes and fees.

Public Services – With increased residential densities and more people, there is an expected increase in the need for public service, compared to the Preferred Alternative.

As with the Preferred Alternative, this alternative is consistent with the Hawaiʻi County General Plan (Urban Expansion) and Kona CDP (Kona Urban Area). However, this alternative is not selected for a variety of reasons, all related to the scale of the development.

This alternative has over twice the number of residential units as the Preferred Alternative. While the Kona CDP permits up to 30-units per acre and therefore 11,400 total residential units within Kaloko Makai, it is probable that significant public opposition would arise if any project proposed this scale in the North Kona, despite the fact that the Kona CDP obtained overwhelming community support.

Likewise, the traffic impacts generated by a development will burden the system, and require significantly more road and intersection improvements.

Finally, the market assessment for residential development does not support a project of this size. A project the scale of the Preferred Alternative (5,000 residential units) is fully supported by the market analysis; a scale of 11,400 residential units is not.

7.4 EXISTING ZONING (5-ACRE AGRICULTURAL LOTS, GOLF, CONSERVATION)

Under the Existing Zoning alternative there would be approximately 150 agricultural lots (5-acres each), a 190-acre golf course, State Land Use Conservation District land fronting Queen Kaʻahumanu, and a Dryland Forest Preserve would be developed.

The Existing Zoning alternative would develop a standalone golf course within approximately 190 acres of land that was reclassified to the State Urban District in 1985 to allow for such development. However, since most of the larger resort areas on the Kona Coast already offer golf courses, need for an additional golf-course is not justified.

The land in the State Conservation District would remain as open space, except a Conservation District Use Permit will be sought for the construction of a single-family dwelling.

The remainder of the property would be developed as a standard grid-format agricultural subdivision, each subdivided lot being a minimum of 5-acres, according to the existing zoning. A

Planned Unit Development Permit could also be sought in order to create clustered 2 to 3 acre lots, with a large open/agricultural area. As it currently stands, however, the land occupied by the project site is inadequate for agricultural production. The site itself is covered virtually entirely by a layer of hardened lava rock, and its potential for agricultural production would be further constrained by a functional lack of irrigation infrastructure.

Under the Existing Zoning alternative, similar mitigation measures to the Preferred Alternative will be incorporated into the overall community planning, although at a reduced scale, due to the reduced scale of the development. For areas of particular concern, the following summarizes descriptions, potential impacts and mitigation measures for the Existing Zoning alternative.

Groundwater Resources and Nearshore Marine Environment – As with the Preferred Alternative, development under the Existing Zoning is not anticipated to impact groundwater, marine waters or ocean biology, as noted in the conclusions of groundwater and marine water analysis reports that prepared on behalf of the project. This conclusion is based on analysis of potential impacts of Kaloko Makai's proposed water, wastewater, irrigation (including fertilizer application) and drainage systems, as noted in this EIS. As noted in Chapter 3, resort development with golf course up the coast from Kaloko Makai have not had negatively impacted groundwater or nearshore marine resources.

Flora – As with the Preferred Alternative, this alternative will not impact botanical species currently listed as endangered under either the federal or the State of Hawai`i's endangered species programs. None of the listed endangered plants will be "taken" in the development and construction of the project.

Three individual endangered plants (two hala pepe and one 'aiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. buffer between the two hala pepe and one 'aiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

Approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve. Through the establishment of this Preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

Fauna/Invertebrates – As with the Preferred Alternative, this alternative will not impact avian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawai'i's endangered species programs, as were observed during the course of the survey. No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

The principal potential impact that the project pose to Hawaiian hoary bat is during the clearing and grubbing phases of the project. Clearing of dense vegetation should not occur between June 1 – September 15, when bats may be carrying young and potentially could be at risk as a result of such clearing activities. In addition, the clearing of dense vegetation, including woody plants beyond 15 feet should also not be cleared during this period.

Archaeological Resources – As with the Preferred Alternative, this alternative will not negatively impact archaeological resources. All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawaiʻi Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval.

Cultural Resources – As with the Preferred Alternative, this alternative will not impact cultural resources. With the possible exception of intermittent gathering of plant materials, there are no other traditional or customary native Hawaiian rights being exercised within the project area.

Trails and Access – As with the Preferred Alternative, this alternative will retain the Kohanaiki Trail into the project. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity.

Traffic – Unlike the Preferred Alternative, this alternative is inconsistent with the transit related polices of the Kona CDP. Development under Existing Zoning is characterized by a grid layout of 5-acre parcels scattered throughout the bulk of the project area. There are no transit stations and the development under Existing Zoning is not conducive to being a walkable community.

Since the number of residential units is approximately 150, there is a significant reduction in the number of automobiles generated by the project and the traffic impacts will, therefore, be significantly less than the Preferred Alternative.

Noise – As with the Preferred Alternative, this alternative, in the short-term, will create unavoidable construction noise during the duration of the construction of the proposed project. However, it will be significantly less that the Preferred Alternative. Appropriate laws, ordinances and rules will be followed to comply with noise limits.

Air Quality - As with the Preferred Alternative, this alternative will create potential air quality impacts during construction of the project. However, it will be significantly less that the Preferred Alternative. Appropriate laws, ordinances and rules will be followed to comply with air quality standards.

Water – As with the Preferred Alternative, this alternative will require development of additional water sources, storage and transmission facilities. However, even with a golf course, the needs and scale of improvements will be significantly less that the Preferred Alternative. Due to limited rainfall in this area, catchment is not feasible and a variance for catchment systems from Hawaiʻi County is unlikely. As noted in 4.10.1 of this EIS, several alternatives are considered, with utilization of wells (at an approximate 710-ft elevation) as the Preferred Alternative. The scale will be significantly reduced due to the reduced number of residential units, compared to the Preferred Alternative.

Wastewater – Due to the reduced scale of the project and scattered nature of the development, individual septic systems are preferred over a central on-site wastewater treatment plant. Each property owner will be responsible to design and construct their respective system on their property and will assure the systems are consistent with appropriate County and State laws, codes, ordinances and rules. Therefore, no R-1 treated effluent would be available for irrigation purposes.

Drainage – As with the Preferred Alternative, development under Existing Zoning will not impact drainage. There are no streams or natural drainageways in or near the project site. The surrounding area consists of barren *a`ā* and *pāhoehoe* lava fields which are highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata. Stormwater over the project lands will either percolate directly into the ground (in natural and landscaped areas) or will be collected in a system of catch basins and drain lines and disposed of in drywells located throughout the community. Drainage is not expected to have an adverse effect on groundwater or coastal marine waters.

Solid Waste – Development under this alternative has significantly lower number of units than the Preferred Alternative. Lot owners will take their solid waste to the County transfer stations or landfill.

Electrical – Because development of this alternative has significantly lower number of units than the Preferred Alternative, electrical demands will be significantly reduced, compared to the Preferred Alternative. This alternative also allows for opportunity to incorporate alternative energy generation.

Housing – Development under this alternative will produce a single market type, rather than the diverse housing opportunities called for in the Preferred Alternative. This alternative would result in significantly lower overall density. Pricing for these lots would likely be high and marketing would be focused on higher income markets, thereby limiting the range of income groups that could afford these lots. In addition, no affordable housing would be provided, as none would be required under Chapter 11 of the Hawai‘i County Code.

Education: Since the number of residential units are significantly less than the Preferred Alternative, the impacts to education facilities under this alternative are significantly less than the Preferred Alternative. No school sites will be provided.

Economic and Fiscal – Public economic revenue, benefits and demands will be less if the site is developed under this alternative, as compared to the Preferred Alternative.

Public Services - Because there would be significantly less units, if developed under this alternative, there would also be a significantly lower demand for public services.

Poor soil productivity has restricted historical use of the site, as well as the immediate surrounding area, for agricultural production and would most likely preclude future large-scale agricultural

activities. In addition, there is no significant source of low cost agricultural water nearby. Nevertheless, this alternative is plausible, as it conforms to the existing permitted land uses.

This alternative fails to address a range of Kaloko Makai and Kona CDP objectives including but not limited to: 1) Create a diverse, sustained community of mixed uses, including residential, retail and commercial spaces, light industrial areas, recreational spaces, and open space; 2) Provide housing for the working families of Hawai'i near areas of workforce demand, as a result improving overall quality of life through the reduction of commuting and facilitation of everyday function; 3) Openly embrace a diversity of people and activities through offering mixed uses and housing types; 4) Contribute to the social fabric of the community by providing infrastructure and facilities, and by including school, hospital, recreational, and civic sites.

This alternative would also not be consistent with the County of Hawaiʻi General Plan (as amended in December 2006), which designates a large portion of the project site for Urban Expansion, nor would it improve the current housing market, or increase jobs or tax revenues. The property would not be put to a higher economic use, forgoing contribution to a larger tax base for the County of Hawaiʻi.

7.5 CONVENTIONAL SUBDIVISION DEVELOPMENT (5-UNITS/ACRE; SOME COMMERCIAL AND INDUSTRIAL)

This alternative, considering the site in a development pattern consistent with recent development in the region, would include approximately 3,000 single and multi-family units in conventional grid layout; 100-acres in commercial uses; 75-acres of light industrial/commercial; and a Dryland Forest Preserve.

This alternative would attain some of the Kaloko Makai objectives, but it would not create a diverse, sustained community of mixed uses, reduce commuting, offer mixed uses, or emphasize non-vehicular transit for mainstream community-wide travel. However, it would add housing, and openly embrace a diversity of people and activities, and contribute to the social fabric of the community by providing infrastructure and facilities. To the extent possible the Conventional Subdivision would and engender and incorporate intelligent, planned sustainability by design.

Under this alternative, the project layout would mimic typical existing development in the region. Given the neighboring uses, this would mean light industrial in the makai region, in grid pattern layout, similar to the adjoining Kaloko Industrial Park. Mauka of this would be a mix of residential and commercial on the balance of the property. Due to the existence of endangered plants within the Dryland Forest Area, the approximately 150-acres would be set aside for forest preservation.

Typical residential and commercial development has most commercial uses at major roadway intersections and along the major roads. This layout and pattern of use is characteristic of the "sprawl" that is evident in areas of North Kona.

Under this alternative similar mitigation measures to the Preferred Alternative will be incorporated into the overall community planning. For areas of particular concern, the following summarizes descriptions, potential impacts and mitigation measures for this alternative.

Groundwater Resources and Nearshore Marine Environment – As with the Preferred Alternative, this alternative is not anticipated to impact groundwater, marine waters or ocean biology, as noted in the conclusions of groundwater and marine water analysis reports prepared on behalf of the project, which are based on analysis of potential impacts of Kaloko Makai's proposed water, wastewater, irrigation (including fertilizer application) and drainage systems, as noted in this EIS.

Flora – As with the Preferred Alternative, this alternative will not impact botanical species currently listed as endangered under either the federal or the State of Hawai`i's endangered species programs. None of the listed endangered plants will be "taken" in the development and construction of the project.

Three individual endangered plants (two hala pepe and one 'aiea) found outside the Dryland Forest Preserve will be buffered by setbacks and enclosures (fence/wall). Kaloko Makai will develop a 50-ft. buffer between the two hala pepe and one 'aiea and any structure. The plants will be incorporated into landscaping within the 50-ft. buffers.

Approximately 150-acres will be set aside as the Kaloko Makai Dryland Forest Preserve. Through the establishment of this preserve, a variety of species will have continued permanent protection and their habitat set aside, in perpetuity.

Fauna/Invertebrates – As with the Preferred Alternative, this alternative will not impact avian species currently listed as endangered, threatened, or proposed for listing under either the federal or the State of Hawai'i's endangered species programs, as were observed during the course of the survey. No invertebrate currently listed as endangered or threatened under either federal or state statutes was located within the survey area.

The principal potential impact that the project pose to Hawaiian hoary bat is during the clearing and grubbing phases of the project. Clearing of dense vegetation should not occur between June 1 – September 15, when bats may be carrying young and potentially could be at risk as a result of such clearing activities. In addition, the clearing of dense vegetation, including woody plants beyond 15 feet should also not be cleared during this period.

Archaeological Resources – As with the Preferred Alternative, this alternative will not negatively impact archaeological resources. All of the confirmed and suspected burials will be preserved pursuant to a burial treatment plan prepared in consultation with recognized descendants and the Hawai'i Island Burial Council. The other preservation sites will be treated in accordance with a preservation plan submitted to and approved by State Historic Preservation Division (SHPD) prior to final subdivision approval.

Cultural Resources – As with the Preferred Alternative, this alternative will not impact cultural resources. With the possible exception of intermittent gathering of plant materials, there are no other traditional or customary native Hawaiian rights being exercised within the project area.

Trails and Access – As with the Preferred Alternative, this alternative will incorporate the Kohanaiki Trail into the project. The mauka-makai alignment ("footprint") of the Trail shall be open for public use and retained in perpetuity.

Traffic – Under this alternative, transportation needs are focused on the automobile, rather than transit. This alternative is expected to increase local and regional traffic because the emphasis is on the automobile.

Rather than development patterns and walkable concentration in an urban, walkable core, this alternative layout spreads the residential uses across the landscape of the site and forces owners within the development to drive to shop, work, recreate, etc.

Rather than minimize traffic congestion as sought in the Kona CDP through focus on transit and TOD, this alternative will maximize automobile activity on area roads, and force occupants into their cars, rather than onto their feet or into mass transit vehicles to get around.

Noise – As with the Preferred Alternative, this alternative, in the short-term, will create unavoidable construction noise during the duration of the construction of the proposed project. Operation of construction equipment and vehicles will raise ambient noise levels in the project vicinity. In addition, since the emphasis of travel will be on the automobile, automobile noise is expected to be significantly higher than the Preferred Alternative. Appropriate laws, ordinances and rules will be followed to comply with noise limits.

Air Quality - As with the Preferred Alternative, this alternative will create potential air quality impacts during construction of the project. In addition, since the emphasis of travel will be on the automobile, emissions from automobiles are expected to be significantly higher than the Preferred Alternative. Appropriate laws, ordinances and rules will be followed to comply with air quality standards.

Water – As with the Preferred Alternative, this alternative will require development of additional water sources, storage and transmission facilities. As noted in 4.10.1 of this EIS, several water system alternatives are considered, with utilization of wells (at approximate 710-ft elevation) as the Preferred Alternative. The proposed project will construct the required water system facilities that may be dedicated to the County's Department of Water Supply.

Wastewater – As with the Preferred Alternative, this alternative will create an on-site wastewater treatment plant as the Preferred Alternative for processing Kaloko Makai wastewater. An on-site wastewater treatment plant would be self-sufficient, water efficient, and environmentally sound. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) water standards. However, since this alternative contains 3,000 independent single-family lots in a conventional grid pattern, and DOH guidelines limit reuse of the treated effluent to residential property, an irrigation supervisor would be needed in order for the treated effluent to be used for irrigation purposes.

Drainage – As with the Preferred Alternative, this alternative will not impact drainage. There are no streams or natural drainageways in or near the project site. The surrounding area consists of barren *a`ā* and *pāhoehoe* lava fields which are highly permeable. The natural drainage pattern consists of rainfall percolating through layers of very porous lava to the subsurface strata. Stormwater will either percolate directly into the ground (in natural and landscaped areas) or will be collected in a system of catch basins and drain lines and disposed of in drywells located throughout the community.

Solid Waste – As with the Preferred Alternative, this alternative would include working with the County to identify and implement feasible alternatives for residential curbside collection, including source-separated recyclables.

Electrical – As with the Preferred Alternative, electrical power supply for this alternative will be provided by the existing power grid that traverses through the project site. Opportunities for alternative energy generation strategies such as use of solar power or photovoltaic systems are available, as in the Preferred Alternative.

Housing – Because this alternative is focused on developing single-family homes, there will not be a variety of housing options available to the market. Price differences may occur due to varying lot size or view opportunities; however, the pricing will remain relatively constant, thereby limiting the range of buyers to a relatively tight price range. However, the development would be required to comply with Hawaiʻi County's affordable housing requirements.

Education: Since the number of residential units are less than the Preferred Alternative, the impacts to education facilities under this alternative are generally less than the Preferred Alternative.

Economic and Fiscal – As with the Preferred Alternative, this alternative will contribute to increased State and County tax revenues in the form of increased property, general excise and increased income taxes from increased employment. However, since the focus is on residential development, with some commercial uses fronting roads and intersections, the economic and fiscal opportunities for the public benefit are less than the Preferred Alternative.

Public Services – With reduced number of residential units, there will be a reduced demand for public services.

The Conventional Subdivision Development pattern in West Hawaiʻi is reminiscent of urban/sub-urban sprawl and is heavily dependant on automobile transportation. This type of development is inconsistent with the TOD approach noted in the Kona CDP, that calls integration as a means to avoid the current trend toward sprawling low-density developments, disconnected subdivisions and business centers, and a general decline in the "Kona Way of Life." The Kona CDP land use policy seeks to concentrate growth within the TODs, in lieu of sprawl.

The Conventional Subdivision Development alternative is not selected because it is inconsistent with the Kona CDP (Transit Oriented Development) and is a continuation of urban sprawl discouraged under the Kona CDP.

7.6 ALTERNATE LOCATION

Alternative locations for the project were considered. However, since the Kaloko Makai site is designated as a Neighborhood TOD in the Kona CDP, the evaluation and opportunity for an alternative location was limited for several reasons.

The Kaloko Makai project was conceived, planned and designed to be consistent with the Hawaiʻi County *General Plan*, the *Keāhole to Kailua Development Plan* (K-to-K Plan) and the Kona CDP. The focus of planning for the Kaloko Makai site and the foundation of the layout, range of uses and densities have been designed to meet the purpose, details and village design guidelines of the Kona CDP.

As noted in the Kona CDP, most of the future growth in Kona will be directed to the Urban Area (UA,) as designated on its Official Land Use map. Within the Kona UA, growth would be directed to compact villages located along proposed transit routes or to infill areas within, or adjacent to, existing development. The general locations of these villages are within the designated TODs, as shown on the Official Kona Land Use Map.

The existing Kaloko Makai site is approximately 1,139-acres. No other properties of this size and with similar attributes are available for development within the Kona UA. Likewise, no other properties within the State of Hawaiʻi were found that possess these characteristics.

The project site is owned and/or controlled by the Applicant. No alternative sites are available, but if there was such a site, Applicant would have to acquire that site in order to develop the project. No other site has been designated as the “Kaloko Makai” TOD under the Kona CDP. Therefore, it is unreasonable to pursue an alternative location for the project.

This page intentionally left blank.

8. CONTEXTUAL ISSUES

8.1 RELATIONSHIP BETWEEN THE SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

Short-term uses and long-term productivity consist of project's short-term construction phases and the long-term benefits of the project after construction.

During construction, there will be short-term uses involving temporary and permanent alteration of land for grading, site work, and building construction. Short-term construction impacts can be avoided or mitigated by implementation of construction best management practices (BMPs). BMPs may include erosion and sedimentation control measures, directing storm-water runoff to detention/retention basins, and preventing release of contaminants. During the construction period, traffic conditions, noise levels, and air quality in the project area will be impacted. However, the project will comply with State regulations related to construction noise, fugitive dust, and water quality. The trade-off among these short-term impacts are the increase in employment and immediate economic benefits of construction-related activities.

In the long-term, the proposed project will commit 574 acres of currently classified agricultural land and 224 acres of conservation land to urban developments (total petition area is 798 acres). These actions would commit the property to mixed-use, residential, and commercial use as it would require the provision of infrastructure in the form of new roadways, wastewater treatment plant, waster system improvements, and electrical and telecommunication utilities.

As discussed in Section 3.3, the property's soil class ratings of Class VIIs and Class VIII mean that the soils are not suitable for cultivation and are generally restricted to non-agricultural use. Additionally, the project area is rated D, E and unclassified by the LSB Detailed Land Classification.

With only 6 percent of the project site designated "Other" and the remainder of the project site not classified in the Agricultural Lands of Importance in the State of Hawaiʻi (ALISH) system, Kaloko Makai will not have an impact on agriculturally significant lands or reduce the inventory of agricultural significant lands.

In addition, there will also be a long-term loss of open space and existing views mauka-makai views from Queen Kaʻahumanu Highway and from the shoreline.

The project area is suitable to accommodate urban type uses and its proposed uses are consistent with regional planning. The development proposed will increase the range of beneficial uses of the environment by providing quality residential neighborhood, with educational, medical, community, and recreational facilities. There will be long-term productivity gains through the project's provision of quality, desirable homes in a mixed-use, master planned community to meet the shortage of housing needs for Kona's residents. Other proposed uses would improve social well-being of West Hawaiʻi residents through increased employment opportunities in the area and conveniently located hospital, medical services, and governmental services.

The project site possesses desirable attributes, including optimal location with regards to its, gentle slope, views, climate and proximity to existing services.

The project will comply with applicable Federal, State and County of Hawaiʻi regulations governing project development and implementation. The project is not in an area with known hazards such as flooding or tsunami inundation.

In the long-term, the proposed project will provide substantial positive economic and social benefits as discussed throughout this Second Draft EIS. As a result, the proposed project will contribute to the maintenance and enhancement of long-term productivity for the people of Kona.

8.2 CUMULATIVE IMPACTS

Cumulative impacts are those that result from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions. Together with other existing and anticipated future development in the area, the project has the potential to generate cumulative impacts including traffic volumes on regional transportation facilities, increased demand for school facilities, drinking water, public services, coastal resources, and impacts on open space. Table 8-1 summarizes planned residential and commercial developments in the project vicinity.

A discussion of existing human and natural environmental conditions in the project area is found in Chapters 3 and 4.

The analysis of impacts on natural and human resource areas described in this Second Draft EIS has also taken into account other future development in Kona, where known and relevant. In particular, the discussion of traffic impacts includes additional traffic generated by build-out of Kaloko Makai as well as local traffic growth from nearby projects and trips to/from existing land uses. The following describes these types of cumulative impacts.

Groundwater: As discussed in Sections 3.5.1 and 4.10.1 of this EIS, three alternative water sources for the Kaloko Makai project are being considered:

1. On-site Wells at 710-foot Elevation Within the Project Site (Preferred Alternative)
2. On-site Wells a 710-foot Elevation with Reverse Osmosis (RO) Treatment
3. On-Site Wells at 363-foot Elevation with Desalinization of Saline Groundwater

At full build out, the projected drinking water demand would be 2.18 million gallons per day (mgd) and 0.57 mgd for irrigation use of R-1 recycled water.

Alternatives 1 and 2 would drill wells at the mauka end (710-foot elevation) of the project site. If successful, wells would tap fresh artesian groundwater which exists at depth below the basal lens and saline groundwater. One of these options would be pursued if it can be demonstrated, initially by testing in the exploratory borehole and subsequently by testing in the finished production wells, that pumping this water will have no impact on the basal lens above. The well would be tapping groundwater that flows beneath the basal lens and does not leak into it.

The third alternative, desalination of saline groundwater, would utilize on-site wells designed to draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt (parts per thousand) or greater. Extensive testing would be undertaken in the development of these wells to affirmatively demonstrate that such pumping can be done without adversely impacting the overlying basal lens.

The key requirement for all three alternatives being considered is that none would utilize water from the brackish basal lens flowing beneath the project site

Wastewater: An on-site wastewater treatment plant is the preferred alternative for processing Kaloko Makai wastewater. The Kaloko Makai facility will treat wastewater to produce reclaimed water meeting the highest (R-1) water standards for general irrigation within Kaloko Makai thus reducing the use of drinking water for irrigation. Section 4.10.2 contains further discussion.

Nearshore Marine Environment: As discussed in Section 3.5.2, it is unlikely that there would be any effects to the nearshore marine environment as a result of increases in nutrient concentrations in groundwater. Potential water quality impacts during construction of the project will be mitigated by adherence to State and County water quality regulations governing grading, excavation and stockpiling. The County's grading ordinance includes provisions related to reducing and minimizing the discharge of pollutants associated with soil disturbing activities such as grading, grubbing and stockpiling.

Construction Best Management Practices (BMPs) will be utilized in compliance with County ordinances pertaining to grading, grubbing, stockpiling, soil erosion and sedimentation during construction. BMPs will also be implemented for long term development and operation of activities occurring on the site as part of pollution prevention measures.

Kaloko Makai will develop a Pollution Prevention Plan (PPP) that provides BMPs, including structural BMPs, for pollution prevention that address all categories of permitted uses within the project, and will address environmental stewardship and the non-point sources of water pollution that can be generated from any uses allowed within the Project. Emphasis shall be given to BMPs that prevent or limit pollutants arising out of the permitted uses within the Project from reaching the groundwater and ocean.

Kaloko Makai will construct and operate a private wastewater treatment plant (WWTP) within the project. The WWTP will be designed to reduce the concentrations of Total Nitrogen ("TN") to <5 mg/l, and Total Phosphorous ("TP") to <2 mg/l, unless even lower concentrations are required by the DOH.

An on-site wastewater treatment plant will be self-sufficient, water efficient and environmentally sound. The Kaloko Makai facility will treat the wastewater to provide recycled (R-1) water for general irrigation within Kaloko Makai and thus lessen demand for drinking water for irrigation needs.

Traffic: The project will increase traffic demands and congestion in the project area. The cumulative increase in traffic demands including those generated by Kaloko Makai, other projects in

the vicinity or local roads during peak travel periods is assessed in Section 4.4. Mitigation measures to address cumulative traffic impacts are recommended.

Table 8-1
Planned Residential and Commercial Developments in the Project Vicinity

Project Name	Residential – Number of Units	Commercial – Estimated Square Footage	Comment
Kaloko Heights	1,362 units	50,000 square feet	Residential development east of Kaloko Makai, along Hina Lani Drive. Market homes on 7,500 to 15,000 square feet. Neighborhood commercial; zoned CN-20
Kula Nei	270 units	--	State Land Use Boundary Amendment granted October 2008. Plans include residential units, parks, wastewater treatment plant, drinking water well, regional storage reservoir.
Palamanui	1,116	70 gross acres planned as condominium lots in business park	Total is maximum per 2/2010 ordinance. Excludes dormitories. TND design within 725-acre site Tied to Hawaiʻi Community College at Palamanui Campus
Villages of LaʻiʻŌpua	1,097	--	Villages 1,2,4,5,7. V5 now being developed/ marketed, V3 is completed.
Kaloko Housing Project	72	--	Constructed completed.
Kamakana Villages	2,330	197,000 square feet of commercial space	The State's HHFDC requires that Kamakana Villages provide more than 50% of the new homes to buyers whose household income is at or under 140 percent of the median income for Hawaiʻi County, as well as commercial and mixed-use uses.
Queen Liliʻuokalani Trust Estate	Uncertain number	Uncertain number	There are potential residential and commercial developments on Queen Liliʻuokalani Trust lands in Keahuolu, where LUC-Urban designation is already in place, but the lands are zoned for commercial use. QLT plans to petition the LUC for review of the use of these Urban lands.
Kaloko Industrial Park, Phase III (Kaloko Commercial Center) and IV	--	Phase III (Kaloko Business Center) 41-net acres, infrastructure completed in 2009; future Phase IV estimated at 57-net acres.	Mixed light industrial and commercial use

Table 8-1 (continued) Planned Residential and Commercial Developments in the Project Vicinity			
Project Name	Residential – Number of Units	Commercial – Estimated Square Footage	Comment
West Hawaiʻi Business Park	--	337 gross acres less 10-net acres used by West Hawaiʻi Concrete as quarry, with one building. To be marketed as lots	Mixed light industrial and commercial use.
Department of Hawaiian Home Lands - near Kona International Airport and LaʻiʻŌpua		~400,000 SF Commercial ~245,000 SF Commercial	Across from the Airport. Net of likely light industrial uses, these lands are anticipated to support some 400,000 square feet of future commercial spaces; in addition approximately 245,000 SF at LaʻiʻŌpua
Kona Commons		~305,000 SF Commercial	Some 305,000 square feet could be added to the approximately 295,000 square feet that opened in 2008 and 2009

8.3 SECONDARY IMPACTS

Secondary impacts include those that are caused by the project and occur later in time or farther removed in distance but are still reasonably foreseeable. They may include growth inducing effects and other effects related to inducted changes in the pattern of land use, population density or growth rates, regardless of who initiates the action. Potential secondary impacts include: potential air quality impacts associated with the project's electrical power and solid waste disposal requirements; indirect and induced employment both during the construction and operations periods; indirect and induced workforce incomes and indirect fiscal effects upon government and revenues.

Air Quality: Depending on the demand levels, long-term impacts on air quality are also possible due to indirect emissions associated with the project's electrical power and solid waste disposal requirements. Based on the estimated project demand levels and emission rates involved, impacts to air quality near Hawaiʻi Electric Light Company (HELCO) power generation plant and solid waste disposal facilities will be negligible. The project will incorporate energy conservation design features and promote conservation and recycling programs to further reduce any associated impacts.

Employment and Workforce Income: The project will bring about positive benefits to the local economy, including increased expenditures for construction and construction-related jobs and tax revenue. During its build-out, Kaloko Makai is estimated to generate employment for some 300 to 400 full-time equivalent (FTE) persons annually, including positions created directly and indirectly by

its development activities. In the final eight years or so of the project's build-out, after most of its major infrastructure is complete, Kaloko Makai is expected to support some 800 FTE development-related jobs per year. These jobs would be located throughout the state, with greatest concentration in the County of Hawai'i. This estimate does not include employees of the three planned schools, realtors and brokers that may locate on-site, private household workers or employees of community associations or facilities.

The new development-related positions are expected to be associated with total personal earnings[1] of some $1.09 billion over the projection period, or $23 to $38 million per year. The earnings represent an average of about $83,000 to $87,000 per FTE job, including direct construction-related jobs as well as indirect and induced opportunities created throughout the economy.

By the time of its expected completion in 2045, the Project could be expected to have generated some 3,100 direct FTE jobs on-site at its retail, office, industrial, lodge, and medical-related facilities. Because these on-site jobs would all be supported at Project components, they are all direct impacts; there are assumed to be no indirect or induced employment impacts on-site.

Considering the Project's direct, indirect and induced impacts statewide, Kaloko Makai could alternatively be seen to have generated some 1,700 permanent, on-going FTE jobs. These are positions that might not have existed had the Project not been developed. These "net new" jobs could include a small share of the professional, technical, managerial and other staff positions at the new hospital, other medical facilities, office and retail areas; sales and marketing positions supported by the on-going resales and releasing of property at the Project; positions generated at the business and kama'aina-oriented lodge; and myriad other positions generated throughout the economy.

Refer to Section 4.9 for further discussion.

Public Services and Revenues: The project will incur increase demand for public services and facilities operating costs for the State and County of Hawai'i. However, the project will also contribute revenue to the State and County. The project could contribute some $8.8 million per year in net additional County revenues at its completion and annually thereafter.

By late 2045, new County government revenues are estimated to represent about 6.1 times the new County government operating expenditures required to support any additional population that could be attracted to the Island of Hawai'i by the project.

For the State, net additional operating revenues generated by the project are estimated at $4.9 to $6.2 million per year during buildout, when development activity would generate high gross excise and income taxes. The project is projected to continue to contribute to gains in the State budget in the long-run, with net additional revenues of some $2.8 million per year after 2045. These fiscal impacts represent a revenue/expenditure ratio for the State of some 2.4 to 5.2 during build-out, or 1.8 by late 2045 and thereafter.

[1] *Earnings are defined as wage, salary and proprietary income, plus director's fees and employer contributions to health insurance, less employee contributions to social insurance.*

Population Growth and Density: Planned infrastructure improvements (e.g. water, wastewater, transportation) will mitigate project needs only and are not expected to stimulate or induce growth outside of the project area. In addition, the project site has been identified in County planning documents, most recently the Kona Community Development Plan (CDP), for urban development. The County's planning policies encourage development in locations within the Kona Urban Area, such as Kaloko Makai. Kaloko Makai is identified as a Neighborhood Transit Oriented Development (TOD) in the Kona CDP.

8.4 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The project would result in the irreversible and irretrievable commitment of natural and fiscal resources. Major non-renewable resource commitments include the project site and the financing, construction material, labor, and energy required for the project's completion. The impacts represented by the commitment of these resources, however, should be weighed against the positive socio-economic benefits that could be derived from the project versus the consequences of either taking no action or pursing another less beneficial use of the property.

The proposed project will transform vacant open land into urban uses, which will result in the irretrievable loss of open space and alter mauka-makai views from Queen Ka'ahumanu Highway and shoreline. However, the project will also include a considerable amount of open space. Approximately 293 acres will be set aside for open space, parks, preservation of Kaloko Makai Dryland Forest, historic trails, and buffer zones.

As with any construction activity, resources such as fossil fuels and construction material will be irrevocably committed. Labor will be required for planning, engineering, and construction. Once occupied, the new housing will generate increases in the demand of water, electricity, and wastewater service. However, these increases accompany any new housing development, regardless of location. Homes that would have been built elsewhere to satisfy the growing demand for new housing in North Kona would generate at least a great of a demand. As a compact, mixed-use, transit oriented development, Kaloko Makai is anticipated to generate a lower demand on resources.

Providing drinking water for the project would commit additional groundwater resources, however, None of the three alternative drinking water sources would utilize water from the brackish basal lens beneath the project site. Two of the three alternatives that would draw from high level groundwater, none would impact basal groundwater in the project's mauka-makai corridor or elsewhere in North Kona.

In summary, two of the three drinking water source alternatives would drill wells at the mauka end (710 ft. elevation) of the project site. If successful, wells for these two alternatives would tap fresh artesian groundwater which exists at dept below the basal lens and saline groundwater. One or the other of these options would only be pursued if it can be demonstrated, initially be testing in the exploratory borehole and subsequently by testing in the finished production wells, that pumping this water will have no impact on the basal lens above. Rather it would simply be tapping groundwater that flows beneath the basal lens and does not leak into it.

The third alternative desalination of saline groundwater, would utilize on-site wells designed to draw water from a substantial distance below the basal lens where the salinity may be on the order of 30 ppt. Extensive testing would be undertaken in the development of these wells to affirmatively demonstrate that such pumping can be done without adversely impacting the overlying basal lens.

The Applicant is setting aside lands for Kona Regional Hospital and schools. The development of these facilities will result in the irretrievable and irreversible commitment of State and County funds to operate and maintain these facilities.

There is always the risk of environmental accidents resulting from any phase of project implementation which may cause irreversible damage to the environment. The possibility of environmental accidents will be mitigated by complying with all applicable environmental laws and regulations and following BMPs to help prevent and respond to any environmental accidents.

8.5 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

This section describes the project's long-term adverse impacts that may be unavoidable and the rational for proceeding notwithstanding the unavoidable effects.

Open Space/Views: The proposed action will transform vacant open land into urban uses. The project will obscure the mauka-makai views from Queen Kaʻahumanu Highway and the shoreline. However, approximately 293 acres will be set aside for open space, parks, preservation of Kaloko Makai Dryland Forest Preserve, historic trails, and buffer zones.

Noise: During construction, there will likely be unavoidable noise impacts associated with operation of heavy construction machinery, paving equipment and material transport vehicles. Proper mitigating measures will be employed to minimize construction-related noise impacts and comply with all Federal and State noise control regulations. Increased noise activity due to construction will be limited to daytime hours and persist only during the construction period. Noise from construction activities will be short-term and will comply with DOH noise regulations (HAR, Chapter 11-46, Community Noise Control). When construction noise exceeds, or is expected to exceed the DOH's allowable limits, a permit must be obtained from the DOH.

Air Quality: The proposed project will have short-term construction-related impacts on air quality, including the generation of dust and emissions from construction vehicles, equipment and commuting construction workers. During construction, activities such as grading and excavation at the project site will generate dust while vehicles and equipment will produce exhaust emissions. Dust control measures stipulated by Department of Health Administrative Rules, Title 11, Chapter 60, "Air Pollution Control" regulations will be employed, as appropriate.

Traffic: The project will increase traffic demands and congestion in the project area. The cumulative increase in traffic demands including those generated by Kaloko Makai, other projects in the vicinity or local roads during peak travel periods is assessed in Section 4.4. Mitigation measures to address cumulative traffic impacts are recommended.

Electrical Power: When fully built-out the electrical demand for Kaloko Makai is expected to reach a maximum of approximately 210.8 million kilowatt hours/year. To reduce energy consumption, energy conservation measures will be implemented where appropriate in the design of Kaloko Makai (see Section 2.5). Where appropriate, the Applicant will utilize LEED and ENERGY STAR concepts in the development of Kaloko Makai (Refer to Section 2.5 and Appendix Q).

Solid Waste: As discussed in Section 4.10.4, solid waste will be generated during construction and after completion of Kaloko Makai. Upon full build-out and occupancy, Kaloko Makai is expected to produce approximately 12,795 tons/year of household/community waste. Measures and provisions to implement recycling, such as collection systems and storage for recyclables will be heavily incorporated to Kaloko Makai.

Kaloko Makai will work hand in hand with the County to produce feasible alternatives for residential curbside collection, including source-separated recyclables. Waste that is rendered unable to be recycled or incorporated into on-site green waste processing will be disposed of in the Pu‘uanahulu landfill.

8.5.1 Rationale for Proceeding with Kaloko Makai Notwithstanding Unavoidable Effects

In light of the above mentioned unavoidable effects, the project should proceed because adverse impacts will be minimized, mitigated, or off-set by substantial benefits. The proposed project will have numerous benefits to off-set its potential unavoidable adverse impacts:

- Compliance with the *County of Hawai‘i General Plan* (February 2005), which designates the Kaloko Makai property for Urban Expansion.
- Compliance with the *County of Hawai‘i Kona Community Development Plan* (September 2008), which designates the site as part of the Kona UA and as a TOD; consistency with the vision, principles and goals of the Kona CDP.
- Substantial consistency with policies of the *Hawai‘i State Plan*, State Functional Plans, and the Coastal Zone Management Act.
- Approximately 5,000 new single-family and multi-family home in a live-work-play environment to meet islandwide housing needs.
- Homes for a variety of income ranges, including affordable housing
- Potential hospital and medical facilities.
- Construction jobs.
- Additional jobs not related to construction of the project; development of new centers for business and employment.
- School sites.
- Recreational resources.
- The provision of diverse housing opportunities makai of Queen Ka‘ahumanu Highway.
- The preservation of the Kaloko Makai Dryland Forest Preserve.
- The wages, taxes and overall positive economic impacts of Kaloko Makai.

8.6 UNRESOLVED ISSUES

Some issues are unresolved at the time of the preparation of this Second Draft EIS. They are described below and are expected to be resolved prior to commencement of the proposed action.

8.6.1 Transportation Improvements

The project will increase traffic demands and congestion in the project area. The cumulative increase in traffic demands including those generated by Kaloko Makai and other projects in the vicinity on local roads during peak travel periods is assessed in Section 4.4. Mitigation measures to address cumulative traffic impacts are recommended. The configurations of those improvements, timing of completion and allocation of funding for these improvements are unresolved. These matters will be addressed through agreements between the Applicant and the County and/or the State DOT, as applicable, prior to vertical construction of the project.

The general configuration of the project's internal roadways is known, but the precise roadway design standards that will be applicable to the internal roadway network within Kaloko Makai have not been finalized by the County of Hawai'i Planning Department and Department of Public Works. As a compact, mixed-use transit oriented development, Kaloko Makai should be designed to be consistent with the Kona CDP and Village Design Guideline. However, those Guidelines are not consistent with the more general standards required by the County Department of Public Works. Prior to project development, Applicant will obtain County approval of the internal roadways.

8.6.2 Archaeological and Historic Resources

The archaeological surveys were submitted to State Historic Preservation Division (SHPD) in October 2008 for their review. At the time of this Second Draft EIS, SHPD was still reviewing the archaeological inventory surveys.

8.6.3 Type of Transit Oriented Development Village

The Kaloko Makai project has been designated as a Neighborhood TOD in the Official Kona Land Use Map. The Applicant is setting aside 40 acres of land in anticipation of a regional hospital being sited within Kaloko Makai TOD. Kona CDP economic policy ECON-1.1 at page 4-128 states that, if the land is developed with a regional hospital the Neighborhood TOD at Kaloko Makai shall be designated as a Regional Center TOD. However, the proposed project will be designed and assessed herein as a Neighborhood TOD.

In the event a hospital developer and operator is not arranged for the 40-acre site noted in the project site plan, then the residential units and commercial square footage will be reallocated throughout the area identified as Phase 1 (see Figure 2-15). This means there will be a slight reduction in densities in some of the existing residential and commercial properties in Phase 1. There will be no change in residential unit count or commercial square footage in each of Phases 1, 2 and 3, or the entire project.

Whether a hospital developer/operator comes forward or not, the Kaloko Makai TOD will remain as a Neighborhood TOD (consistent with the Official Land Use Map of the Kona CDP) and its uses in the

"neighborhood" and the project will not be developed as a Regional TOD. If the hospital is included, a portion of the commercial space in the project will support it. If the hospital is not included then some of the proposed space will address regional medical needs, as well as other commercial demands. In addition, commercial core uses (recreational space, small-scale public/civic uses, office, retail, mixed-use, etc) will serve the needs of the immediate community (Kaloko Makai,) as well as neighboring communities.

Applicant will not be developing the hospital, but several entities have been approached to undertake the development. Applicant will continue to pursue a hospital developer, and will continue dialog with those entities on the potential development of the new regional hospital/medical center at Kaloko Makai.

On May 23, 2011, Stanford Carr sent a letter to Bruce Anderson, CEO of Hawai'i Health Systems Corporation offering 40-acres of land to the appropriate entity to build and operate a hospital. In part, that letter stated, "This letter is to confirm that SCD - TSA Kaloko Makai LLC is willing to convey to the State, HHSC or other appropriate entity, at no cost, 40-acres of land within the Kaloko Makai project for a new regional acute care Hospital." "This proposal does not suggest Kaloko Makai will construct, pay for or operate a Hospital facility. However, Kaloko Makai is prepared to give the 40-acre site within the project for the new hospital facility."

This page intentionally left blank.

9. CONSULTATION

9.1 PRE-CONSULTATION

The following agencies and parties were consulted during the pre-assessment phase of the EIS Preparation Notice.

Federal
U.S. Fish & Wildlife Service

State
Department of Business, Economic Development, and Tourism (DBEDT), Land Use Commission
State Department of Transportation (DOT)
Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife, Na Ala Hele

County of Hawaiʻi
Planning Department
Planning Department, Design Center
Department of Public Works
Department of Water Supply

9.2 ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE CONSULTATION

The following agencies, organizations, and individuals were consulted during the Environmental Impact Statement Preparation Notice (EISPN) process. Consultation was conducted to solicit comments from the public regarding their concerns and agency requirements. Notice of availability of the EISPN was published in the September 23, 2010 issue of *The Environmental Notice*. The public comment period on the EISPN was from September 23, 2010 to October 23, 2010. Copies of all written comments received along with response letters are reproduced and included in Appendix R.

Name of Agency, Organization, or Individual	Date of Letter*
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	10/29/10
U.S. Geological Survey	
U.S. Department of Agriculture Natural Resources Conservation Service	
U.S. National Park Service, Kaloko Honokōhau National Historical Park	10/22/10
U.S. National Park Service, Ala Kahakai National Historic Trail	10/22/10
Federal Highway Administration	
* If blank, agency or organization did not comment.	

Name of Agency, Organization, or Individual	Date of Letter*
State of Hawai‘i	
Department of Accounting & General Services	
Department of Agriculture	
DBEDT, Land Use Commission	
DBEDT Strategic Industries Division	
DBEDT Office of Planning	11/03/10
DBEDT Hawai‘i Public Housing Authority	
DBEDT Hawai‘i Housing Finance & Development Corporation	
DBEDT Energy, Resources and Technology Division	
Department of Land and Natural Resources (DLNR)	
Engineering Division	
Division of State Parks	
Commission on Water Resource Management	
Land Division, Hawai‘i District	10/21/10
DLNR, Division of Forestry and Wildlife	
DLNR, Division of Aquatic Resources	10/22/10
DLNR, Office of Conservation and Coastal Lands	10/18/10
DLNR, Historic Preservation Division	
Department of Health (DOH)	
Safe Drinking Water Branch	
Wastewater Branch	11/04/10
Clean Air Branch	10/26/10
DOH Environmental Planning Office	
DOH Clean Water Branch	10/05/10
DOH Indoor and Radiological Health Branch	10/25/10
DOH Office of Environmental Quality Control	
Department of Education	10/15/10
Department of Hawaiian Home Lands	10/07/10
Department of Transportation	10/26/10
Office of Hawaiian Affairs	10/21/10
University of Hawai‘i at Mānoa (UHM) Environmental Center	
County of Hawai‘i	
Office of the Mayor	10/08/10
Civil Defense Agency	
* If blank, agency or organization did not comment.	

Name of Agency, Organization, or Individual	Date of Letter*
Department of Environmental Management	10/13/10
Fire Department	10/11/10
Planning Department	10/21/10
Planning Department, Kona CDP Action Committee	
Planning Department, Kona CDP Design Center	
Department of Parks and Recreation	
Police Department	10/11/10
Department of Public Works	01/05/11
Department of Water Supply	10/25/10
Elected Officials	
Councilmember Brenda Ford, District 7	
Councilmember Kelly Greenwell, District 8 (former)	
Senator Josh Green, M.D., District 3	
Representative Robert Herkes, District 5	
Representative Denny Coffman, District 6	
Public Utility Agencies	
Hawai‘i Electric Light Company	10/01/10
Hawaiian TelCom	
Oceanic/Time-Warner Cable	
Organizations	
Hawai‘i Leeward Planning Conference	
Kona Hawaiian Civic Club	09/19/10
Kona Outdoor Circle	
Kona Traffic Safety Committee	
Kona-Kohala Chamber of Commerce	
Na Kokua Kaloko- Honokōhau	
Peoples Advocacy for Trails Hawai‘i (PATH)	
* If blank, agency or organization did not comment.	

9.2.1 Meetings with Elected Officials, Agencies and Stakeholders

The Applicant consulted with the following agencies, organizations, elected officials, and stakeholders:

Federal
U.S. Federal Highways Administration
Fish and Wildlife Service
Kaloko Honokōhau Historical National Park

State
Department of Accounting and General Services
Department of Education
Department of Health
Department of Land and Natural Resources
- DLNR Land Division
- DLNR Division of Forestry and Wildlife
  - Endangered Species Recovery Committee
  - Na Ala Hele
- DLNR State Historic Preservation Division

Department of Transportation
Governor's Representative - West Hawai'i
Hawai'i Health Systems Corporation
- HHSC Kona Community Hospital Administrator
- HHSC West Hawai'i Regional Board

State Supreme Court staff

County of Hawai'i
Mayor's Office
Department of Environmental Management
Department of Parks and Recreation
Department of Public Works
- Engineering Division
- Traffic Division

Department of Water Supply
Planning Department

Private Groups
Group 70
Hui O Na Kupuna

9.3 AGENCIES AND PARTIES TO BE CONSULTED DURING THE DRAFT EIS.

The following agencies, organizations, and individuals were consulted during the Draft Environmental Impact Statement (EIS) process. Consultation was conducted to solicit comments from the public regarding their concerns and agency requirements. Notice of availability of the

Draft EIS was published in the August 8, 2011 issue of *The Environmental Notice*. The public comment period deadline was September 21, 2011. Copies of all written comments received along with response letters are reproduced and included in Appendix S.

Name of Agency, Organization, or Individual	Date of Letter*
Federal	
U.S. Army Corps of Engineers	
U.S. Fish and Wildlife Service	10/04/11
U.S. Geological Survey	
U.S. Department of Agriculture Natural Resources Conservation Service	08/09/11
U.S. National Park Service, Kaloko Honokōhau National Historical Park	10/05/11
U.S. National Park Service, Ala Kahakai National Historic Trail	
Federal Highway Administration	
State of Hawai‘i	
Department of Accounting & General Services	08/23/11
Department of Agriculture	
DBEDT, Land Use Commission	09/12/11
DBEDT Strategic Industries Division	
DBEDT Office of Planning	10/07/11
DBEDT Hawai‘i Public Housing Authority	
DBEDT Hawai‘i Housing Finance & Development Corporation	
DBEDT Energy, Resources and Technology Division	
Department of Defense	
Department of Human Services	08/30/11
Department of Labor & Industrial Relations	
Department of Land and Natural Resources (DLNR)	09/22/11
Engineering Division	
Division of State Parks	
Commission on Water Resource Management	
Land Division, Hawai‘i District	
DLNR, Division of Forestry and Wildlife	no date
DLNR, Historic Preservation Division	
* If blank, agency or organization did not comment.	

Name of Agency, Organization, or Individual	Date of Letter*
Department of Health (DOH)	
Safe Drinking Water Branch	09/30/11
Wastewater Branch	08/22/11
Clean Air Branch	09/20/11
DOH Environmental Planning Office	
DOH Office of Environmental Quality Control	
Department of Education	09/09/11
Department of Transportation	09/20/11
Office of Hawaiian Affairs	10/05/11
Department of Hawaiian Home Lands	
University of Hawaiʻi at Mānoa (UHM) Environmental Center	09/21/11
County of Hawaiʻi	
Office of the Mayor	
Planning Department	
Planning Department, Kona CDP Action Committee	
Department of Water Supply	09/26/11
Department of Public Works	
Department of Parks and Recreation	
Department of Environmental Management	08/09/11
Civil Defense Agency	
Police Department	08/18/11
Fire Department	08/26/11
Elected Officials	
Councilmember Brenda Ford, District 7	
Councilmember Angel Pilago, District 8	
Senator Josh Green, M.D., District 3	
Representative Coffman, Denny District 6	
Representative Robert Herkes, District 5	
Public Utility Agencies	
Hawaiʻi Electric Light Company	09/13/11
Hawaiian TelCom	
Oceanic/Time-Warner Cable	
* If blank, agency or organization did not comment.	

Name of Agency, Organization, or Individual	Date of Letter*
Organizations	
Hawaiʻi Leeward Planning Conference	
Kona Hawaiian Civic Club	
Kona Outdoor Circle	
Kona Traffic Safety Committee	
Kona-Kohala Chamber of Commerce	
Na Kokua Kaloko- Honokōhau	
Peoples Advocacy for Trails Hawaiʻi (PATH)	
Libraries and Media	
Honolulu Star-Advertiser	
Hawaiʻi Tribune Herald	
West Hawaiʻi Today	
Kailua-Kona Library	
Legislative Reference Bureau	
Hawaiʻi State Library	
University of Hawaiʻi Hamilton Library	
Pearl City Library	
Kaneʻohe Library	
Kaimuki Library	
Hilo Library	
University of Hawaiʻi at Hilo Moʻokini Library	
Kahului Library	
Lihuʻe Library	
Other	
Kona Community Hospital	09/06/11
Hawaii Forestry Industry Association	09/20/11
Sierra Club	09/20/11
Surfrider Foundation Kona Kai Ea Chapter	10/02/11
Ruth Aloua	09/20/11
Lily Anne Souza	09/20/11
Michelle Tomas	09/21/11
* If blank, agency or organization did not comment.	

This page intentionally left blank.

10. LIST OF PREPARERS

Name and Company	Responsibility
Earl Matsukawa, AICP, Wilson Okamoto Corporation Tracy Fukuda, Wilson Okamoto Corporation Keola Cheng, Wilson Okamoto Corporation	EIS Preparation
Jay Nakamura, Stanford Carr Development Peter Phillips, Stanford Carr Development	EIS Preparation and Land Use Plan EIS Preparation and Land Use Plan
Peter Young, Hoʻokuleana, LLC Jennifer Barra, Hoʻokuleana, LLC,	EIS Preparation, Land Use Plan, Community Outreach, and Sustainability Plan
Ann Bouslog, Mikiko Corporation	Economic and Fiscal Assessment and Market Assessment
John Knox, John M. Knox & Associates, Inc.	Social Impact Assessment
Tom Nance, Tom Nance Water Resources Engineering	Groundwater Assessment
Steve Dollar, Marine Research Consultants, Inc.	Marine and Pond Assessment
Brian Lock P.E., Wilson Okamoto Corporation Evan Kawashima, Wilson Okamoto Corporation	Civil Engineering
Craig Lekven, P.E., Brown & Caldwell	Wastewater
Pete Pascua, P.E., Wilson Okamoto Corporation Cathy Leong, P.E., Wilson Okamoto Corporation KOA Engineering	Traffic Engineering
Yoichi Ebisu, Y. Ebisu & Associates	Noise Assessment
Barry Neal, B.D. Neal & Associates	Air Quality Assessment
Cultural Surveys Hawaiʻi, Inc.	Archaeological and Cultural Impact Assessment
Steve Montgomery, Ph.D.	Terrestrial Invertebrate Survey
Art Whistler	Botanical Survey

Name and Company	**Responsibility**
Reginald David, RANA Productions, Ltd.	Avifauna and Mammalian Survey and Botanical Survey
Eric Guinther, AECOS Consultants	Botanical Survey
Cattaneo & Stround, Inc.	Health Care Facilities Forecast

11. REFERENCES

Atkinson, Marlin J. & Falter, James L.; *Coral Reefs in Biogeochemistry of Marine Systems*, 2003 (Atkinson 2003).

Bauer, Glenn (PR-2003-01); *A Study of the Ground-Water Conditions in North and South Kona and South Kohala Districts Island of Hawai'i, 1991-2002*; September 2003 (Bauer 2003).

Bergen, Billy; Loyal to the Land: The Legendary Parker Ranch; University of Hawai'i Press, Honolulu; 2007 (Bergin 2004).

Cobb Allan, Michelle Elmore, and Joseph Kennedy; *An Archaeological Assessment of TMK: 7-3-09:025, 26 and 28 at Kaloko and Kohanaiki Ahupuaa, North Kona District, Island of Hawai'*i; ACP, Haleiwa Hawai'i; 2003 (Cobb et al. 2003).

Cordy, Ross and Joseph Tainter and Robert Renger and Robert Hitchcock. *An Ahupuaa Study: The 1971 Archaeological Work at Kaloko Ahupuaa North Kona, Hawai'i"* Archaeology at Kaloko-Honokohau National Park, Western Archaeological and Conservation Center Publications in Anthropology No. 58. Tucson: National Park Service. 1991 (Cordy et al. 1991).

County of Hawai'i. *The General Plan Hawai'i County*. February 2005 (County of Hawai'i 2005).

County of Hawai'i. *Kona Community Development Plan* 2008. Prepared by Wilson Okamoto Corporation. September 2008 (County of Hawai'i 2008).

County of Hawai'i. *2006 County of Hawai'i Data Book*. November 2007. http://www.hawaii-county.com/databook_current/dbooktoc.htm

County of Hawai'i. *2008 County of Hawai'i Data Book*. November 2009. http://www. hawaii-county.com/databook_current/dbooktoc.htm

County of Hawai'i. Multi-*Hazard Mitigation Plan: County of Hawai'i*. February 2005 (County of Hawai'i 2005).

County of Hawai'i. *Hawai'i Island Plan Website.* November 2007, http://www.hcrc.info/hawai-i-island-plan/kona

Hawaii County Civil Defense Tsunami Evacuation Zone Maps, accessed website June 18, 2013, http://records.co.hawaii.hi.us/Weblink8/Browse.aspx?startid=24604&dbid=1

County of Hawai'i. *Integrated Resources and Solid Waste Management Plan Update, The Path to Zero Waste.* Prepared by CH2M Hill. December 2009 (County of Hawai'i 2009).

County of Hawai'i, Department of Environmental Management. *North Kona Improvement District Project Sewer Master Plan*. Prepared by SSFM International, May 2006 (County of Hawai'i 2006).

DeVerse, K., Appendix A: Kaloko-Honokōhau National Historical Park resource overview. In: HaySmith, L., F. L. Klasner, S. H. Stephens, and G. H. Dicus. Pacific Island Network vital signs monitoring plan. Natural Resource Report NPS/PACN/NRR—2006/003 National Park Service, Fort Collins, Colorado, 2006 (KAHO 2006).

DLNR-DAR; Long-Term Monitoring of Coral Reefs of the Main Hawaiian Islands, Final Report 09-30-10 (DAR 2010).

Dollar, S.J. and M.J. Atkinson; *Effects of nutrient subsidies to nearshore marine systems off the west coast of the Island of Hawai'i*. Estuarine, Coastal and Shelf Science 35: 409-424; 1992 (Dollar and Atkinson 1992).

Donham, Theresa K. *Full Archaeological Reconnaissance Survey, Kohana-Iki Development Project Area, Land Of Kohana-Iki, North Kona, Island of Hawai'i (TMK: 3-7-3-9:3, 14*) PHRI Report 216-040286, Hilo, HI. 1986.

Engott, J.A.; *A Water Budget Model and Assessment of Groundwater Recharge for the Island of Hawai'i*, USGS Scientific Investigations Report 2011-5078; 2011 (Engott 2011).

Fukunaga & Associates, Inc.; *Hawai'i County Water Use and Development Plan Update*, Hawai'i Water Plan, August 2010 (WUDP 2010).

Garcia et al.; Stratigraphy of the Hawai'i Scientific Drilling Project core (HSDP2): Anatomy of a Hawaiian shield volcano; Published in Geochemistry, Geophysics, Geosystems; February 28, 2007; (HSDP2 2007).

Geometrician Associates LLC; Comment to Draft Environmental Assessment for Water Well and Associated Facilities at Honokōhau 1st, North Kona, TMK (3rd.) 7-4-02:08, October 5, 2009 (Terry 2009).

Geometrician Associates LLC; *Monk Seal Rehabilitation Facility at NELHA*, TMK (3rd) 7-3-043:042, North Kona District, Island of Hawai'i, Draft Environmental Assessment; March 2011 (Terry 2011).

George A.L. Yuen & Associates, Inc. *State Water Resources Protection Plan, Volumes I and II*. Prepared for the State of Hawai'i Department of Land and Natural Resources, Commission on Water Resource Management. Review Draft, March 1992.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P. –S Chu, J.K. Eischeid, and D.M. Delparte; *Online Rainfall Atlas of Hawai'*i, Bull. Amer. Metero. Soc., doi 10.1175/BAMS-D-11-00228.1. 2012 (Giambelluca and Others 2011).

Hammatt, Hallett H., David W. Shideler and Cultural Surveys Hawai'i; *Native Hawaiian Cultural Impact Assessment on the Development of a 224.43 Acre Parcel Within Portions of Kaloko and Kohnaiki Ahupuaa (TMK 7-3-09:17 and portion of 2*; Cultural Surveys Hawai'i, Kailua, Hawai'i; 1996 (Hammatt and Shideler 1996).

Haun, Alan E.; *Archaeological Assessment 400-Acre Portion of TMK 7-3-09: 028 Land of Kaloko, North Kona District, Island of Hawai'i*; Haun and Associates, Keaau, Hawai'i; 2003 (Haun 2003).

Ii, John Papa; *Fragments of Hawaiian History*; Bishop Museum Press, Honolulu; 1959 (Ii 1959).

Kamakau, Samuel Manaiakalani; *Ruling Chiefs of Hawai'i*; The Kamehameha Schools Press, Honolulu, HI; 1961 (Kamakau 1961).

Kelly, Marion; *Keakaha: Aina Malo'o, Historical Survey and Background of Kaloko and Kukio Ahupuaa, North Kona, Hawaii*; Department of Anthropology Report 71-2; Bishop Museum, Honolulu, HI; 1971 (Kelly 1971).

Kukui Planning Company, LLC. Kaloko Makai Dryland Forest Preserve Rare Plant Survey Final Report. January 2, 2012.

Maly, Kepa; Appendix A: Historical Documentary Research in Archaeological Inventory Survey Kaloko Industrial Park Parcel. Paul H. Rosendahl, Ph.D., Inc, Hilo, Hawai'i; 1993 (Maly 1993).

Maly, Kepa and Onaona Maly; *Kohanaiki Ma Kekaha Wai Ole O Na Kona (Kohanaiki on the Arid Shores of Kona): A Report on Archival and Historical Documentary Research and Oral History Interviews for the Ahupuaa of Kohanaiki, District of Kona, Island of Hawai'i (TMK 7-3-09: 03, 14);* Kumu Pono Associates, Hilo, Hawai'i' 2003 (Maly and Maly 2003).

Maly, Kepa and Onaona Maly; *He Wahi Moolelo 'Ohana No Kaloko Me Honokohau, Ma Kekaha O Na Kona – A Collection of Family Traditions Describing Customs, Practices and Beliefs of the Families and lands of Kaloko and Honokohau, North Kona, island of Hawaii*; Kumu Pono Associates, Hilo, Hawai'i' 2003 (Maly and Maly 2002).

Marine Research Consultants; *An Assessment of Potential Effects to the Marine and Pond Environments in the Vicinity of the Kaloko-Honokōhau Business Park*, North Kona, Hawai'i; , March 2002 (Marine Research Consultants 2002).

Meeker, Heidi. State Department of Education. Personal Communication, November 29, 2007.

Nance, T. *Potential Impact on Water Resources of the Proposed Kealakehe Commercial/Industrial Park in Kealakehe, North Kona, Hawai'i*. Consultant Report prepared for PBR Hawai'i. 2002 (Nance 2002).

Oceanit. *Kona Kai Ola Final Environmental Impact Statement, Volume I*. Prepared for Jacoby Development and Hawai'i State Department of Land and Natural Resources. July 2007.

Parsons, Michael L. et al; *A multivariate assessment of the coral ecosystem health of two embayments on the lee of the island of Hawai'i, in Marine Pollution Bulle*tin, 2008 (Parsons 2008).

PBR Hawaiʻi. *Ooma Beachside Village Environmental Impact Statement Preparation Notice*. Prepared for State of Hawaiʻi Land Use Commission and North Kona Village, LLC. April 2007 (PBR 2007).

Pukui, Mary Kawena; *Olelo Noeau, Hawaiian Proverbs and Poetical Sayings, Collected, Translated and Annotated by Mary Kawena Pukui, Illustrated by Dietrich Varez;* Bernice P. Bishop Museum Special Publication No. 71; Bishop Museum Press, Honolulu; 1983 (Pukui 1983).

R.M. Towill Corporation. *Keahole to Kailua Development Plan*. Prepared for the County of Hawaiʻi Planning Department. April 1991 (R.M. Towill 1991).

Renger, Robert. Kaloko Field Notes. 1971 (Renger 1971).

Rosendahl, Margaret L.K. and Alan E. Haun; Archaeological Reconnaissance Survey, Kaloko Water Tank Sites, Land of Kaloko North Kona, Island of Hawaiʻi; PHRI Report 370-101487. Paul H. Rosendahl, Ph.D., Inc., Hilo, 1987 (Rosendahl and Haun 1987).

Rosendahl, Paul H. and Alan Walkder; Archaeological Field Inspection, Proposed Kaloko Indusrial Crusher Sites, Land of Kaloko, North Kona District, Island of Hawaiʻi (TMK: 3-7-3-09: 17); PHRI Hilo, 1991 (Rosendahl and Walker 1991).

Siddall, John W.; *Men of Hawaiʻi (Biographical Description of John Avery Maguire)*; Honolulu Star Bulletin; 1917 (Siddall 1917).

Schmitt, Robert C.; *The Missionary Censuses of Hawaii*; Number 20, Pacific Anthropological Records, Department of Anthropology, Bernice P. Bishop Museum, Honolulu, HI; 1973 (Schmitt 1973).

SSFM International. *North Kona Improvement District Project Sewer Master Plan Summary Report*. Prepared for County of Hawaiʻi Department of Environmental Management. October 2006 (SSFM 2006).

Smart Growth Network. *Getting to Smart Growth: 100 Policies for Implementation*. http://smartgrowth.org

Springer, Hannah K.; *Regional Notes from Kekaha: Kaupulehu, An Ethnography Kaupulehu Ma Uka Conservation and Agricultural Lands, TMK 7-2-03: 03*; 1989 (Springer 1989).

State of Hawaiʻi Department of Business, Economic Development and Tourism. *2006 The State of Hawaiʻi Data Book A Statistical Abstract*. August 2007.

State of Hawaiʻi Department of Education *School Status and Improvement Report School Year 2009-20010 for Kealakehe Elementary School.* November 22, 2010a.

State of Hawaiʻi Department of Education *School Status and Improvement Report School Year 2009-2010 for Kealakehe Intermediate School.* November 22, 2010b.

State of Hawaiʻi Department of Education *School Status and Improvement Report School Year 2009-2010 for Kealakehe High School.* November 22, 2010c.

State of Hawaiʻi Department of Hawaiian Home Lands, *Kealakehe/Laiopua Regional Plan.* October 2007.

State of Hawaiʻi. *The Hawaiʻi State Functional Plans*. 1989-1991.

State of Hawaiʻi Department of Transportation. *Kona international Airport at Keahole 14 CFR Part 150 Noise Compatibility Study, Noise Exposure Maps Update*. Prepared by Kober, Hanssen, Mitchell Architects in Association with Coffman Associates, Inc., PBR Hawaiʻi, and Becker Communication. April 2009.

State of Hawaiʻi Office of State Planning, Department of Business, Economic Development and Tourism, *Land Use Division Newsletter*, December 13, 2012, http://planning.hawaii.gov/wp-content/uploads/2012/10/LUD-Program-Flyer_20121213.pdf

Stopler et al.; Deep Drilling into a Mantle Plume Volcano: The Hawaiʻi Scientific Drilling Project; Scientific Drilling, No. 7, March 2009 (HSDP 2009).

Tom Nance Water Resource Engineering; *Assessment of the Potential Impact on the Water Resources of the Proposed Kaloko-Honokōhau Business Park in North Kona, Hawaiʻi*, March 2002 (Nance 2002).

Tom Nance Water Resource Engineering; *Assessment of the Potential Impact on* the Water Resources of the proposed O`oma Beachside Village in North Kona, Hawaiʻi, April 2008, Revised December 2008; (Nance 2008).

Tom Nance Water Resource Engineering; First Order Approximation of the Impact on Salinity of Pumping Inland High Level Aquifer Wells; August 13, 2009 (Nance 2009).

Tom Nance; Personal communication. May 25, 2011 (Nance 2011).

U.S. Census Bureau American FactFinder:
http://factfinder.census.gov/home/saff/main.html?_lang=en&_ts=

US Geological Survey Report 99-4047; *Ground-Water Resources in Kaloko-Honokōhau National Historical park, Island of Hawaiʻi, and Numerical Simulation of the Effects of Ground-Water Withdrawals*; 1999 (Oki et al. 1999).

US Geological Survey; *Results of Sampling for Wastewater Tracers At and Near Kealakehe WWTP, Kona, Hawaiʻi*, March 13, 2008 (Hunt 2008).

U.S. Geological Survey Website: http://hi.water.usgs.gov; accessed June 9, 2011 (USGS 2011).

University of Hawaiʻi; *Research Publication No. 23*; University of Hawaiʻi, Honolulu; 1927 (University of Hawaiʻi 1927).

Waimea Water Services, Inc., *Evidence and Implications of Saline Cold Groundwater, Honokōhau, Hawaiʻi,* June 2007 (Bowles 2007).

Waimea Water Services, Inc. & Mink and Yuen, Inc*, Geology and Ground-Water Hydrology in the Vicinity of Honokōhau Harbor*; 2006 (Bowles 2006).

Walker, Alan T. and Alan Haun, Limited Archaeological Data Recovery, Kona Palisades Subdivision Parcel, Land of Kalaoa 4th, North Kona District, Island of Hawaii (TMK: 3-7-3-05: 87), 1988.

Water Resource Associates*; Hydrogeologic Feasibility Study For A Water Development Shaft At Keʻōpū Kailua, Kona, Hawaiʻi*; Consultant Report prepared for Engineering Division, Department of Land and Natural Resources, 2007 (Water Resources Associates 2007).

Wilson Okamoto & Associates, Inc.; June 2001 *Final Environmental Assessment, Kealakehe Wastewater Treatment Plant Effluent Reuse Master Plan, North Kona District, Hawaiʻi*; June 2001 (W-O 2001).

Wilson Okamoto Corporation. *Environmental Impact Assessment for Kaloko Industrial Park Phases III and IV*. Prepared for TSA International, Limited. October 2000.

Wolforth, Thomas R., Chris Monahan, Kirk Johnson, Tyler Paikuli-Campbell and Robert L. Spear; Archaeological Inventory Survey of the Northern Portion of the Kaloko Heights Project in Kohanaiki and Kaloko Ahupuaa, North Kona District, Island of Hawaiʻi; Settlement Pattern Investigations in the Southern Kekaha Middle Elevations (TMK 3-7-3-09: 032); SCS; 2005 (Wolforth et al. 2005).

Personal Communication, Dora Beck and Lyle Hirota, County of Hawaiʻi Wastewater Division, July 7, 2011.

Personal Communication, Chauncy Wong-Yuen, State of Hawaii Department of Transportation, date unknown.

Source for Figures:
Hawaiʻi Statewide GIS Program: http://www.hawaii.gov/dbedt/gis/download.htm

Office of Conservation and Coastal Lands, State Department of Land and Natural Resources: http://www.hawaii.gov/dlnr/occl/subzone.php

County of Hawaiʻi, Kona Community Development Plan, September 2008.

1907 S BERETANIA STREET, SUITE 400
HONOLULU, HAWAII 96826
PH (808) 946-2277 FX (808) 946-2253
wilsonokamoto.com