FHWA-HI-EIS-17-01-D

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I
Project Number DP-HI-0200(5)

DRAFT

ENVIRONMENTAL IMPACT STATEMENT

Volume II - Appendices

April 2017

Submitted Pursuant to the National Environmental Policy Act (NEPA),
42 U.S.C. 4332 (2)(c), Section 4(f) of the Department of Transportation Act (DOT)
49 U.S.C. 303, and Chapter 343, Hawai‘i Revised Statutes (HRS)

U.S. Department of Transportation, Federal Highway Administration (FHWA)
State of Hawai‘i, Department of Transportation, Highways Division

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix A Public Involvement and Agency Coordination
A1: Notice of Intent in Federal Register and EISPN Notice in OEQC Bulletin

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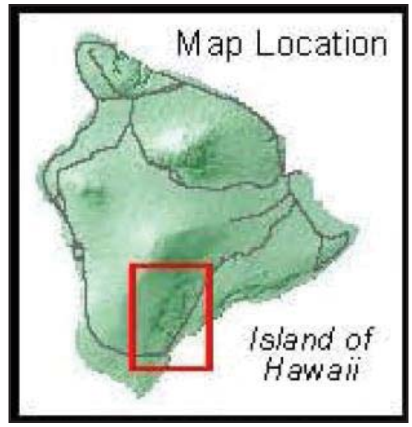
HAWAIʻI (HRS 343)

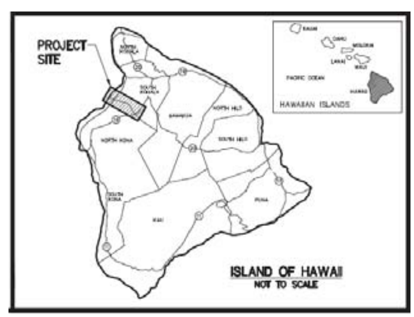
1. Kaʻū Forest Reserve Management Plan DEA-AFONSI



Island: Hawaiʻi
District: Kaʻū
TMK: (3rd) 9-7- 001:001, 009, 013, 014, 015, 016, 017, 018, 019, 020, 021, 022; 9-6-006:009, 010, 015, 018; and 9-5-015:003 (por.)
Permits: Board of Land and Natural Resources approval; HRS Chapter 6e, Historic Sites approvals.
Proposing/Determination Agency: Department of Land and Natural Resources, Division of Forestry and Wildlife, 1151 Punchbowl Street, Room 13, Honolulu, HI 96813.
Contact: Tanya Rubenstein, (808) 587-0027
Consultant: Geometrician Associates, P.O. Box 396, Hilo, HI 96721. Contact: Ron Terry, (808) 969-7090
Status: Anticipated Finding of No Significant Impact. 30-day comment period begins; comments are due on June 22, 2012. Send comments to the Proposing Agency and the Consultant

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), is preparing a management plan for the 61,641-acre Kaʻū Forest Reserve. The Plan responds to a need to maintain and restore key watershed, preserve a unique ecosystem with critically endangered plants and animals, perpetuate natural resources vital to Hawaiian culture and practices, find a suitable site to reintroduce ʻAlalā or Hawaiian Crow into the wild, and provide for continued and expanded public use. Common to all three alternatives under consideration is construction of 12,000 acres of new fenced management units in the upper elevation central portions of the Reserve in which ungulates will be removed and the native forest protected. Field surveys would be conducted to identify locations for the planned fence alignments, and final fence alignments would be sited to avoid any impacts to botanical, faunal, and archaeological resources. Fences would include walkovers and gates to ensure public access into management units. Other actions include weed monitoring and control, trail and access improvements for hunters and hikers, out planting of rare plant species, cooperation with water source users, and actions to foster reintroduction and survival of the ʻAlalā. Impacts to pig hunting, which is considered by many to be a cultural practice, would occur but be less than significant because of the proposed locations of management areas. DOFAW seeks to balance providing public hunting opportunities in the Reserve with the protection of native ecosystems and watersheds, and the Plan includes actions to substantially facilitate public hunting in the Reserve.

2. Saddle Road Extension: Mamalahoa Highway (State Route 190) to Queen Kaʻahumanu Highway (State Route 19) FEA-EISPN



Island: Hawaiʻi
District: South Kohala/North Kona
TMK: (3rd) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015; 7-1-003:001
Permits: Federal: Clean Water Act Section 404 Permit*; Section 106 NHPA concurrence; Section 7 ESA concurrence. State: Clean Water Act Section 401 Water Quality Certification*, Stream Channel Alteration Permit*; Historic Sites Review, State Highways Permit, National Pollutant Discharge Elimination System Permit, Coastal Zone Management Consistency. County: Grading, Grubbing, Excavating and Stockpiling Permits; Subdivision Approval (* = not yet determined)

Proposing Agency: Hawaiʻi Department of Transportation, Highways Division, Hawaiʻi District, 869 Punchbowl, Street, Rm. 301, Honolulu, Hawaiʻi 96813. Contact: Dean Yanagisawa, (808) 587-1834

Approving Authority: Governor, State of Hawaiʻi, c/o Office of Environmental Quality Control

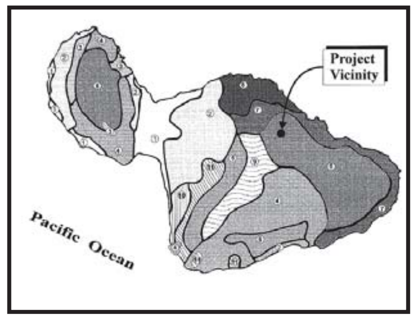
Consultant: Geometrician Associates, P.O. Box 396, Hilo, Hawaiʻi 96721.
Contact: Ron Terry 808-969-7090

Status: Environmental Impact Statement Preparation Notice (EISPN) Determination. 30-day comment period begins; comments are due on June 22, 2012. Send comments to the Proposing Agency and the Consultant

The State of Hawaiʻi Department of Transportation, in cooperation with the Federal Highway Administration, Hawaiʻi Division, proposes an arterial connector highway between Māmalahoa Highway, State Route (SR) 190, and Queen Kaʻahumanu Highway (SR 19). The eastern terminus of the proposed highway would be at the junction where the realigned Saddle Road (SR 200) meets SR 190, near Milepost 13. The western terminus would be at the junction of SR 19 and Waikoloa Beach Drive. The purpose and need of the Saddle Road Extension project are to: 1) improve the efficiency and operational level of traffic movement between East and West Hawaiʻi, particularly for traffic on the realigned Saddle Road; 2) improve safety; and 3) support special needs of commercial truck traffic and military traffic.

MAUI (HRS 343)

3. Waikamoi Flume Replacement Project DEA-AFONSI



Island: Maui

District: Makawao and Hana

TMK: (2) 2-3-005:004 and 025 (pors.), (2) 2-4-015:029 (por.), and (2) 2-4-016:001, 002, 003, and 004 (pors.)

Permits: Conservation District Use Permit (Departmental Permit)

Proposing/ Determination Agency: County of Maui, Department of Water Supply, 200 South High Street, 5th Floor, Wailuku, Hawaiʻi 96793.
Contact: Thomas Ochwat, (808) 270-7835

Consultant: Munekiyo & Hiraga, Inc., 305 High Street, Suite 104, Wailuku, Hawaiʻi 96793.
Contact: Mark Alexander Roy, (808) 244-2015

Status: Anticipated Finding of No Significant Impact. 30-day comment period begins; comments are due on June 22, 2012. Send comments to the Proposing Agency and the Consultant

The County of Maui, Department of Water Supply (DWS) proposes the replacement of the existing Waikamoi Flume which is situated within the Koʻolau Forest Reserve in East Maui. The flume stretches approximately 1.1 miles from its intake at Haipuaʻena Stream in the east to its termination in the vicinity of Waikamoi Stream in the west. The subject project will affect a corridor of land approximately 1.1 miles long by 30 feet wide.

As an integral component of the DWS Upper Kula System, freshwater conveyed by the Waikamoi Flume provides irrigation and domestic potable water to the residents of Kula, Waiakoa, Keokea, Ulupalakua, and Kanaio in Upcountry Maui. The existing flume consists of a redwood box section that measures 2 feet wide by 13 inches deep. Redwood timber bridges support the flume over gulches and gullies where abrupt changes in ground elevation preclude maintaining a constant slope for the flume. Continuous weathering of the timbers over the years has resulted in substantial leakages along the flume's entire length, and the bridges have become dangerous for maintenance personnel to traverse.

The purpose of this project is (1) to provide an aluminum replacement flume that will increase system efficiency by eliminating leakages and (2) to give maintenance workers a safe platform for accessing the flume along its entire length. Construction-related improvements include re-graveling portions of the existing access road and the establishment of a temporary construction staging area.

Regional Airport, at the following address: Asheville Regional Airport, 61 Terminal Drive, Suite 1, Fletcher, NC 28732.

FOR FURTHER INFORMATION CONTACT: Rusty Nealis, Program Manager, Atlanta Airports District Office, 1701 Columbia Ave., Campus Building, Suite 2–260, Atlanta, GA 30337–2747, (404) 305–7142. The application may be reviewed in person at this same location.

SUPPLEMENTARY INFORMATION: The FAA is reviewing a request by the City of Asheville and Buncombe County to release approximately 50 acres of airport property at the Asheville Regional Airport. This property was originally acquired with FAA assistance in 1958. This property is currently being used by the State of North Carolina for the Western North Carolina Agricultural Center and is compatible with airport operations.

Any person may inspect the request in person at the FAA office listed above under **FOR FURTHER INFORMATION CONTACT.**

In addition, any person may, upon request, inspect the request, notice and other documents germane to the request in person at the Asheville Regional Airport.

Issued in Atlanta, Georgia on March 10, 2014.

Larry F. Clark,

Manager, Atlanta Airports District Office, Southern Region.

[FR Doc. 2014–05898 Filed 3–17–14; 8:45 am]

BILLING CODE 4910–13–P

DEPARTMENT OF TRANSPORTATION

Federal Highway Administration

Environmental Impact Statement; Hawaii, HI

AGENCY: Federal Highway Administration (FHWA), DOT.

ACTION: Revised Notice of Intent.

SUMMARY: The FHWA is issuing this revised notice of intent (NOI) to inform the public that an environmental impact statement (EIS) will be prepared for a proposed highway project in Hawaii County, Hawaii. This notice revises the NOI that was published in the **Federal Register** on July 13, 1999.

FOR FURTHER INFORMATION CONTACT: Ricardo Suarez, Division Engineer, Federal Highway Administration, Central Federal Lands Highway Division. Contact Information: 12300 West Dakota Avenue, Lakewood, CO 80228. Telephone: (720) 963–3448.

SUPPLEMENTARY INFORMATION: The FHWA, Central Federal Lands Highway Division (CFLHD), and the Hawaii Department of Transportation will prepare an environmental impact statement (EIS) for a surface transportation project in the South Kohala and North Kona Districts, of the island of Hawaii. The project intends to address the linkage between the Queen Kaahumanu Highway (State Highway 19) and the Mamalahoa Highway (State Highway 190) in the vicinity of the newly realigned Daniel K. Inouye Highway (formerly Saddle Road [State Highway 200]). This proposed link would constitute the final piece to complete one of the three highway arterials that connect the east and west regions on the island of Hawaii. This proposed link has been identified in the Hawaii Long-Range Plan for the purpose of adding inter-regional capacity. This notice updates a notice for the project originally published in the July 13, 1999, **Federal Register**. An EIS was not issued pursuant to the prior notice because changed circumstances may affect potential project alternatives.

The purpose of the project is to further develop this inter-regional capacity and connectivity link by considering various alternatives and their impacts, including the no-build scenario, through the environmental impact statement process. Secondary and supporting purposes to this primary goal are to: (1) Improve the efficiency and operational level of traffic movement between East Hawaii and West Hawaii in general; and (2) support the unique modal needs along this corridor, such as commercial and military transportation uses.

A notice describing the proposed action and soliciting comments will be sent to appropriate Federal, State, and local agencies, and to private organizations and individuals who have expressed an interest in the project. A public hearing will be held after publication of the Draft EIS. A public notice will be placed in a daily newspaper to announce the date, time and place of the meeting and the availability of the Draft EIS for public and agency review and copying.

To ensure that the full range of issues relating to the proposed action are identified and addressed, comments and suggestions are invited from all interested parties. Comments or questions concerning the proposed action should be directed to the FHWA at the address provided above.

(Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction. The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program.)

Issued on: March 11, 2014.

Ricardo Suarez,

Division Engineer, FHWA–CFLHD.

[FR Doc. 2014–05899 Filed 3–17–14; 8:45 am]

BILLING CODE 4910–22–P

DEPARTMENT OF THE TREASURY

Financial Crimes Enforcement Network

Renewal Without Change to the Bank Secrecy Act Designation of Exempt Person Report; Proposed Collection; Comment Request

AGENCY: Financial Crimes Enforcement Network ("FinCEN"), U.S. Department of the Treasury.

ACTION: Notice and request for comments.

SUMMARY: FinCEN, a bureau of the U.S. Department of the Treasury ("Treasury"), invites all interested parties to comment on its proposed renewal without change to the collection of information through its "Designation of Exempt Person" ("DoEP") report used by banks and other depository institutions to designate eligible customers as exempt from the requirement to report transactions in currency over $10,000. This request for comments is being made pursuant to the Paperwork Reduction Act ("PRA") of 1995, Public Law 104–13, 44 U.S.C. 3506(c)(2)(A).

DATES: Written comments are welcome and must be received on or before May 19, 2014.

ADDRESSES: Written comments should be submitted to: Policy Division, Financial Crimes Enforcement Network, Department of the Treasury, P.O. Box 39, Vienna, Virginia 22183, Attention: PRA Comments—BSA-DoEP Renewal. DoEP comments also may be submitted by electronic mail to the following Internet address: *regcomments@fincen.treas.gov*, again with a caption, in the body of the text, "Attention: BSA-DoEP Renewal."

Inspection of comments: Comments may be inspected, between 10 a.m. and 4 p.m., in the FinCEN reading room in Vienna, VA. Persons wishing to inspect the comments submitted must request an appointment with the Disclosure Officer by telephoning (703) 905–5034 (not a toll free call).

FOR FURTHER INFORMATION CONTACT: The FinCEN Regulatory Helpline at 800–949–2732, select option 8.

SUPPLEMENTARY INFORMATION:

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix A Public Involvement and Agency Coordination
A2: Comments to NOI/EISPN and HDOT Responses

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NEIL ABERCROMBIE
GOVERNOR

DEAN H. SEKI
COMPTROLLER

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

(P)1138.2

JUN 18 2012

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawai'i 96721

Dear Mr. Terry:

Subject: Environmental Impact Statement Preparation Notice
Saddle Road Extension: From Mamalahoa Highway (State Route 190)
To Queen Ka'ahumanu Highway (State Route 19)
South Kohala / North Kona, Island of Hawai'i
TMK: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015; 7-1-003:001

This is in response to your letter regarding the subject project. The proposed project does not impact any of the Department of Accounting and General Services' projects or existing facilities, and we have no comments to offer at this time.

If you have any questions, please call me at 586-0400 or have your staff call Mr. David DePonte of the Public Works Division at 586-0492.

Sincerely,

DEAN H. SEKI
State Comptroller

c: Mr. Dean Yanagisawa, DOT Highways
Mr. Jerry Watanabe, DAGS Hawaii District

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2583

September 12, 2012

TO: THE HONORABLE DEAN SEKI
COMPTROLLER
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES

FROM: GLENN M. OKIMOTO, Ph.D.
DIRECTOR OF TRANSPORTATION

SUBJECT: COMMENTS TO FINAL ENVIRONEMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (FEA-EISPN), SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY (STATE ROUTE 190) TO QUEEN KAAHUMANU HIGHWAY (STATE ROUTE 19)

Thank you for your comment letter dated June 18, 2012, on the FEA-EISPN in which your agency had no comments to offer. We appreciate your involvement in the Environmental Impact Statement (EIS) process.

If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LORETTA J. FUDDY, A.C.S.W., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
File:

12-096 EISPN/EA
Saddle Road

May 25, 2012

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Environmental Impact Statement Preparation Notice/Environmental Assessment for Saddle Road Extension: From Mamalahoa Highway to Queen Ka`ahumanu Highway, South Kohala/North Kona, Hawai`i

The Department of Health (DOH), Environmental Planning Office (EPO), acknowledges receipt of your letter. Thank you for allowing us to review and comment on the subject document. The document will be routed to the various branches of the Environmental Health Administration. We recommend that you contact the following branches:

Clean Water Branch regarding Section 401, "Water Quality Certification";
Indoor and Radiological Health Branch regarding "Community Noise Permit"; and
Clean Air Branch regarding anticipated dust issues.

We reserve the right to future comments. We strongly recommend that you review all of the Standard Comments on our website: www.hawaii.gov/health/environmental/env-planning/landuse/landuse.html. Any comments specifically applicable to this application should be adhered to.

The United States Environmental Protection Agency (EPA) provides a wealth of information on their website including strategies to help protect our natural environment and build sustainable communities at: http://water.epa.gov/infrastructure/sustain/ . The DOH encourages State and county planning departments, developers, planners, engineers and other interested parties to apply these strategies and environment principles whenever they plan or review new developments or redevelopments projects. We also ask you to share this information with others to increase community awareness on healthy, sustainable community design. If there are any questions about these comments please contact me.

Sincerely,

Laura Leialoha Phillips McIntyre, AICP
Environmental Planning Office Manager
Environmental Health Administration
Department of Heath
919 Ala Moana Blvd., Ste. 312
Honolulu, Hawaii 96814
Phone: 586-4337
Fax: 586-4370
laura.mcintyre@doh.hawaii.gov

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2584

September 12, 2012

TO: LAURA MCINTYRE, AICP
MANAGER
DEPARTMENT OF HEALTH
ENVIRONMENTAL PLANNING OFFICE

FROM: GLENN M. OKIMOTO, Ph.D.
DIRECTOR OF TRANSPORTATION

SUBJECT: COMMENTS TO FINAL ENVIRONEMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (FEA-EISPN), SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY (STATE ROUTE 190) TO QUEEN KAAHUMANU HIGHWAY (STATE ROUTE 19)

Thank you for the letter dated May 25, 2012, indicating that you would route the document to the various branches of the Environmental Health Administration, recommending that we also contact several branches, and providing references to your Standard Comments and the EPA website on infrastructure.

We will be contacting individual agencies and/or reviewing agency regulations as part of preparing impact analysis and mitigation, as needed, and will provide these agencies an opportunity to comment on the Draft Environmental Impact Statement (EIS).

We very much appreciate your involvement in the EIS process. If you have any questions about the FEA/EISPN or EIS, please contact Dean Yanagisawa at 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 20, 2012

Geometrician Associates
Attention: Mr. Ron Terry
P.O. Box 396
Hilo, Hawaii 96721

via email: rterry@hawaii.rr.com

Dear Mr. Terry:

SUBJECT: Environmental Impact Statement, Preparation Notice/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19), Geometrician Associates, LLC for Hawaii Department of Transportation, Highways Division, and US Department of Transportation, South Kohala and North Kona, Hawaii; TMKs: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015, 7-1-003:001

Thank you for the opportunity to review and comment on the subject matter. The Department of Land and Natural Resources' (DLNR) Land Division distributed or made available a copy of your report pertaining to the subject matter to DLNR Divisions for their review and comments.

At this time, enclosed are comments from (i) the Engineering Division, (ii) Hawaii District Land Office, (iii) Division of Aquatic Resources, and (iv) Commission on Water Resource Management on the subject matter. Should you have any questions, please feel free to call Kevin Moore at (808) 587-0426. Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION

2012 JUN 15 P 2:

DEPT. OF LAND &
NATURAL RESOURCES
STATE OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 23, 2012

MEMORANDUM

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: Environmental Impact Statement, Preparation Notice/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

LOCATION: South Kohala and North Kona, Hawaii; TMKs: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015, 7-1-003:001

APPLICANT: Geometrician Associates, LLC for Hawaii Department of Transportation, Highways Division, and US Department of Transportation

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by June 20, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Kevin Moore at 587-0426. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(X) Comments are attached.

Signed:
Date: 6/18/12

cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LM/KevinMoore
REF.:EISPNSaddleRdExtMamaloha-Queen
Hawaii.563

COMMENTS

(X) **We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone X. The National Flood Insurance Program does not have any regulations for developments within Zone X.**

( ) Please take note that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Zone____.

( ) Please note that the correct Flood Zone Designation for the project site according to the Flood Insurance Rate Map (FIRM) is ___.

( ) Please note that the project must comply with the rules and regulations of the National Flood Insurance Program (NFIP) presented in Title 44 of the Code of Federal Regulations (44CFR), whenever development within a Special Flood Hazard Area is undertaken. If there are any questions, please contact the State NFIP Coordinator, Ms. Carol Tyau-Beam, of the Department of Land and Natural Resources, Engineering Division at (808) 587-0267.

Please be advised that 44CFR indicates the minimum standards set forth by the NFIP. Your Community's local flood ordinance may prove to be more restrictive and thus take precedence over the minimum NFIP standards. If there are questions regarding the local flood ordinances, please contact the applicable County NFIP Coordinators below:

( ) Mr. Mario Siu Li at (808) 768-8098 or Ms. Ardis Shaw-Kim at (808) 768-8296 of the City and County of Honolulu, Department of Planning and Permitting..

( ) Mr. Frank DeMarco at (808) 961-8042 of the County of Hawaii, Department of Public Works.

( ) Mr. Francis Cerizo at (808) 270-7771 of the County of Maui, Department of Planning.

( ) Ms. Wynne Ushigome at (808) 241-4890 of the County of Kauai, Department of Public Works.

( ) The applicant should include water demands and infrastructure required to meet project needs. Please note that projects within State lands requiring water service from the Honolulu Board of Water Supply system will be required to pay a resource development charge, in addition to Water Facilities Charges for transmission and daily storage.

( ) he applicant should provide the water demands and calculations to the Engineering Division so it can be included in the State Water Projects Plan Update

( ) Additional Comments: ______________________________

( ) Other: ______________________________

Should you have any questions, please call Ms. Suzie S. Agraan of the Planning Branch at 587-0258.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: 6/14/12

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

2012 MAY 25 P 1:12

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

RECEIVED
LAND DIVISION
HILO, HAWAII

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 23, 2012

MEMORANDUM

RECEIVED
LAND DIVISION
2012 JUN -1 A 9:58
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: Environmental Impact Statement, Preparation Notice/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

LOCATION: South Kohala and North Kona, Hawaii; TMKs: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015, 7-1-003:001

APPLICANT: Geometrician Associates, LLC for Hawaii Department of Transportation, Highways Division, and US Department of Transportation

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by June 20, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Kevin Moore at 587-0426. Thank you.

Attachments

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:
Date: 5/31/12

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

75 Aupuni Street, Room 204
Hilo, Hawaii 96720
PHONE: (808) 961-9590
FAX: (808) 961-9599

May 31, 2012

MEMORANDUM

TO: Russell Y. Tsuji, Administrator

FROM: Gordon C. Heit, Hawaii District Land Agent

SUBJECT: Environmental Impact Statement, Preparation Notification/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

LOCATION: South Kohala and North Kona, Hawaii, TMK: (3) 6-8-001:005, 066, 067, 6-8-002:013, 014, 015, 7-1-003:001

APPLICANT: Geometrician Associates, LLC on behalf of Hawai'i Department of Transportation, Highways Division and the US Department of Transportation

Pursuant to your request for comments on the above matter, we offer the following:

The accompanying map (fig.1-2) indicates Alignment 4 passing through portions of State land identified by TMK: (3) 7-1-003:001. This parcel is currently encumbered under Executive Order No. 4162 to the DLNR Division of Forestry and Wildlife. In the event this alignment is chosen, the portion of State land utilized by Alignment 4 would have to be set-aside to the Department of Transportation.

Please contact me should you have any questions.

AMW
WW

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 23, 2012

LAR 4335

MEMORANDUM

RECEIVED
LAND DIVISION
2012 JUN -8 P 1:21
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

TO: **DLNR Agencies:**
X Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: Environmental Impact Statement, Preparation Notice/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)
LOCATION: South Kohala and North Kona, Hawaii; TMKs: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015, 7-1-003:001
APPLICANT: Geometrician Associates, LLC for Hawaii Department of Transportation, Highways Division, and US Department of Transportation

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by June 20, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Kevin Moore at 587-0426. Thank you.

Attachments

( ) We have no objections.
(X) We have no comments. WJW
( ) Comments are attached.

Signed:
Date: 07 JUNE 2012

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION

2012 MAY 25 P 2:42

DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 23, 2012

2012 MAY 24 PM 1:57

MEMORANDUM

From: ~~TO:~~ **DLNR Agencies:**
X Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
X Div. of State Parks
X Commission on Water Resource Management
X Office of Conservation & Coastal Lands
X Land Division – Hawaii District
X Historic Preservation

To: ~~FROM:~~ Russell Y. Tsuji, Land Administrator

SUBJECT: Environmental Impact Statement, Preparation Notice/Environmental Assessment, Saddle Road Extension: From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

LOCATION: South Kohala and North Kona, Hawaii; TMKs: (3) 6-8-001:005, 066, 067; 6-8-002:013, 014, 015, 7-1-003:001

APPLICANT: Geometrician Associates, LLC for Hawaii Department of Transportation, Highways Division, and US Department of Transportation

Transmitted for your review and comment on the above referenced document. We would appreciate your comments on this document. Please submit any comments by June 20, 2012.

If no response is received by this date, we will assume your agency has no comments. If you have any questions about this request, please contact Kevin Moore at 587-0426. Thank you.

Attachments

(✓) We have no objections.
( ) We have no comments.
( ) Comments are attached.

Signed: W. [signature]
Date: 5/24/12

cc: Central Files

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2585

September 12, 2012

TO: RUSSELL Y. TSUJI
ADMINISTRATOR
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

FROM: GLENN M. OKIMOTO, Ph.D.
DIRECTOR OF TRANSPORTATION

SUBJECT: COMMENTS TO FINAL ENVIRONEMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (FEA-EISPN), SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY (STATE ROUTE 190) TO QUEEN KAAHUMANU HIGHWAY (STATE ROUTE 19)

Thank you for your letter dated June 20, 2012, on the FEA-EISPN, in which you provided comments from various agencies within DLNR. In answer to specific comments from the provided memos:

1. *Engineering Division comment on flood zones*. Thank you for the confirmation that all affected corridors are located within Flood Zone X.

2. *Hawai'i District Land Division comment: 3) 7-1-003:001 parcel is currently encumbered under Executive Order No. 4162 to the DLNR DOFAW. If this alignment is chosen, the portion of State land utilized by Alignment 4 would have to be set-aside to DOT.* This information will be included in the Draft Environmental Impact Statement (EIS) and made known to the DOT Highways Division Right-of-Way Branch. If this alignment is chosen, DOT will seek the set-aside.

3. *Division of Aquatic Resources and Commission on Water Resources Management*. We acknowledge the no-comment memos from these agencies.

We appreciate DLNR's involvement in the EIS process and particularly your circulation of the FEA-EISPN and compiling comments from DLNR agencies. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at 587-1834 or project EIS consultant Ron Terry at (808) 969-7090.

William P. Kenoi
Mayor

William T. Takaba
Managing Director

Dora Beck, P.E.
Acting Director

Hunter Bishop
Deputy Director

County of Hawai'i
DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
25 Aupuni Street • Hilo, Hawai'i 96720
(808) 961-8083 · Fax (808) 961-8086
http://co.hawaii.hi.us/directory/dir_envmng.htm

May 29, 2012

Mr. Ron Terry, Ph.D.
Project Environmental Consultant
Geometrician Associates, LLC
P. O Box 396
Hilo, HI 96721

RE: EISPN/EA
Saddle Road Extension: From Māmalahoa Highway (State Route 190) to Queen Ka'ahumanu Highway (State Route 19)
South Kohala/North Kona
TMK: 6-8-001:005, 066, 067; 6-8-002:013, 014, 015; 7-1-003:001

Dear Mr. Terry,

We have no comments to offer on the subject project.

Thank you for allowing us to review and comment on this project.

Sincerely,

Dora Beck

Dora Beck, P.E.
ACTING DIRECTOR

cc: Mr. Dean Yanagisawa
Hawai'i DOT
Highways Division
869 Punchbowl Street, Rm. 39001
Honolulu, HI 96813

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2586

September 12, 2012

Ms. Dora Beck
Acting Director
County of Hawaii
Department of Environmental Management
25 Aupuni Street, Room 210
Hilo, Hawaii 96820

Dear Ms. Beck:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your letter dated May 29, 2012 on the FEA-EISPN, in which you stated that your agency had no comments on the project.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

William P. Kenoi
Mayor

Darren J. Rosario
Fire Chief

Renwick J. Victorino
Deputy Fire Chief

County of Hawai'i
HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Room 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

March 31, 2012

Mr. Ron Terry
Geometrician Associates
PO Box 396
Hilo, HI 96721

Dear Mr. Terry,

SUBJECT: SADDLE ROAD EXTENSION: FROM MAMALAHOA HWY (STATE ROUTE 190) TO QUEEN KAAHUMANU HWY (STATE ROUTE 19)
TMK: (3RD) 6-8-001:005, 066, 067; 6-8-002:013-015; 7-1-003:001

The Hawai'i Fire Department does not have any comments to offer at this time regarding the above-referenced Environmental Impact Statement Preparation Notice/Environmental Assessment.

Thank you for the opportunity to comment. A copy or Notice of Availability of Environmental Assessment is not needed when completed.

Sincerely,

DARREN J. ROSARIO
Fire Chief

TG:lc

Hawai'i County is an Equal Opportunity Provider and Employer.

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2587

September 12, 2012

Mr. Darren J. Rosario
Chief
County of Hawaii
Hawaii Fire Department
25 Aupuni Street, Room 2501
Hilo, Hawaii 96720

Dear Chief Rosario:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your letter dated March 31, 2012 on the FEA-EISPN, in which you stated that your agency had no comments on the project.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawai'i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

June 14, 2012

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, Hawaii 96721

Dear Mr. Terry:

SUBJECT: Environmental Impact Statement
Saddle Road Extension, From Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)
Island: Hawaii
District: South Kohala/North Kona
Tax Map Key: (3rd) 6-8-001L005, 066, 067; 6-8-002:013, 014, 015; 7-1-003:001

The above-referenced Environmental Impact Statement has been reviewed, and we have no comments or objections to offer at this time.

Should there be any questions, please contact Captain Aimee Wana, Commander of the South Kohala District, at 887-3080; or Captain Richard Sherlock, Commander of the Kona District, at 326-4646, ext. 299.

Sincerely,

HARRY S. KUBOJIRI
POLICE CHIEF

PAUL H. KEALOHA JR.
ASSISTANT POLICE CHIEF
AREA II OPERATIONS

AW/RS:dmv
RS120309

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2588

September 12, 2012

Mr. Harry S. Kubojiri
Chief
County of Hawaii
Police Department
349 Kapiolani Street
Hilo, Hawaii 96720

Dear Chief Kubojiri:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your letter dated June 14, 2012 on the FEA-EISPN, in which you stated that your agency had no comments at this time.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

DOUGLAS H. DIERENFIELD, D.D.S.

CASA DE EMDEKO, SUITE D
75-6082 ALII DRIVE
KAILUA-KONA, HAWAII 96740
TELEPHONE (808) 329-5251

June 11, 2012

Ron Terry
Geometrician Associates
P.O Box 396
Hilo, Hawaii 96721

Dear Mr. Terry,

This is a note of support for the concept that all roads, especially those in this great State should be constructed to accommodate all modes of transportation. The Saddle Road Extension is no exception. At this point in the design and construction please be sure to include SAFE avenues for bicycle and pedestrian traffic along this new addition to our scenic roadway system.

Thank you,

Douglas H. Dierenfield

Cc; Dean Yanagisawa
Hawaii Department of Transportation

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2589

September 12, 2012

Dr. Douglas H. Dierenfield, D.D.S.
Casa de Emdeko, Suite D
75-6082 Alii Drive
Kailua-Kona, Hawaii 96740

Dear Dr. Dierenfield:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your comment letter dated June 11, 2012, stating that the Saddle Road Extension should be constructed to accommodate all modes of transportation, and that the project should include safe avenues for bicycle and pedestrian traffic. The Hawaii Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades, to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS).

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

HI Ron, I support these recommendations from PATH for the Saddle Road EIS. A bikeway might also be great for more environmentally friendly tourism.

1. To be consistent with County, State and Federal policies, this project should be designed and constructed to accommodate all modes of transportation, including bicycles and pedestrians as a complete roadway to address current and anticipated future needs. Due to vehicular speed and road grade, we advocate for a **separated multi-use path** alongside the proposed Saddle Road extension.

2. The location of this roadway can essentially serve as a backbone for a **network of non-motorized access** routes that could connect our island communities without being dependent on automobiles. This alignment connects with Māmalahoa Highway, the Queen Ka`ahumanu Highway and the major resort node of Waikoloa, HELCO utility road that spans from Kawaihae Road south to Kailua Kona. Prudent planning NOW will go a long way to make this possible and meet our island's future transportation needs.

Aloha,

Cory Harden
PO Box 10265
Hilo, Hawai'i 96721
mh@interpac.net
808-968-8965

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2590

September 12, 2012

Ms. Cory Harden
P.O. Box 10265
Hilo, Hawaii 96721

Dear Ms. Harden:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the FEA-EISPN, in which you expressed support for a safe route for bicycles and pedestrians, including a separated, multi-use path that could serve as the backbone for non-motorized travel in the area.

The Hawaii Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades, to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS). The suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Dear Ron ,

Re; TMK 6-8-2 :12 and 13.

Following up on our discussions. We own the subject parcels and have been cooperating with you on your planning this new highway which is proposed to run through our property. We would like confirmation that DOT will provide reasonable access points to our land from both the Mamalahoa Highway and from this new proposed highway. .

Thank you very much. We look forward to working with you.

Roger Harris

For BIVWR Investment LLC.
rharris@dtnhawaii.net

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2591

September 12, 2012

Mr. Roger Harris
BIVWR Investment, LLC
rharris@dtnhawaii.net

Dear Mr. Harris:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email requesting confirmation that the Hawaii Department of Transportation (DOT) will provide reasonable access points to your land from both Mamalahoa Highway and from the proposed Saddle Road Extension.

DOT will ensure that all properties are connected to reasonable accesses. DOT will begin to work on specific access points during the EIS process, but may not resolve all access issues until later in the project design and right-of-way acquisition phases.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

I like alignment #4 because it will give Waikoloa less traffic. Safety for Pedestrians is always a concern. Especially for School Traffic. Also, if it was possible to connect align #4 to part of Align #5 to connect for traffic going to Waikoloa. If not, that's okay. Just a thought. But I realley like alignment #4.

It will help people from East Hawaii to travel to work at the various Shops & Hotels & Golf Courses safely and shorter time in Waikoloa to Kona to Kawaihae etc.

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant: **Geometrician Associates**
Address: **PO Box 396**
Hilo HI 96721
Contact: **Ron Terry** **Phone: 808-969-7090**

rterry@hawaii.rr.com

Your comments must be received or postmarked by June 22, 2012

MERNA IZAWA
P.O. BOX 1545
KAILUA-KONA, HI 96745-1545

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2592

September 12, 2012

Ms. Merna Izawa
P.O. Box 1545
Kailua-Kona, Hawaii 96745-1545

Dear Ms. Izawa:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comments you provided on the comment sheet from the June 14, 2012 meeting for the FEA-ESIPN, expressing your preference for Alignment 4 because it would generate less traffic on Waikoloa Road. We appreciate your opinion and reasoning concerning the best alignment, which are valuable as the Hawaii Department of Transportation seeks to determine which alternative works best for the project purpose and the majority of the community and what practicable adjustments can be made to make it even more functional.

Concerning the inquiry about whether Alignment 4 could include a connector to Waikoloa Road, the project is meant to provide a connection between Mamalahoa Highway and Queen Kaahumanu Highway. It is possible that the County and/or private developers could adapt their road plans to take into account the proposed highway and provide additional connections for the traffic network, such as the one you suggest, should Alignment 4 be selected.

We also acknowledge your statement on the potential economic and social benefits of the project.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

ALIGN #4 is Best idea, for this PLANNING

ByCAR's shoud enjoy less trafic to old road.

TAKEO IZAWA. uki47@hotmail.co.jp

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant: Geometrician Associates
Address: PO Box 396
Hilo HI 96721
Contact: Ron Terry **Phone:** 808-969-7090

Your comments must be received or postmarked by June 22, 2012

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2593

September 12, 2012

Mr. Takeo Izawa
Uki47@hotmail.co.jp

Dear Mr. Izawa:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comments you provided on the comment sheet from the June 14, 2012 meeting for the FEA-EISPN, expressing your preference for Alignment 4 because it would generate less traffic on Waikoloa Road.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834 or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Linda Kahananui
2945 W Riverwalk Cir, Unit G
Littleton, CO 80123
ainakailani@gmail.com

Geometrician Associates
attn: Ron Terry
P.O. Box 396, Hilo, HI 96721

Aloha Mr. Terry,

I am writing to you as a member of PATH (Peoples Advocacy for Trails Hawai'i) and as a past and **future** resident of Hawai'i Island. I will be moving to the Waikoloa/Waimea area in two years when I retire. While I cannot attend the meeting June 14th in Waimea, I wanted to personally take the time to express my opinion about the lack of any mention of a bike/pedestrian path for the Saddle Road Extension.

I strongly encourage you and your associates to include a bikeway/pedestrian path as part of the Saddle Road Extension project plan. To be consistent with County, State and Federal policies, the project should be designed and constructed to accommodate **all** modes of transportation, including **bicycles and pedestrians**, as a complete roadway to address current and anticipated future needs. Due to vehicular speed and road grade, we advocate for a **separated multi-use path** alongside the proposed Saddle Road extension.

Prudent planning **now** will go a long way to make this possible and meet Hawai'i island's future transportation needs. I currently live in an area that has made a priority of providing **safe paths** for pedestrians and cyclists, many running adjacent to major roadways, others going through designated open space. They are used **all the time**, in all seasons, and represent the best of planning and execution by caring people willing to work together to meet the **community's needs**.

The location of this roadway can essentially serve as a backbone for a network of non-motorized access routes that could connect our island communities without being dependent on automobiles. This is essential for those of us that commute, exercise, and recreate by foot and bicycle; this would go a long way to improving the **health and safety of residents** and visitors alike.

The health and welfare of the people is at stake here and adjacent pathways can be planned and constructed at a fraction of the cost of adding them later. I can testify that if the paths are available, they **will** get used by everyone from keiki to kupuna!

Mahalo, Linda Kahananui

Linda Kahana

cc: PATH, Peoples Advocacy for Trails Hawaii | PO Box 62 | Kailua-Kona, Hawaii 96745

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2594

September 12, 2012

Ms. Linda Kahananui
2945 West Riverwalk Circle, Unit G
Littleton, Colorado 80123

Dear Ms. Kahananui:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your letter on the FEA-EISPN, in which you expressed support for a safe route for bicycles and pedestrians, including a separated multi-use path that could serve as the backbone for non-motorized travel in the area.

The Hawaii Department of Transportation is committed to facilities that adequately and safely accommodate all modes. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS). Please note that the priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

All

Re consideration #2: Slow traffic climbing lane for trucks to pull off on steep grades.

I hope the length of this lane would be enough to accommodate an average, military convey traveling in line, uphill.

My memory of military conveys driving up Kawaihae Rd is:
1- conveys tend to travel in a long line of contiguous military vehicles
2- the uphill speed of convey vehicles is significantly lower than average uphill driving speed of passenger vehicles, causing miles and miles (and miles!) of back-up, and associated driver frustration with irrational passing activity.
3- on undivided roads drivers passing very slow moving vehicles do not well estimating the speed of non divided road downhill traffic.
4- when there is a modest amount of room to pull over to the right on uphill lanes, many drivers (including convey drivers), pull to far right.

Lacking a long enough, designated, slow uphill traffic lane, it is possible (likely?) that a wide bicycle / distressed vehicle lane will be used as a travel lane. Legal or not, this is currently a common practice on Kawaihae Rd on the section just below the old egg farm, where slow moving vehicles often "drive with aloha" by pulling over so traffic can safely pass. I am hoping the Saddle Road Extension road will be designed to NOT promote this behavior, since this practice could ultimately put cyclists/stranded motorists at risks.

Janine Rees Packett (SKTSC member)

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2595

September 12, 2012

Ms. Janine Rees Packet
fishfun@mac.com

Dear Ms. Packet:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

We received your email responding to a communication from Mike Price of the South Kohala Traffic Safety Committee concerning military convoys, which we are assuming is a comment meant to respond to the FEA-EISPN for the project. Owing to the general grade, the climbing lane will likely be necessary for the great majority of the approximately 10-mile route and it will easily accommodate both slow trucks and military convoys, unlike Kawaihae Road.

We appreciate your involvement in the Environmental Impact Statement (EIS) process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

PATH

Share the road with aloha!

PATH ~ PEOPLES ADVOCACY FOR TRAILS HAWAI`I

PO BOX 62 ◆ KAILUA-KONA, HAWAI`I 96745 ◆ 808 -329-9718 ◆ sharetheroad@pathhawaii.org

Mr. Ron Terry
Geometrician Associates
P.O. Box 396,
Hilo, HI 96721

June 22, 2012

Subject: Saddle Road Extension

Dear Mr. Ron Terry,

PATH is pleased to have the opportunity to provide written comments early in the process for the design and construction of the Saddle Road extension between Māmalahoa Highway (190) and Queen Ka`ahumanu Highway (19). As an advocacy group promoting transportation options for bicyclists and pedestrians, we feel that our citizens that choose these modes should be accommodated along with motor vehicles in the creation of a complete corridor. As such, this roadway will serve to accommodate all residents and visitors of Hawai`i Island, regardless of their age, ability, or choice of transportation mode.

This corridor will effectively connect the resort node of Waikoloa with the uplands. It can serve as a central corridor for a network of off-highway bike and pedestrian causeways, integrating existing and future roadways, utility corridors and undeveloped roadways. This is a future-oriented approach, looking not only present needs for transportation alternatives, but also the needs of future generations as development of the region continues. As a premier destination for triathletes, training on Hawaii Island's roadways beyond the race courses is a year-round phenomenon. Visitors and residents of all ages and abilities can be seen utilizing widened shoulders between Kailua Kona and the South Kohala resorts on any given day as people strive to engage in healthier lifestyles. Clearly there is a great need for an increase in safe bicycle infrastructure, now and into the future.

While Shoulder Bikeways provide the space required for moderate to advanced bicyclists to safely travel along high speed roadways, less experienced riders and pedestrians are at risk when aligned immediately adjacent to the travel lane. A separated shared use path promotes a more relaxed pace of travel, allowing bicyclists and pedestrians a means to enjoy the sweeping open spaces and great scenic beauty of Hawaii Island without needing a motor vehicle. A meandering path at no more than 5% grade will enable passage of bicyclists and pedestrians of all ages and abilities. Additionally, a separated shared use pathway expands the width of the maintained right-of-way that serves as defensible space for suppression efforts in this wildfire-prone region of the island.

In 2010, the U.S. Secretary of Transportation Ray LaHood made a strong policy statement that directed State DOTs to treat walking and bicycling as equals with other transportation modes, and discouraged investments in transportation that negatively affect cyclists and pedestrians (*see* http://fastlane.dot.gov/2010/03/my-view-from-atop-the-table-at-the-national-

PO Box 62 ◆ Kailua-Kona, Hawai`i 96745 ◆ 808 -329-9718 ◆ sharetheroad@pathhawaii.org

bike-summit.html). As a federally funded project, we enthusiastically endorse the Secretary's position that equalizes transportation options for all ages and abilities. PATH sees this is an exciting opportunity to continue to advance our island's transportation policy that focuses on the movement of people, rather than a focus on the movement of motor vehicles and to fully embrace the intent of Complete Streets under Act 54 (2009). As such we can promote a choice of transportation options, as opposed to making the choice for the people. PATH on behalf of its 1,500 members requests DOT to provide:

1) The planning, design, right-of-way, grading, and drainage for a separated, meandering, topography conforming, 5% maximum gradient Shared-Use Path, that includes:
   a) Intersections with future Shared-Use Paths connecting to Waikoloa, HELCO transmission access roads and both remnants of the Old Mamalahoa Highway near the junction of the Saddle Road Extension and Māmalahoa Highway.
   b) A schedule to fund and complete paving for the Shared-Use Path as the backbone on an off-road bike and pedestrian network.

2) A fully Functional and safe Shoulder Bikeway that provides:
   a) Signage, pavement markings, etc.

Mahalo nui loa for your consideration of our comments,

Cindy Conway
Operations Director

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2596

September 12, 2012

Ms. Cindy Conway
Operations Director
Peoples Advocacy for Trails Hawaii
P.O. Box 62
Kailua-Kona, Hawaii 96745

Dear Ms. Conway:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the FEA-EISPN, in which you expressed support for a safe route for bicycles and pedestrians, including a separated, multi-use path, with no more than a 5% grade that could serve as the backbone for non-motorized travel in the area.

The Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS) to ensure that the facility does not negatively affect bicyclists or pedestrians. The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits. We will also be researching other potential facilities that may be planned to service the functions your letter lists, in terms of interconnecting Waikoloa Village and other potential paths and destinations.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

John Simmerman PO Box 62 Kaila-Kona HI 96745

Rumble strips
- Please do not place rumble strips in shoulder, place rumble strips where the white line is located.

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

Shoulders - Please maintain a minimum of 8' foot (if 55 mph prefer 10-12') shoulders to accomodate bicycle riders

Intersections - Please plan safe bicycle facilities at the intersections

multi-use pathway - Additionally in the spirit of our complete streets law please ~~to~~ plan for a 10-12' * separated multi-use pathway which would serve as a safe and inviting option for cyclists who ~~would~~ do not feel comfortable riding on higher speed roadways ~~as well as~~ as well as for pedestrians. This would be a tremendous asset to the community and a valued facility for the tourists visiting the Kohala coast. A potential connection to a proposed multi-use path using the utility pole line corridor would be an added benefit.

* With 52' of subgrade width there is plenty of opportunity from a space perspective.

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant: Geometrician Associates
Address: PO Box 396
Hilo HI 96721
Contact: Ron Terry
Phone: 808-969-7090

Your comments must be received or postmarked by June 22, 2012

* Be Glad to provide assistance and guidance on technical aspects of bike and pedestrian facilities: John Simmerman MS PATH, Director of Programs Events & Development john@pathhawaii.org

NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
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GLENN M. OKIMOTO
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Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2597

September 12, 2012

Mr. John Simmerman
P.O. Box 62
Kailua-Kona, Hawaii 96745

Dear Mr. Simmerman:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comments you supplied on the comment sheet from the June 14, 2012 meeting for the FEA-EISPN. In answer to your specific comments:

1. *Minimum shoulder width of 8 feet, with a 10-foot minimum in 55-MPH zones.* The DOT is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades, to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS) to ensure that the facility does not negatively affect bicyclists or pedestrians.

2. *Plan for safe intersections.* As discussed earlier, we would welcome a meeting between you and our design team at your earliest convenience.

3. *Separated, multi-use path with no more than a 5% grade for non-motorized travel in the area.* The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, costs and benefits. We will also be researching other potential facilities that may be planned to service the functions your letter lists, in terms of interconnecting Waikoloa and other potential paths.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Geometrician Associates
attn: Ron Terry
P.O. Box 396, Hilo, HI 96721,

Hawai`i Department of Transportation
Attention Dean Yanagisawa.
869 Punchbowl St., Room 301,
Honolulu, HI 96813

RE: **ACCOMMODATION FOR BICYCLISTS OR PEDESTRIANS IN THE *EIS* FOR THE SADDLE ROAD EXTENSION**

Aloha,

I request that you include accommodation for bicyclists and pedestrians in the EIS for the Saddle Road Extension. A separated multi-use path alongside the proposed Saddle Road extension would be ideal given the grade and speed limits. If this is not possible, please at least plan for these uses.

This roadway is critical in connecting various other routes, particularly on the west side of Hawaii Island including the Mamalahoa Highway, the Queen Ka'ahumanu Highway, and other major roadways.

Additionally, to be consistent with County, State and Federal policies, this project should be designed and constructed to accommodate all modes of transportation, including bicycles and pedestrians as a complete roadway to address current and anticipated future needs.

Thank you for considering my comments and requests,

Mahalo,

Bob Smith

77-262 Maliko St.

Kailua Kona, HI 96740

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
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FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2598

September 12, 2012

Mr. Bob Smith
77-262 Maliko Street
Kailua-Kona, Hawaii 96740

Dear Mr. Smith:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the FEA-EISPN, in which you expressed support for a safe route for bicycles and pedestrians, including a separated, multi-use path that could serve as the backbone for non-motorized travel in the area.

The Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS). The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, cost and benefit.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

77-262 Maliko St.
Kailua Kona, HI 96740
June 9, 2012

Ron Terry
Geometrician Associates
P.O. Box 396, Hilo, HI 96721,

RE: **ACCOMMODATION FOR BICYCLISTS OR PEDESTRIANS IN THE *EIS* FOR THE SADDLE ROAD EXTENSION**

Aloha,

In accordance with County, State and Federal policies, the Saddle Road project needs to be designed, constructed and completed to accommodate all modes of transportation--including bicycles and pedestrians.

To address current and anticipated future needs, I request that you include accommodation for bicyclists and pedestrians in the EIS for the Saddle Road Extension. Ideally, the proposed extension should be built with a separate multi-use path to separate bicycles and pedestrians from the grade and speed limits planned on this road.

This roadway is a critical connection with various other routes, on the west side of Hawaii Island including the Mamalahoa Highway, the Queen Ka'ahumanu Highway, and Waikoloa Road. If a multiuse path is not possible, please at least plan for these alternative uses.

Thank you for considering my comments and requests,

Mahalo,

Mary Ellen C. Smith

Mary Ellen C. Smith

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
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RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2599

September 12, 2012

Ms. Mary Ellen Smith
77-262 Maliko Street
Kailua-Kona, Hawaii 96740

Dear Ms. Smith:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the FEA-EISPN, in which you expressed support for a safe route for bicycles and pedestrians, including a separated, multi-use path that could serve as the backbone for non-motorized travel in the area.

The Hawaii Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades, to accommodate bicyclists. An analysis of the proposed design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS). The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

South Kohala Traffic Safety Committee
P.O. Box 383375
Waikoloa, HI 96738

June 18, 2012

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

RE: Saddle Road Extension, Mamalahoa HWY MM 14 to Queen Ka'ahumanu Highway Project Comments

Dear Mr. Terry;

South Kohala Traffic Safety Committee's concern is that this new road will be a heavily used connector between East and West Hawai'i. As the Island population grows, future traffic on this road will increase substantially. Many members remember the light use at first of the Queen Ka'ahumanu Highway. Today this is mostly a heavily used congested 2 lane route with many safety issues. Most members feel strongly that this project should be designed for the future potential and planned growth. Procurement of a wide Right of Way now will avoid rising procurement costs and access problems in the future. If funding is not available to build a "super complete street highway" now, design and procure the necessary ROW with this project is the point.

The following comments were made by the membership previously for your review and consideration;

1. Interchanges:

    a. Grade separated interchanges are preferred. Right of Way and design should be for future needs.

    b. Design and coordinate with Hawaii County Dept. of Public Works an interchange for a proposed future County Road extension of Paniolo Avenue or Kilakila Street in Waikoloa Village, to run south and connect to this Saddle Road HWY Extension.

2. Slow traffic climbing lane for trucks to pull off on steep grades.

3. Runaway truck ramps designed and constructed concurrently with roadway.

4. Pull offs for tourists to look at views, or tired drivers to rest. Design for future rest stop with restrooms, transit stop, park & ride area and electric car charging stations (solar powered). Providing ROW for these future improvements enhances: environment & sustainability, modal integration, system preservation, security, economic vitality, system efficiency management & operations, transportation access mobility, and safety.

5. Need for smooth flow of commercial and military traffic. Road will traverse some steep terrain. No stop lights or minimal are preferred to keep trucks and buses moving especially on steep grades. Keep traffic moving with separated grade interchange ramps for smooth transition of commercial trucks and other vehicles into and out of traffic flow.

6. Divided highway. Build two lanes now. Eventually build two more as a divided highway with planted medians so that two lanes will be westbound, and two eastbound. This will provide slow and turn lanes while maintaining a free flow lane. Queen Ka'ahumanu Highway design has resulted in too many head on collisions fatalities.

7. ROW width should be at least 250 to 300 Feet wide like the new present Queen Ka'ahumanu HWY improvement project alignment to accommodate future lanes.

8. **Design the highway beyond present needs - triple what we seem to need now. Design for future needs and expansion.**

9. Accentuate SAFETY in designing grade, and for all users: workers, residents, tourists, bicyclists, buses and commercial trucks including trucks hauling fuel.

Only a few SKTSC members were able to attend the meeting on June 14, 2012 at Waikoloa Elementary School. Those in attendance, all residents of Waikoloa Village, favored alignments #5 and #6 equally. An intersection connection to Waikoloa Village is necessary for the safety, security and connectivity of Waikoloa Village to this new Highway. This connection meets goals of environment & sustainability, modal integration, system preservation, security, economic vitality, system efficiency management & operations, transportation access mobility, and safety.

Alignment #6 appears to improve safety on Waikoloa Road MM 0 to MM 3. The recent Waikoloa Road Capacity and Safety Improvements Study by SSFM International for Hawaii County May 2010 points out many deficiencies on this section of road. The inconvenience of 3 – 4 months of construction on the existing road would be offset by the procurement cost savings of the existing ROW, an established basic graded foot print and reduction in the risk of Waikoloa Village residents driving off the road, crashing into the lava field and sustaining serious injury and/or vehicle damage. Many residents have had accidents especially at night on this neglected dark stretch of road.

Alignment #5 provides for an intersection with Waikoloa Road, limited construction delay except for building the intersection (months of construction?) and approximately 3 miles of alternate route in case of emergency closure of lower Waikoloa Road. Due to the safety issues raised in the preceding paragraph, the alternate route will reduce delays as accident victims and vehicles are periodically removed from the lava fields adjacent to existing unimproved Waikoloa Road.

As discussed we look forward to your presentation to SKTSC at the regular meeting August 14, 2012. Clarification of the proposed alignment #5 and #6 intersection with the existing Waikoloa Road showing as approximately 2+ miles makai of Paniolo Avenue/Waikoloa Road intersection would be appreciated.

Regarding bicycle safety connecting Waikoloa Village to Queen Ka'ahumanu HWY, please review the Hawaii County Bicycle and Pedestrian Advisory Committee Annual Report for 2007. Page 9 of 11 K. Waikoloa Loop (Emergency Access Road and Paniolo Avenue) provides for a low cost 10 foot wide bicycle and pedestrian alternate separated route. This separated shared route addresses PATH's concerns stated by several testifiers at the June 14, 2012 meeting. Many Waikoloa Village pedestrians and bicyclists, on mountain bikes, already use the existing mostly gravel route for recreation and commuting to resort node employment. A land owner easement and minimal asphalt paving at minimal cost would provide a 3 – 4 mile direct and safe pedestrian and bicycle route.

We appreciate the opportunity to comment on this long awaited project and hope you will keep South Kohala Traffic Safety Committee informed as the project progresses. Hopefully the end result will be a well designed, safe roadway that serves present and future needs. Mahalo for your consideration of these comments.

Sincerely,

Mike Price

Mike Price-Chair South Kohala Traffic Safety Committee

CC: State Senator Malama Solomon
State Representative Cindy Evans
Councilman Pete Hoffmann
Jadine Urasaki-Deputy Director DOT Highways Division
Sal Panem-District Engineer DOT Highways Division
Warren Lee-Director County Department of Public Works

NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
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JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2600

September 12, 2012

Mr. Mike Price
Chair
South Kohala Traffic Safety Committee
P. O. Box 383375
Waikoloa, Hawaii 96738

Dear Mr. Price:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your comment letter dated June 18, 2012, on the FEA-EISPN. In answer to your specific comments:

1. *SKTSC would prefer grade-separated interchanges; coordination with DPW regarding potential future connections to Waikoloa Village by extending Paniolo Avenue or Kilakila Street.* The Draft Environmental Impact Statement (EIS) will include a traffic study that will evaluate the necessity, cost, and right-of-way needs for grade-separated interchanges, and may recommend acquisition of right-of-way at a minimum, if warranted. The Draft EIS will also evaluate potential future intersections for roads connecting to Waikoloa Village. The Department of Transportation (DOT) will be meeting with the County to discuss this and other design issues.

2. *Climbing lanes.* Owing to the general grade, the climbing lane will likely be required for the great majority of the approximately 10-mile route.

3. *Runaway truck ramps.* The design will include one or more runaway truck ramps.

4. *Advise to design or at least provide ROW for pullouts for tourists to look at views, or tired drivers to rest. Design for future rest stop with restrooms, transit stop, park & ride area and electric car charging stations (solar powered).* Thank you for your suggestions. The priority for this project is to ensure the regional capacity needs of the island are being efficiently met. However, in providing for a comprehensive transportation system, your suggestions of scenic pullouts, transit stops, a park and ride area, a comfort station, and electric charging stations will be considered. As we move forward with this project, we will consult with the responsible agencies pertinent to your suggestions. A prevailing concern for these types of facilities is their feasibility considering the associated operations and maintenance cost. The suggestion of setting aside right-of-way for these various facilities will be considered further.

5. *Use grade-separated interchanges and ramps with no or few signal lights to maximize traffic flow efficiency, especially heavy vehicles.* Thank you for your suggestion. As part of the development of alternatives and their analyses, various intersection types will be considered. Additionally, as part of this project, a traffic study will be developed to identify the roadway capacity needs of the project, including whether traffic signals are warranted.

6, 7 and 8. *Suggest building two lanes now but with divided highway with a ROW width of 250 to 300 (triple what may be needed now) to accommodate 4-lane highway, which will avoid head-on collisions.* Thank you for your suggestion. As part of this project, a traffic study will be developed to identify the roadway capacity needs of the project. The highway capacity forecast period is twenty years, and if a four-lane highway is warranted during this period, the project will consider this. In addition, the amount of right-of-way to be obtained, as well as the design features of a divided highway, will be considered during the EIS process.

9. *Accentuate safety for all users: workers, residents, tourists, bicyclists, buses and commercial trucks including trucks hauling fuel.* DOT is committed to providing a safe facility for all users. The EIS will discuss project design features that ensure safety.

10. *Preferences for alignments.* We appreciate your analyses of the pros and cons of each alignment from perspective of SKTSC.

11. *Meeting with SKTSC.* DOT looks forward to meeting with your group and clarifying any questions on the project. The resolution of some design details is pending further environmental and engineering studies.

12. *Potential of Waikoloa Loop (Emergency Access Road and Paniolo Avenue) to provide a low cost 10-foot wide bicycle and pedestrian alternate separated route being requested by many in community for Saddle Road Extension.* Thank you for drawing our attention to this report, which will be discussed in the Draft EIS.

We appreciate your involvement in the EIS process and in all traffic-related issues in the area. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Dear Mr. Terry,

I have several comments and concerns regarding the proposed Saddle Road Extension project:

1. The Mamalahoa Highway/Saddle Road/Saddle Road Extension intersection should be grade separated. I believe a traditional signalized or a roundabout intersection will be grossly inadequate. A grade separated intersection will allow traffic to freely flow.

2. I believe a park and ride facility should be included at this intersection.

3. Alignment five is the best makai alignment for this project. It provides access to Waikoloa Village without disrupting traffic on Waikoloa Road. Alignment four and six don't do this.

Sincerely,

Aaron Stene
aaron@hawaii.rr.com

NEIL ABERCROMBIE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
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RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2601

September 12, 2012

Mr. Aaron Stene
aaron@hawaii.rr.com

Dear Mr. Stene:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the FEA-EISPN. In answer to your specific comments:

1. *Prefer grade-separated interchange*. The Draft Environmental Impact Statement (EIS) will include a traffic study that will evaluate if grade-separated interchanges are appropriate. Associated costs and the acquisition of right-of-way will also be considered in the Draft EIS, as warranted.

2. *Park and ride facility*. Thank you for your suggestion. The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, your suggestions of a park and ride area will be considered. As we move forward with this project, we will consult with the responsible agencies pertinent to your suggestions. A prevailing concern for a facility such as this is its feasibility considering property acquisition, operations, and maintenance costs.

3. *Preference for Alignment 5*. Thank you for providing your opinion and reasoning concerning the best alignment, which is valuable as Department of Transportation seeks to determine which alternative works best for the project purpose and the majority of the community.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Kelvin Sumic

Kelvin@hilofish.com

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

Reference W-7 Alignment: What is KEAMUKU VILLAGE? Archaeological site?

Roadway Corridor Alternatives: Favor Alignment 5. Mass Transit Direct route to Hilo for employment opportunities Waikoloa to Hilo. Current situation/circumstance favor employment opportunities Hilo to Kohala Coast. Bus Transit station (small Bus Stop to shield from elements)at Align 5 connection with current Waikoloa Village Road, also alternative route in event of natural disaster. (i.e. - fire, earthquake, flood.)

Bike Lane/Pathway - Highway is designed for 50 - 65 mph(?) will be posted for 45 - 55 mph(?). Bikers should yield right-of-way on Highway to automotive vehicles. Shoulder of 8 - 10 feet is sufficient for Bike use. Rumble strip adequate as currently applied to other roads of recent repair/maintenance/renovation. Beyond pavement should be coated with a substance as to not allow gravel onto shoulder (during use) posing hazard to Bike use (cause/effect) thereby resulting in Biker to sway onto Highway or stay on Highway to avoid hazards and damage.

Saddle Road Extension (Mauka to Makai - from 190 to 19 - Waikoloa Beach Drive intersection) should consider of Military Use and speed of convoys to allow for Convoy to travel unobstrusive of through traffic - as to not impede "intended" flow of traffic. (Passing "double" lane(s)?

For efficient use of time - and to avoid "grandstanding"/political views/personal agendas - questions and/or comments should be written and "handed"/submitted to Featured Speaker to address appropriately.

Respectfully submitted.

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant:	**Geometrician Associates**
Address:	**PO Box 396**
	Hilo HI 96721
Contact:	**Ron Terry**

rterry@hawaii.rr.com

Phone: 808-969-7090

Your comments must be received or postmarked by June 22, 2012

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2602

September 12, 2012

Mr. Kelvin Sumic
kelvin@hilofish.com

Dear Mr. Sumic:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comments you provided on the comment sheet from the June 14, 2012 meeting for the FEA-EISPN. In answer to your specific comments:

1. *What is Keamuku Village?* It is an old ranch site located within the Keamuku portion of lands that formerly belonged to Parker Ranch and are now part of the Army's Pohakuloa Training Area.

2. *Preference for Alignment 5.* Thank you for providing your opinion and reasoning concerning the best alignment, which is valuable as Department of Transportation seeks to determine which alternative works best for the project purpose and the majority of the community.

3. *Double-left turn lane at Waikoloa Beach Drive to accommodate military convoys.* The Draft Environmental Impact Statement (EIS) will include a traffic study which will address the traffic volumes and movements, and will take into account this suggestion.

4. *Meeting format.* We appreciate your suggestion regarding better efficiency during the question and answer portion of future meetings and will consider the adoption of it, as appropriate.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Michael Traub, ND, FABNO
Ho'o Lokahi
75-169 Hualalai Rd. Suite 301
Kailua Kona, Hawaii 96740
Phone 808-329-2114
Fax 808-326-2871

June 9, 2012

Geometrician Associates
Attention: Ron Terry
P.O. Box 396
Hilo, HI 96721

Hawai`i Department of Transportation
Attention: Dean Yanagisawa
869 Punchbowl St., Room 301
Honolulu, HI 96813

Dear Sirs:

As a graphic example of why safe bicycle and pedestrian pathways are needed in Hawai'i, I would like to describe a bicycle accident that I had in March while on Maui. I was completing a 2 hour ride from Kihei to Makena and back when I encountered a rough patch of road repairs that had not been smoothed over while riding downhill at approximately 20 mph. I was thrown off balance, lost control and crashed on to the road surface. I sustained a separated shoulder and a deep gash to my leg that required me to be transported to Maui Memorial Hospital.

To be consistent with County, State and Federal policies, the Saddle Road Extension project should be designed and constructed to accommodate all modes of transportation, including bicycles and pedestrians as a complete roadway to address current and anticipated future needs. Due to vehicular speed and road grade, I urge you to plan for a separated multi-use path alongside the proposed Saddle Road extension.

The location of this roadway can essentially serve as a backbone for a network of non-motorized access routes that could connect our island communities without being dependent on automobiles. This alignment connects with Māmalahoa Highway, the Queen Ka`ahumanu Highway the major resort node of Waikoloa, and the HELCO utility road that spans from Kawaihae Road south to Kailua Kona. Prudent planning now will go a long way to make this possible and meet our island's future transportation needs.

Thank you for using your positions of authority to insure safe pathways for cyclists and pedestrians.

Sincerely,

M Traub

Michael Traub, ND

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2603

September 12, 2012

Mr. Michael Traub, ND, FABNO
Ho'o Lokahi
75-169 Hualalai Road, Suite 301
Kailua-Kona, Hawaii 96740

Dear Dr. Traub:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comment letter dated June 9, 2012, sharing your experience on Maui and stating that the Saddle Road Extension should be constructed to accommodate all modes of transportation, and that the project should include safe avenues for bicycle and pedestrian traffic, including a separated, multi-use path.

The Department of Transportation is committed to facilities that adequately and safely accommodate all modes of transportation. At this time, we are considering 8-foot wide shoulders and minimizing steep grades, to accommodate bicyclists. An analysis of the proposed highway design and its safety features for pedestrian and bicyclists will be included in the Draft Environmental Impact Statement (EIS). The priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

June 22, 2012

Saddle Road Extension Comments

Waikoloa Dry Forest Initiative
68-3720 Lua Hoana Place
Waikoloa, HI 96738
(808) 339-2142
jen@waikoloadryforest.org

Aloha,

The Waikoloa Dry Forest Initiative is a non-profit organization that manages a patch of remnant dry forest near Waikoloa Village and within proximity of the Saddle Road Extension. The major concern of the Waikoloa Dry Forest Initiative (WDFI) is the loss of native plant habitat and individual plants as a direct result of construction of the Saddle Road Extension. The increased risk of wildfire during construction and after opening the road is also of concern.

As an organization dedicated to conservation of native species, we would also like to suggest that the WDFI exclosure would be an appropriate location to move native trees that exist within the project area if transplanting is feasible, especially for the wililiwili (*Erythrina sandwicensis*). The WDFI exclosure is a 275 acre ungulate free site with active weed and pest management. WDFI would provide care for the trees after transplanting. A wiliwili tree has been successfully transplanted into the project site in the past and we would like to try to transplant those that would otherwise be destroyed by construction.

We would also like to suggest a one kilometer buffer zone, where no construction would occur, around any endangered plant species such as the uhiuhi (*Caesalpinia kavaiensis*) that may be found while surveying the project area. These trees are especially vulnerable as there are very few remaining in the wild and they are desirable for woodworking. We fear that they would be in danger if they were within view from the new road.

We feel that "alignment 6" would result in the least new ground being broken and, presumably, less impact on biological and other resources. We would like to see a map of native trees impacted for each alignment option before endorsing a particular alignment. "Alignment 4" is the least desirable of the alternatives as it bypasses Waikoloa Village and traverses the most undeveloped land. We would also like to review a fire mitigation plan as construction and subsequent use will likely increase the threat of fire and pose a threat to our project site.

Overall we support the Saddle Road Extension project and appreciate the effort being made to document and map all native trees within proximity to the project area.

Mahalo for your consideration,

Jen Lawson
Project Manager
Waikoloa Dry Forest Initiative

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2604

September 12, 2012

Ms. Jen Lawson
Project Manager
Waikoloa Dry Forest Initiative
68-3720 Lua Hoana Place
Waikoloa, Hawaii 96738

Dear Ms Lawson:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comment letter dated June 22, 2012, on the FEA-EISPN. In answer to your specific comments:

1. *Direct and indirect impacts of Saddle Road Extension construction and operation.* Indications to date are that the habitat that will be directly affected by construction is already highly degraded and that no plants considered rare, island-wide or locally, will be affected. This is being confirmed by updated studies. Wildfire is an important issue that will be analyzed in the Draft Environmental Impact Statement (EIS).

2. *Wiliwili trees that will be taken out by project could be accepted at the Waikoloa Dry Forest Preserve*. We welcome your assistance with evaluating this idea in the Draft EIS. If practical, it could be a beneficial mitigation measure.

3. *Buffer zones around uhiuhi*. To date, we are unaware of any uhiuhi within 1 kilometer of any proposed construction. Although an extensive buffer such as one kilometer may not be feasible for all such trees, the project will attempt to determine the location of nearby uhiuhi, if any, and will propose mitigation measures for this and other protected species.

4. *Preference for Alignment 6 and concern about Alignment 4.* Thank you for providing your opinion and reasoning concerning the best alignment, which is valuable as Department of Transportation seeks to determine which alternative works best for the project purpose and the majority of the community.

We appreciate your statement of support for the project and your involvement in the EIS process. If you have any questions about the FEA/EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Hawai'i Department of Transportation, Highways Division, Hawai`i District
869 Punchbowl Street, Rm. 301
Honolulu HI 96813
Dean Yanagisawa 808-587-1834

Geometrician Associates
PO Box 396
Hilo HI 96721
Ron Terry 808-969-7090

Name of Project: Saddle Road Extension: From Māmalahoa Highway (State Route 190) to Queen Ka'ahumanu Highway (State Route 19).

I would like to take the time to offer the following comments and rational for the EIS development of the proposed project.

CORRIDOR SELCTION

The three alignments presented are reasonable, but since crucial data is not yet available to evaluate impacts, benefits, or estimated costs it will be necessary to wait until they are available to determine the best alignment. It is understood that other alignments were previously considered but were eliminated. Can a fourth alignment be considered that maximizes the opportunity to utilize land on the Kona side of the judicial district boundary?

Rational:

- Previous route elimination criteria may no longer be valid and other issues may have increased in relevance over time. Freight traffic (military, harbor intermodal, and solid municipal waste) have all changed in character, relevance and urgency.

- The right-of-way in Kona is already owned by the State of Hawai`i. This is indicative of both lower land acquisition costs and a reduced time frame that benefit the project.

DESIGN SPEED

Original information proposed a design speed was 50 mph. Can we establish the design speed at 60 mph and the posted speed at 55 mph?

Rational:

- Revising the speeds would be more consistent with system speed limits including the Queen Ka`ahumanu Highway, Saddle Road (W-7) Realignment, and even the segment of Mamalahoa Highway between (W-7) and the existing Saddle Road (currently posted at 50 mph).

GRADE SEPARATION

Currently one of the most economical grade separation designs is the precast segmented arch. Can this innovative type of design be considered for (a) the Mamalahoa Hwy junction and (b) the Queen Ka`ahumanu Hwy junction?

Rational:

- The arch design is not only a lower cost than traditional super-structure bridges but provides the esthetic values that create a unique visual appeal.
- The precast segmented arch creates an enlarged lava tube resemblance that provides both archeological and geological sensitivity and context.

SHARED-USE PATH

There are no open trails or paths between Queen Ka`ahumanu and Mamalahoa Highways in North Kona or South Kohala that can safely and comfortably accommodate pedestrians, hikers, basic bicyclists, or non-motorized users. Can the planning and design of a separated, meandering, 5% maximum gradient Shared-Use Path be included?

Rational:

- The Hawai`i DOT has stated during the development of the Statewide Pedestrian Master Plan that highway shoulders are not pedestrian facilities.
- A maximum 5% gradient can take advantage of natural terrain and meet the guidance to accommodate pedestrians of all abilities and bicyclists of all skill levels.
- The Shared-Use Path can incorporate elements of the proposed highway corridor, hunting access routes, jeep trails and parts of the HELCO transmission lines.
- Separated pathways provide additional vegetation control, wildfire resilience, and expanded emergency access and mobility.
- A Shared-Use Path will help meet the policy issued by the US DOT to incorporate safe and convenient walking and bicycling facilities into transportation projects.
- A Shared-Use Path will also meet the policy criteria of Complete Streets passed under Act 54 (2009) and codified as HRS 264-20.5.
- A separated meandering pathway will be the spine that integrates walking and bicycling into a transportation system connecting Waikoloa, Kailua, and Waimea with connections to other pathways identified in Bike Plan Hawai`i and the Kona Community Development Plan and other planning documents.

SHOULDER BIKEWAYS

Shoulder facilities are still required to meet pavement preservation, roadside hazard, drainage improvement, breakdown accommodation, enforcement area, and run-off recovery. Can a functional Shoulder Bikeway be developed and included in the plans to accommodate mopeds and the most experienced and conditioned bicyclists?

Rational:

- No facility is currently planned for mopeds as defined either by the County of Hawai'i or the slightly different State of Hawai'i definition.
- Shoulder Bikeways should include necessary signage and pavement markings to clarify respective rights and responsibilities of motorists, bicyclists and mopeds.
- Roadside hazard mitigation (rumble strips, guard rails, sign posts, utility covers, culvert abutments, drainage inlets, driveway aprons, etc.) should be integrated.
- Intersection accommodation is critical so all users have clearly indicated "paths of travel" to minimize unexpected behavior of motorists, bicyclists and mopeds.
- Signalized intersections should provide bicycle accommodation. Consideration should be given for detection systems, bike boxes, etc.

Thank you for your consideration on these issues. I would be pleased to answer any additional questions or discuss these concerns.

Sincerely,

Robert Ward
77-6526 Ho'olaupa'i Street
Kailua Kona, HI 96740

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2605

September 12, 2012

Mr. Robert Ward
77-6526 Hoolaupai Street
Kailua-Kona, Hawaii 96740

Dear Mr. Ward:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your comment letter on the FEA-EISPN, in which you expressed your preference for Alignment 5 along with your rationale. In answer to your specific comments:

1. *Can the planning and design of a separated, meandering, 5% maximum gradient Share-Use Path be included?* Please note that the priority for this project is to ensure the regional capacity needs of the island are being met. However, in providing for a comprehensive transportation system, the suggestion to study a separate bikeway that was provided by several commenters will be studied for practicality in terms of right-of-way needs, costs, and benefits.

2. *Shoulder bikeways and intersections designed to better accommodate bicycles, with minimum shoulder width of 8 feet, with a 10-foot minimum in 55-MPH zones.* The DOT is committed to facilities that adequately and safely accommodate all modes of transportation. An analysis of the proposed design and its safety features for pedestrian and bicyclists, including possible expansion of 8-foot minimum shoulder to 10 feet in 55 MPH zones, will be included in the Draft Environmental Impact Statement (EIS) to ensure that the highway does not negatively affect bicyclists or pedestrians. We plan to work with PATH for input on intersection design.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Thank you for all your work with this project and explaining it to us. I wanted to express in writing some of my thoughts and humble opinions. I am a cyclist and having this road cyclist friendly will be so wonderful since there are no cyclist friendly roads that join the lower and upper roads. I fully understand that joining the road to the current waikoloa village road would be an asset for most parties. My opinion on this would be to have it done in the least intrusive way by having the actual connections done at the last step and maybe having a simple joining of the two roads like an H pattern or a round about. Also the shoulder rumble strips should be placed right by the white line and the sides dropped downwards to prevent rock build up on the shoulders along with signage to be placed off the pavement of course.

Thank you for the consideration & Aloha,

Michael Wolf
Wolf Worx
818-732-9653
mikewolfworx@gmail.com

"Do onto others as you would want done to you"

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

Thank you for a wonderful presentation and for listening to our comments.

Many thanks for acknowledging that cyclists are a new consideration for the use of the Saddle Road Extension. Please consider us in the design of intersections and the implementation of the shoulder.

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant: **Geometrician Associates**
Address: **PO Box 396**
Hilo HI 96721
Contact: **Ron Terry** **Phone: 808-969-7090**

Your comments must be received or postmarked by June 22, 2012

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2608

September 12, 2012

Mr. Michael Wolf
mikewolfworx@gmail.com

Dear Mr. Wolf:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for your email on the project stating that from your perspective as a cyclist (assuming Alignment 5 or 6 is selected), the connection between the new highway and Waikoloa Road should be done as the last step, perhaps designed like an H-pattern or as a roundabout. Your suggestions will be considered in the Environmental Impact Statement (EIS).

Concerning the shoulder rumble strips and transition of the shoulder to the right-of-way beyond, we intend to work with PATH for input on shoulder and intersection design that accommodate bicycles in the safest practicable way.

We appreciate your involvement in the EIS process. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

RuthASmith rmswaikoloa@aol.com

I'm V. Prin at Waikoloa School & was a Steering Committee member for the South Kohala Community Dev. Plan (CDP) - I have a strong community interest -

While Align #4 could be the most economical, several concerns were voiced & I share them. Align #6 will be too expensive & disruptive - with only modest benefit to the Village over Align #5 (purple) - that seems the best route - Waikoloa Rd would need less maintenance w/ less truck + military traffic - & the speed could be lower, if folks had a readily accessible option -

THANK YOU for Coming & for asking!

Ruth Smith

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant:	**Geometrician Associates**	
Address:	**PO Box 396**	
	Hilo HI 96721	
Contact:	**Ron Terry**	**Phone: 808-969-7090**

Your comments must be received or postmarked by June 22, 2012

SADDLE ROAD EXTENSION EA/EISPN COMMENT CARD

Red = no disruption during construction and no impact in future from PTA convoys

Purple = little disruption during construction other than portion that touches Waikoloa Road; ? on intersection

Green = While improvements will be made on makai portion possible impacts with convoy although climbing lanes may mitigate those impacts over length of project; most disruptive during construction; least desireable

(Use back of sheet or attach additional sheets if desired)

If sending by mail, please send original comments to the:

Consultant:	**Geometrician Associates**	
Address:	**PO Box 396**	
	Hilo HI 96721	
Contact:	**Ron Terry**	**Phone: 808-969-7090**

Your comments must be received or postmarked by June 22, 2012

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.2609

September 12, 2012

Ms. Ruth Smith
raswaikoloa@aol.com

Dear Ms. Smith:

Subject: Comments to Final Environmental Assessment/Environmental Impact Statement Preparation Notice (FEA-EISPN), Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Kaahumanu Highway (State Route 19)

Thank you for the comments you supplied on the comment sheet from the June 14, 2012 meeting for the FEA-EISPN, in which you expressed your preference for Alignment 5. We appreciate your opinion and reasoning concerning the best alignment, which is valuable as the Department of Transportation seeks to determine which alternative works best for the project purpose and the majority of the community.

We appreciate your involvement in the Environmental Impact Statement (EIS) process and we wish to thank you and your school for hosting our community meeting. If you have any questions about the FEA-EISPN or the EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

DIR 0956

NEIL ABERCROMBIE
GOVERNOR OF HAWAI'I

GARY L. HOOSER
DIRECTOR

STATE OF HAWAI'I
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
235 SOUTH BERETANIA STREET, SUITE 702
HONOLULU, HAWAI'I 96813

In reply, please refer to:
File:

2012 JUN 27 P 1:03
DIRECTOR'S OFFICE
DEPT. OF
TRANSPORTATION

June 22, 2012

TO: GLENN OKIMOTO, DIRECTOR
DEPARTMENT OF TRANSPORTATION

FROM: HERMAN TUIOLOSEGA, LEAD PLANNER
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

SUBJECT: FINAL ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARTION NOTICE; SADDLE ROAD EXTENSION, FROM MAMALAHOA HIGHWAY (STATE ROUTE 190) TO QUEEN KAAHUMANU HIGHWAY (STATE ROUTE 19), SOUTH KOKALA/NORTH KONA DISTRICTS, ISALND OF HAWAI'I

The Office of Environmental Quality Control published the subject FEA/EISPN in the May 23, 2012 issue of The Environmental Notice. The publication started the statutory 30-day comment period; OEQC offers the following comments:

1. The last sentence in the first paragraph, page 8, states that the subject FEA/EISPN replaces the document published on August 8, 1999. Please note that the August 1999 publication was for the eastern leg of Saddle Road; this project extends the western portion of the road discussed in 1999 and therefore, is not a replacement but rather a continuation of the project from 1999 that would complete the improvements to Saddle Road for a shorter, faster and safer route between East and West Hawai'i.

2. We look forward to reviewing your findings and commenting on the potential project impacts and mitigation in the draft EIS.

3. Please include all the regional Hawai'i State libraries in the distribution of the draft EIS.

Please feel free to call OEQC at (808) 586-4815 if you have further questions.

HIGHWAYS DIVISION
PLANNING BRANCH
'12 JUL -3 P2:44
RECEIVED
STATE DEPARTMENT OF TRANSPORTATION

NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:
HWY-PA
2.2611

September 12, 2012

TO: HERMAN TUIOLOSEGA
LEAD PLANNER
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: GLENN M. OKIMOTO, Ph.D.
DIRECTOR OF TRANSPORTATION

SUBJECT: COMMENTS TO FINAL ENVIRONMENTAL ASSESSMENT/ENVIRONMENTAL IMPACT STATEMENT PREPARATION NOTICE (FEA-EISPN), SADDLE ROAD EXTENSION, MAMALAHOA HIGHWAY (STATE ROUTE 190) TO QUEEN KAAHUMANU HIGHWAY (STATE ROUTE 19)

Thank you for your comment letter dated June 22, 2012, on the FEA-EISPN. In answer to your specific comments:

1. *Subject FEA/EISPN replacing the document published on August 8, 1999.* The EISPN for the Saddle Road Extension was published in the Notice on August 8, 1999, followed one month later by the Final Environmental Impact Statement (EIS) for the Saddle Road Improvements on September 8, 1999 (see attached pages from these two publications). Despite the similar names and the connections between them, they are separate projects. There appears to be an error on the OEQC website, which provides the Saddle Road Improvements EIS on the date the Saddle Road Extension EISPN was published, and which omits mention of the Saddle Road Extension EISPN altogether.

2. *EIS findings.* We look forward to OEQC review of the EIS and assistance with the EIS process.

3. *DEIS distribution.* We will be sure to include all the regional Hawaii State libraries in the distribution of the DEIS.

We appreciate your review of the document. If you have any questions about the FEA-EISPN or EIS, please contact Dean Yanagisawa at (808) 587-1834, or project EIS consultant Ron Terry at (808) 969-7090.

Attachments

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix A Public Involvement and Agency Coordination
A3: FHWA Coordination Plan Materials

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MAP-21 (Moving Ahead for Progress in the 21st Century)

Section 6002 Coordination Plan, Version 1

Saddle Road Extension
Queen Kaʻahumanu Highway to Mamalahoa Highway
Project No. DP-HI-0200(5)
Hawaiʻi Island, State of Hawaiʻi

Submitted by:
Federal Highway Administration
&
Hawaiʻi Department of Transportation

The following persons may be contacted for additional information concerning this document:

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April 4, 2014

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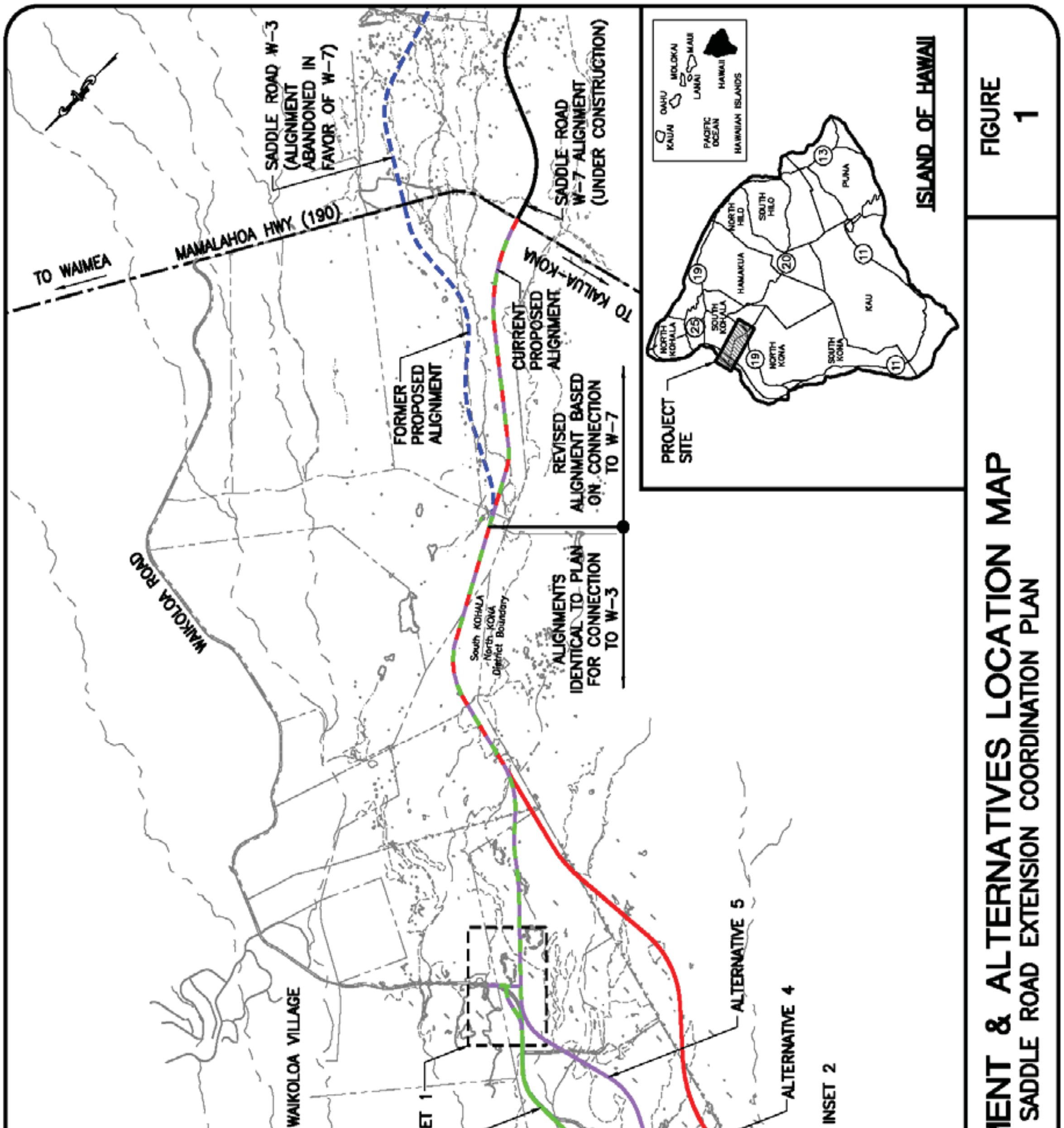
CHAPTER 1: OVERVIEW

The Hawaiʻi Department of Transportation (HDOT) and the Federal Highway Administration (FHWA) have initiated a planning process, including the preparation of an Environmental Impact Statement (EIS), for the Saddle Road Extension Project. The project limits are from the intersection of Queen Ka'ahumanu Highway and Waikoloa Beach Road at its western terminus, to the intersection of the realigned Saddle Road (SR 200) and Mamalahoa Highway at the eastern terminus (Figure 1). This project involves addressing the linkage between Saddle Road between Mamalahoa Highway and Queen Ka'ahumanu Highway. As shown in Figure 1, the project study area extends in an east-west direction for approximately 10.5 miles.

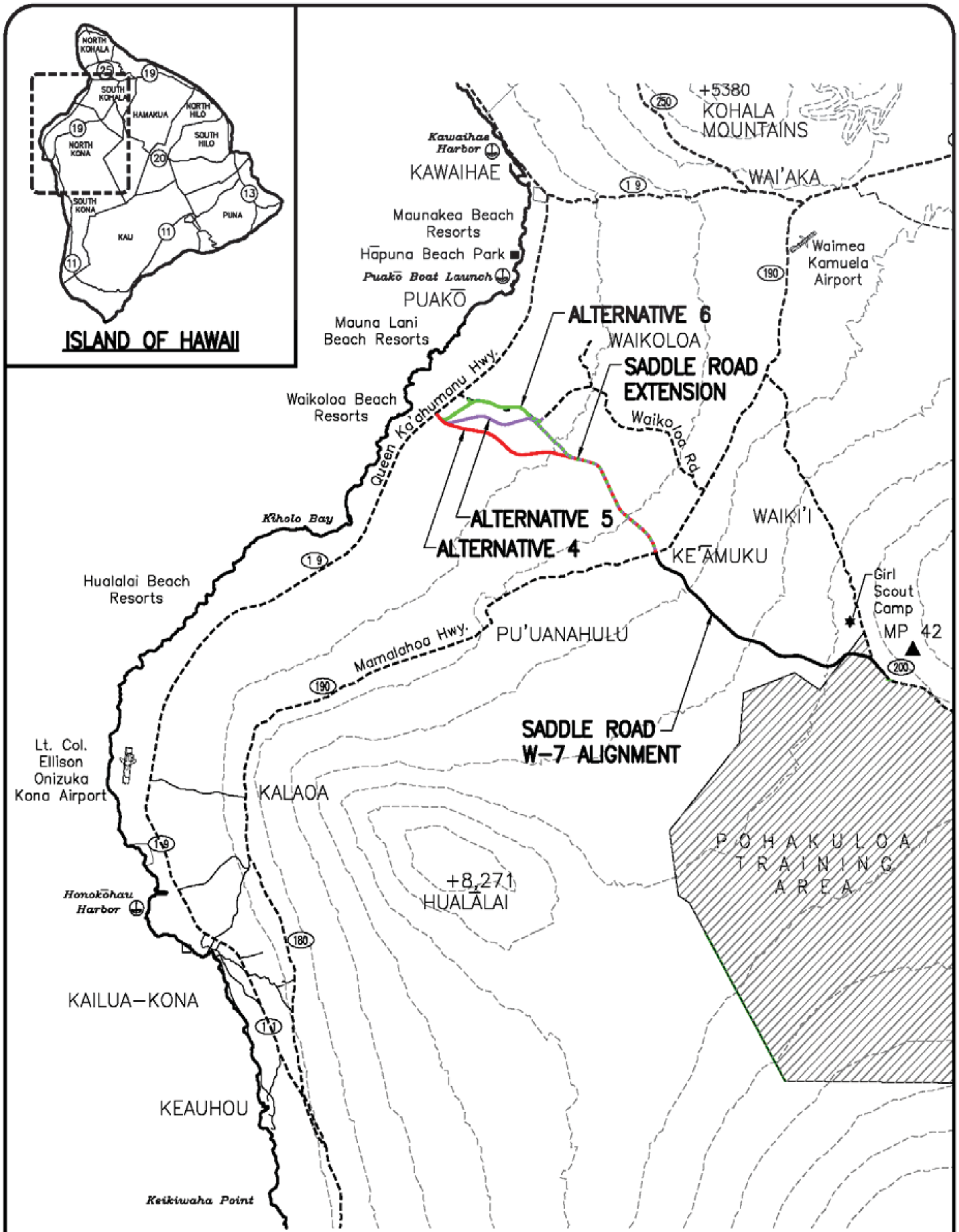
Major destinations spurring cross-island traffic on the island of Hawai'i include airports (Keahole and Hilo), harbors (Kawaihae and Hilo), beaches and resorts (South Kohala and Kona), and population centers (Hilo, Waimea, and Kailua-Kona). This demand is currently met by SR 19 (along the Hamakua Coast and through Honoka'a and Waimea), by the Saddle Road, and by SR 11 (along the less-used route around the southern end of the island).

Traffic between East and West Hawai'i is forecasted to increase steadily and substantially over the next 20 years, particularly on the Saddle Road and SR 19 routes. The Saddle Road is expected to account for a much larger portion of this traffic than it currently does, because of the major alignment, widening and safety improvements that have been constructed over the last 10 years and will soon be substantially complete. The new Saddle Road provides a much shorter, faster, and safer route between East and West Hawai'i. Traffic models predict a threefold increase in average daily traffic (ADT) on the Saddle Road to about 4,200 by year 2020, and 6,500 by 2034. The existing western segment of the Saddle Road through Waiki'i will remain in use mainly for residences and local access, and should see a drop to 840 ADT after construction, with slow growth thereafter. Another HDOT project in the area is the widening of a 5.2-mile section of Queen Kaʻahumanu Highway between Keahole Airport Road and Kealakehe Parkway from two- to four- lanes, with new coordinated traffic signals.

When both the Saddle Road and Queen Ka'ahumanu Highway improvements are complete, much of the capacity need will have been satisfied, with one major gap: from the Mamalahoa Highway in the vicinity of Saddle Road to the Queen Ka'ahumanu Highway. Both the existing and planned termini of Saddle Road are far from most motorists' destinations – i.e., Kailua-Kona and the coastal resort areas of South Kohala (Figure 2). Presently, two options are available to access the Kona area. The first is via Mamalahoa Highway (SR 190), which provides a relatively direct (36.7 miles) but winding and narrow route to *mauka* (inland) North Kona. This route lacks adequate shoulders for most of its length south of Waikoloa Road, and runs through a highly populated residential area for the last 8.7 miles. The other option is via Waikoloa Road (a County Road) and Queen Ka'ahumanu Highway (SR 19), for a total distance of 42.8 miles. The longer distance is due to travel along the relatively winding Waikoloa Road for 12.8 miles. Currently, there is no direct route from the existing or planned Saddle Road termini to the South Kohala resort areas along Queen Ka'ahumanu Highway.



ALIGNMENT & ALTERNATIVES LOCATION MAP
SADDLE ROAD EXTENSION COORDINATION PLAN
FIGURE 1
ISLAND OF HAWAII
PROJECT SITE
SADDLE ROAD W-3 (ALIGNMENT ABANDONED IN FAVOR OF W-7)
SADDLE ROAD W-7 ALIGNMENT (UNDER CONSTRUCTION)
MAMALAHOA HWY (190)
TO WAIMEA
TO KAILUA-KONA
FORMER PROPOSED ALIGNMENT
CURRENT PROPOSED ALIGNMENT
REVISED ALIGNMENT BASED ON CONNECTION TO W-7
ALIGNMENTS IDENTICAL TO PLAN FOR CONNECTION TO W-3
WAIKOLOA ROAD
WAIKOLOA VILLAGE
South KOHALA North KONA District Boundary
SEE INSET 1
SEE INSET 2
ALTERNATIVE 4
ALTERNATIVE 5
ALTERNATIVE 6
WAIKOLOA RESORT INTERSECTION
WAIKOLOA BEACH DRIVE
QUEEN KAAHUMANU HWY
TO KAWAIHAE
TO KAILUA KONA
INSET 1
INSET 2
WAIKOLOA ROAD



KAILUA-KONA & SOUTH KOHALA RESORT MAP
SADDLE ROAD EXTENSION COORDINATION PLAN

FIGURE 2

Both of the existing routes in West Hawaiʻi mentioned are circuitous and do not meet standards of modern regional highways. They would require substantial costs to improve, which might not be warranted because they are not oriented properly to serve current or future traffic demand. The western terminus of Saddle Road has now shifted six (6) miles to the south of its current location, and this extension project will consider the minimization of the existing circuitous routing that exists in West Hawaiʻi.

With the increase in population and economic growth on both sides of the island of Hawaiʻi, there is an increasing need for regional connectivity between the growing communities, businesses, and harbors of Hilo/Puna and Kona/Kawaihae. The current EIS is an effort to address this transportation problem.

An Environmental Impact Statement for the project started in 1999, with a State of Hawaii EIS Preparation Notice released on August 8, 1999 and a Notice of Intent published in the *Federal Register* on July 13, 1999. An alternatives study that generated three alternative alignments was completed, and fieldwork was accomplished over the next two years. Subsequently, in November 2003, the U.S. Army began an EIS for the Army Transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team (SBCT) project, which included purchase and use of Parker Ranch's Keʻāmuku Parcel, where the western portion of the Saddle Road had been planned, for military training. As the location of the Saddle Road terminus was critical for the Saddle Road Extension project, the Saddle Road Extension was put on hold pending resolution of this issue. The EIS process for the military training concluded in April 2008, and shortly thereafter, the U.S. Army determined that the western terminus of the Saddle Road would have to move south to reasonably accommodate training activities in the newly acquired Keʻāmuku Parcel.

With the information that the western terminus of the Saddle Road would be shifted south, the FHWA undertook engineering studies to relocate the western segment of the Saddle Road and began preparation of the Saddle Road Supplemental Environmental Impact Statement to study the impacts of this shift. In February 2010, the Final Supplemental EIS was completed and the Record of Decision (ROD) was prepared for the project. The ROD selected an alignment with a western terminus relocated about a half-mile south of that presented in the 1999 EIS (Figure 1). This segment of the Saddle Road is currently in construction and is expected to be complete by the end of 2013. After resolution of this key issue that had placed the Saddle Road Extension project on hold from 2003 to 2010, the Draft EIS for the Saddle Road Extension was finally resumed in late 2011.

The project termini for the Saddle Road Extension were set based on accommodating the critical area of expected traffic growth. The eastern or *mauka* project limit is anticipated to be Mamalahoa Highway at the realigned Saddle Road terminus. This limit was selected because it will be the outlet of Saddle Road traffic and thus is the logical future focus point of traffic between East and West Hawai'i. The western or *makai* terminus is the Queen Ka'ahumanu Highway (SR 19) at Waikoloa Beach Drive, because this provides the shortest route to SR 19, at a point that is forecasted to become the major intersection in this segment of SR 19 (Figure 1).

As discussed above, FHWA initiated the planning phase of this project with an Alternatives Analysis Report that studied alternatives based on their ability to satisfy the project's purpose and need. The alternatives include eleven (11) alternatives alignments in addition to Transportation Systems Management/Travel Demand Management (TSM/TDM) and Mass Transit. Seven (7) alignments involved construction of a new highway, two (2) involved the redesign of portions of Waikoloa Road to meet modern standards as well as the addition of two travel lanes, and two (2) reversed the focus of traffic movement assumed in the other alignments towards Kona and proceed from the Saddle Road terminus at Mamalahoa Highway to Kawaihae to benefit harbor-bound traffic. The TSM/TDM alternative included modifications such as restrictions involving road use, car-pool incentives, High Occupancy Vehicle Lanes, and minor changes to existing roads. The Mass Transit alternative would not provide more efficient connections between rural regions with sparse road networks, such as the project area (although Mass Transit could benefit from a new roadway in the project region), and it was therefore dismissed from further consideration. The report presented a systematic discussion of how the alternatives that have been carried forward rate among various factors, including specific environmental resources and design considerations. It then presented the conclusions of the alternatives analysis and recommended three (3) alternatives (in addition to the No Build Alternative) to be considered for further environmental studies for the EIS.

Since the proposed action would use State funds and property, it must undergo environmental review in accordance with Hawaiʻi Revised Statutes (HRS) Chapter 343 (the State environmental law). Because of federal involvement in the project, the project must also comply with the National Environmental Policy Act (NEPA), the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) and Moving Ahead for Progress in the 21st Century Act (MAP-21), and numerous other federal requirements such as the National Historic Preservation Act, the Endangered Species Act, the Memorandum of Understanding (MOU) pertaining to coordination of the Clean Water Act Section 404 requirements (e.g., wetlands protection), and many others.

SAFETEA-LU (signed into law on August 10, 2005) and subsequent revisions in MAP-21 (signed into law on July 6, 2012) includes several new provisions intended to streamline the planning and environmental review of highway projects. Details are contained in 23 United States Code (U.S.C.) Section 139, "Efficient Environmental Reviews for Project Decision-Making." More information on the DOT environmental review process can be found on the FHWA website at http://www.fhwa.dot.gov/safetealu/index.htm.

Among the tools mandated by 23 U.S.C 139 is the development early in the planning process of a Coordination Plan (CP) addressing how coordination and communication with agencies and the public will occur throughout the NEPA process. Goals of the CP include delivering an environmental document enabling sound decisions that:

- address the concerns of local government entities and resource/regulatory agencies, and satisfies the mandates of the agencies with jurisdiction, while still meeting the purposes and needs of the project; and
- keep project planning on schedule and within budget.

SAFETEA-LU and MAP-21 use the terms "lead agency," "cooperating agency," and "participating agency." The lead agencies are the project proponents. For this project, the lead agencies are the Federal Highway Administration (FHWA) and the Hawaiʻi Department of Transportation (HDOT). A cooperating agency is any federal agency (or in special cases a State or local agency), other than a lead agency, that has jurisdiction or special expertise with respect to any environmental impact involved in the proposed project. Participating agency is a new category created by SAFETEA-LU and amended by MAP-21 that includes those "federal, State, tribal, regional, and local government agencies that have an interest in the project and that have agreed to participate in the NEPA and scoping processes." Cooperating and participating agencies are expected to play a critical role in defining the project, the project's purposes and needs, the alternatives to be addressed, and methodologies to be employed. The agencies' participation in the planning process is intended to improve the quality of roadway planning while fulfilling the mission of the agency.

The intent of this CP is to identify which agencies shall be considered cooperating and participating agencies; establish clear expectations of the role of the local governments, agencies, and the public in decision-making; identify the responsibilities of cooperating and participating agencies; provide a format and schedule for coordination; and describe procedures that will support timely input at decision milestones and collaborative problem solving where appropriate.

The concepts presented in this CP are drafts, and agencies are invited to provide comments on how they would prefer project coordination to occur. Note that SAFETEA-LU establishes a 30-day maximum comment period for external agency reviews. FHWA and HDOT have determined that they will enforce this 30-day comment period to facilitate timely decision-making. It is expected that all or most project submissions will be made by email. Consequently, the 30-day period will start on the day after the email transmitting the submission is sent. Comments received during the 30-day review period will become part of the administrative record of the project. Comments received after the close of the 30-day review period will be considered at the sole discretion of FHWA and HDOT.

Cooperating and participating agencies may inform FHWA and HDOT that the submission is not complete for the purposes of the particular point of coordination. The review period will be extended until the necessary information is provided. However, the cooperating and participating agencies must generate documentation that describes the missing information and why it is needed for the review at hand.

The lead agency has the authority to extend the 30 day comment period for good cause.

If an agency feels they have been wrongly classified or tasked with inappropriate responsibilities, that agency should provide comments on the CP within 30 days of receipt.

Although SAFETEA-LU establishes the 30-day maximum for most of the comment periods, the comment period for the Draft EIS (DEIS) has been extended from 45 days to a 60-day maximum. Similar to other comment periods, the lead agency has the authority to extend the DEIS comment period for good cause.

A new provision in Section 1308 of MAP-21 allows the HDOT and FHWA to invoke a 150- day statute of limitations (SOL) on claims for all environmental and other approval actions made during this planning process. SOL applies to a permit, license, or approval action by a Federal agency if:

- The action relates to a transportation project; and
- A SOL notification is published in the *Federal Register* (FR) announcing that a Federal agency has taken an action on a transportation project that is final under the Federal law pursuant to which the action was taken.

HDOT and FHWA intend to invoke the 150-day statute of limitations provision for this project.

A list of participating and cooperating agencies and their respective responsibilities can be found in **Section 2.0**. The project schedule, found in **Section 4.0**, lists the anticipated date and agency responsible for key milestones and decision-making. For more information on the Saddle Road Extension Project, please contact Ken Tatsuguchi, Engineering Program Manager, at (808) 587-1830, or Dean Yanagisawa, Project Manager, at (808) 587-1834.

CHAPTER 2: AGENCIES AND ROLES

2.1 Lead Agencies

The lead agencies must perform the functions that they have traditionally performed in preparing an EIS in accordance with 23 CFR Part 771 and 40 CFR Parts 1500-1508. In addition, the lead agencies now must identify and involve participating agencies; develop coordination plans; provide opportunities for public and participating agency involvement in defining the purpose and need and determining the range of alternatives; and collaborate with participating agencies in determining methodologies and the level of detail for the analysis of alternatives. In addition, lead agencies must provide increased oversight in managing the process and resolving issues.

2.1.1 Federal Highway Administration

The responsibilities of the Federal Highway Administration (FHWA) will be to:

- Ensure that the EIS required under NEPA is completed in accordance with SAFETEA-LU and applicable federal law;
- Provide oversight in managing the process and resolving issues;
- Facilitate the timely and adequate delivery of the environmental review process;
- Be responsible for the content of the EIS; furnish guidance, independently evaluate and approve documents, and ensure that project sponsors comply with mitigation commitments;
- Make the decision regarding the validity of the purpose and need used in the NEPA evaluation and range of alternatives to be evaluated in the NEPA document, in consultation with the joint lead agency, and after consideration of input from the public and participating agencies;
- Accept the identification of the Preferred Alternative;
- Decide, in consultation with the joint lead agency, whether to develop the Preferred Alternative to a higher level of detail before issuance of the DEIS; and
- Ensure that the project team follows the programmatic consultation agreement as currently adopted between FHWA and the USACE (NEPA-Section 404 Coordination) (see Appendix A)

2.1.2 Hawaiʻi Department of Transportation

The Hawaiʻi Department of Transportation (HDOT) is the project sponsor, joint lead agency for the NEPA process, and lead agency for the Hawaiʻi Chapter 343 process. The responsibilities of HDOT will be to:

- Prepare the DEIS and the Final EIS (FEIS);

And in conjunction with FHWA:

- Identify and involve participating and cooperating agencies;
- Develop coordination plans;
- Provide opportunities for public and participating agency involvement in defining the purpose and need and determining the range of alternatives;
- Use the scoping process to solicit public and agency input on methodologies for screening of alternatives;
- Collaborate with participating agencies in determining methodologies and the level of detail for the analysis of alternatives; and
- Provide information that will serve as a basis for public and participating agency input on key decisions that will be made by FHWA and HDOT.

2.2 Cooperating Agencies

According to CEQ (40 CFR 1508.5), "cooperating agency" means any federal agency, other than a lead agency, that has jurisdiction by law or special expertise with respect to any environmental impact involved in a proposed project or project alternative. A State or local agency of similar qualifications may, by agreement with the lead agencies, also become a cooperating agency.

The CEQ regulations (40 CFR Section 1501.6) permit a cooperating agency to "assume on request of the lead agency responsibility for developing information and preparing environmental analyses including portions of the environmental impact statement concerning which the cooperating agency has special expertise." An additional distinction is that, pursuant to 40 CFR 1506.3, "a cooperating agency may adopt without recirculating the environmental impact statement of a lead agency when, after an independent review of the statement, the cooperating agency concludes that its comments and suggestions have been satisfied."

Coordination pursuant to Section 404 of the Clean Water Act was accomplished prior to preparation of this CP. The US Army Corps of Engineers' (USACOE) has indicated in a letter dated May 22, 2012 that based on the report prepared and transmitted to them on February 8, 2012, staff field visits, and other information, it does not appear the proposed action would necessitate a Department of the Army standard individual permit under Section 404 of The Clean Water Act nor generate a need for the Corps to adopt the Final EIS. Accordingly, the provisions of the 1995 *National Environmental Policy Act* and <u>Clean Water Act Section 404 Integration Process for Surface Transportation Projects in the State of Hawai'i Memorandum of Understanding</u> have been fulfilled. The NEPA 404 Memorandum of Understanding (MOU) appears in full in **Appendix A**.

2.2.1 Responsibilities of Cooperating Agencies

The responsibilities of the Cooperating Agencies will be to:

- Assume (on request of the Lead Agency) responsibility for reviewing information and environmental analyses, including portions of the Environmental Impact Statement, concerning which the Cooperating Agency has special expertise;

- Participate in meetings and field reviews;
- Fulfill the responsibilities of the Participating Agencies (below);
- Make support staff available;
- Use their own resources and funds;
- Review preliminary drafts of the DEIS and FEIS; and
- Adopt the EIS of the lead agency, without re-circulation, when the cooperating agency concludes that its comments and suggestions have been satisfied.

If new information reveals the need to request another agency to serve as a Cooperating Agency, HDOT will issue that agency an invitation.

2.2.2 Agencies Invited to Participate as Cooperating Agencies

For this project, the primary criterion for selecting which agencies to invite to be "cooperating" agencies is to select those that may have permitting or approval authority, as indicated below.

Federal Agencies

- Department of Defense, Army Corps of Engineers, Regulatory Branch (Section 404, Clean Water Act);
- Department of the Interior, Fish and Wildlife Service;
- Department of Agriculture, Natural Resource Conservation Service;

2.3 Participating Agencies

A participating agency is a "federal, State, tribal, regional or local government agency that has an interest in the project and has agreed to participate in the NEPA and scoping processes." The standard for participating agency status is less encompassing than the standard for cooperating agency status described above. Therefore, cooperating agencies are, by definition, participating agencies, but not all participating agencies are cooperating agencies.

2.3.1 Responsibilities of Participating Agencies

The responsibilities of the Participating Agencies will be to:

- Provide input on the Saddle Road Extension Project and the schedule;
- Identify, as early as practicable, any issues of concern regarding the project's potential environmental or socioeconomic impacts or any issues that could substantially delay or prevent an agency from granting a permit or other approval needed for the project;
- Work cooperatively with HDOT to resolve any issues that could result in denial of any approvals for the project;
- Participate in the issues resolution process identified in this document;

- Provide input on purpose and need, range of alternatives, methodologies and level of detail to be used in the analysis of alternatives;
- Provide input on how the performance of alternatives will be evaluated or on how the impacts of alternatives on various resources will be assessed;
- Provide meaningful and timely input on unresolved issues; and
- Provide oral comment at the community meetings and public hearings described below, or written comments, within 30 days of the receipt of information and request for comment at each of the NEPA and Chapter 343 milestones discussed in this CP.

If, during the progress of the project, new information indicates that an agency not previously requested to be a Participating Agency does indeed have authority, jurisdiction, acknowledged expertise, or information relevant to the project, then HDOT, in consultation with FHWA, will promptly extend an invitation to that agency to be a Participating Agency. HDOT and FHWA will consider whether this new information affects previous decisions on the project.

2.3.2 Agencies Invited to Participate as Participating Agencies

Federal Agencies

- Department of the Interior, Office of Environmental Policy and Compliance;
- Environmental Protection Agency, Office of Federal Activities;
- Environmental Protection Agency, Region 9;
- Environmental Protection Agency, Pacific Islands Contact Office;
- Department of Homeland Security, Federal Emergency Management Agency; and
- Department of Energy, NEPA Policy and Compliance.

State of Hawai'i Agencies

- Department of Accounting and General Services;
- Department of Agriculture;
- Department of Business, Economic Development and Tourism, Office of Planning, Coastal Zone Management Program;
- Department of Education, Hawai'i District;
- Department of Health, Clean Water Branch;
- Department of Health, Environmental Planning Office;
- Department of Health, Solid and Hazardous Waste Branch;
- Department of Health, Indoor and Radiological Health Branch;
- Department of Health, Office of Environmental Quality Control;
- Department of Health, Hawai'i Island District Health Office;
- Department of Land and Natural Resources, Division of Aquatic Resources;
- Department of Land and Natural Resources, Division of Forestry and Wildlife;
- Department of Land and Natural Resources, Land Division;
- Department of Land and Natural Resources, Division of State Parks;
- Department of Land and Natural Resources, Hawai'i Island Burial Council;

- Department of Land and Natural Resources, Historic Preservation Division;
- Office of Hawaiian Affairs;
- University of Hawai'i, Environmental Center; and
- Hawaiʻi State Civil Defense.

County of Hawai'i Agencies

- Office of the Mayor;
- County Council;
- Department of Environmental Management;
- Planning Department;
- Department of Public Works;
- Department of Water Supply;
- Hawai'i Fire Department;
- Department of Parks and Recreation;
- Hawai'i Police Department;
- Hawai'i Civil Defense Agency;
- Department of Research and Development.

2.4 Agency Roles and Responsibilities

The agencies proposed for cooperating and participating agency status in this project and their associated roles and responsibilities are summarized in **Table 1**. Participating and cooperating agency roles are pending, subject to agency acceptance of the invitation to participate.

Table 1: Agencies, Roles and Responsibilities

Agency Name	Role	Responsibilities
United States (U.S.) Department of Transportation, Federal Highway Administration	Federal Lead Agency (NEPA)	Manage agency coordination process; prepare EIS; provide opportunity for public and participating/cooperating agency involvement.
Hawaiʻi Department of Transportation	State Lead Agency (Chapter 343)	Manage agency coordination process; prepare EIS; provide opportunity for public and participating/cooperating agency involvement.
U.S. Department of the Interior (DOI), Fish and Wildlife Service	Cooperating Agency	Provide comments on purpose and need, range of alternatives, and identify and resolve any issues of concern. Also improve efficiency and effectiveness of environmental review per Endangered Species Act and biological resources.
U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)	Cooperating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per the Farmland Protection Policy Act.
U.S. Army Corps of Engineers (USACOE), Regulatory Branch	Cooperating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per water resources.
State of Hawai'i, Department of Land and Natural Resources (DLNR), State Historic Preservation Division	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per Section 106 of the National Historic Preservation Act and HRS Chapter 6E.
State of Hawai'i, DLNR, Division of Forestry and Wildlife (DOFAW)	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per Chapter 195D, HRS Endangered Species Law, and approvals for use of Puʻuanahulu Game Management Area.
State of Hawai'i, Department of Business, Economic Development and Tourism (DBEDT), Office of Planning	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per Coastal Zone Management Act (federal consistency).
U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NMFS)	Participating Agency	Provide comments on purpose and need, range of alternatives, and identify and resolve any issues of concern. Also improve efficiency and effectiveness of environmental review per Endangered Species Act, Marine Mammal Protection Act, and biological resources.

Table 1, Agencies, Roles and Responsibilities, continued

Agency Name	Role	Responsibilities
U.S. DOI, Office of Environmental Policy and Compliance	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per environmental compliance.
U.S. Environmental Protection Agency (EPA)	Participating Agency	Provide comments and concur on: purpose and need, criteria for alternative selection, project alternative to be analyzed in the DEIS, and mitigation plan.
U.S. Department of Homeland Security, Federal Emergency Management Agency	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per hazard response and recovery.
U.S. Department of Energy, NEPA Policy and Compliance	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per NEPA procedures.
State of Hawai'i, Department of Accounting and General Services	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per State programs and activities.
State of Hawai'i, Department of Agriculture	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per agricultural and natural resources.
State of Hawai'i, DBEDT, Hawaiʻi Community Development Authority	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per community development.
State of Hawai'i, Department of Education, Hawai'i District	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per educational resources for Hilo District.
State of Hawai'i, Department of Health (DOH), Clean Water Branch	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per Clean Water Act Section 401, including National Pollutant Discharge Elimination System (NPDES) permit.
State of Hawai'i, DOH, Environmental Planning Office	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per environmental planning.
State of Hawai'i, DOH, Solid and Hazardous Waste Branch	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per solid and hazardous waste management.

Table 1, Agencies, Roles and Responsibilities, continued

Agency Name	Role	Responsibilities
State of Hawai'i, DOH, Indoor and Radiological Health Branch	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per noise and indoor air pollution.
State of Hawai'i, DOH, Office of Environmental Quality Control (OEQC)	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to the environment of the State and Chapter 343.
State of Hawai'i, DOH, Hawai'i Island District Health Office	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review for issues pertinent to Hawai'i County health.
State of Hawai'i, DLNR, Division of Aquatic Resources	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to aquatic resources.
State of Hawai'i, DLNR, Division of Forestry and Wildlife	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to the state's natural resources.
State of Hawai'i, DLNR, Land Division	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to State lands.
State of Hawai'i, DLNR, Division of State Parks	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to State Parks.
State of Hawai'i, DLNR, Hawai'i Island Burial Council	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review per burial requirements and procedures.
State of Hawai'i, Office of Hawaiian Affairs	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, pertinent to Hawaiian affairs.
State of Hawai'i, University of Hawai'i, Environmental Center	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review for issues pertinent to the University of Hawai'i.
State of Hawai'i, Hawai'i State Civil Defense	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to civil defense for the State.

Table 1, Agencies, Roles and Responsibilities, continued

Agency Name	Role	Responsibilities
County of Hawai'i, Office of the Mayor	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review for Hawai'i County issues.
County of Hawai'i, County Council	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review for Hawai'i County issues.
County of Hawai'i, Department of Environmental Management	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County sanitary and solid waste issues.
County of Hawai'i, Planning Dept.	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review for County planning, SMA requirements, and other planning concerns.
County of Hawai'i, Department of Public Works	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County public works and transportation.
County of Hawai'i, Department of Water Supply	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to water supplies.
County of Hawai'i, Hawai'i Fire Department	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County fire control.
County of Hawai'i, Department of Parks and Recreation	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County parks and recreation.
County of Hawai'i, Hawai'i Police Department	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County police services.
County of Hawai'i, Hawai'i Civil Defense Agency	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to civil defense for the County.

Table 1, Agencies, Roles and Responsibilities, continued

Agency Name	Role	Responsibilities
County of Hawai'i, Department of Research and Development	Participating Agency	Provide comments on purpose and need, range of alternatives, identify and resolve any issues of concern, and improve efficiency and effectiveness of environmental review pertinent to County economic development resources.

CHAPTER 3: COORDINATION PROCESS

3.1 Coordination Structure

Coordination will be an ongoing process with increased emphasis on the following decision milestones:

- Notice of Intent (NOI)
- Environmental Impact Statement Preparation Notice (EISPN) (already issued);
- Refinement of project purpose and need;
- Review of project alternatives;
- Collaboration on impact assessment methodologies;
- Completion of the DEIS and FEIS;
- Identification of the preferred alternative and the level of design detail;
- Agreement on least environmentally damaging practicable alternative (per NEPA/404 MOU);
- Completion of the FEIS;
- Completion of the Record of Decision (ROD); and
- Completion of permits, licenses, or approvals after the ROD.

Coordination will be completed in several ways depending on the needs at each individual step. The coordination will include meetings with participating agencies and the public, correspondence with individual agencies related to areas of their expertise, and distribution of preliminary documents to cooperating agencies for their review and comment. FHWA and HDOT will submit project documents by email whenever possible to minimize delay associated with transmitting hard copies.

3.2 Coordination Points

Table 2 below lists key coordination points, including which agency is responsible for activities during that coordination point, the information required at each coordination point, and who is responsible for transmitting that information.

Table 2: Coordination Points, Information Requirements and Agency Responsibilities

Coordination Point (see Notes)	Subject Matter for Coordination	Requesting Agency	Scope of Appropriate Response	Responding Agency
1. Invitation Letter to Agencies	Send Participating and Cooperating Agencies an invitation letter with pre-scoping information and the first version of this Coordination Plan	• HDOT • FHWA	Designate appropriate level of agency involvement depending on quality and quantity of resource involved	All participating and cooperating agencies
2. Notice of Intent (NOI)	NOI is published in Federal Register	• HDOT • FHWA	Comments on NOI	All participating and cooperating agencies and public
3. Environmental Impact Statement Preparation Notice (EISPN)/Purpose and Need	Provide agencies and public with draft purpose and need statement via the EISPN; invite agencies and public to public scoping meeting; hold scoping meeting	• HDOT	Comments on EISPN/purpose and need	All participating and cooperating agencies and public (already published)
4. Discuss alternatives being considered	Provide participating agencies and public with information regarding alternatives previously analyzed in 2001 Alternatives Analysis Report, and how existing alternatives relate to this.	• HDOT • FHWA	Comments on alternatives being carried forward for detailed study	All participating and cooperating agencies and public
5. Concurrence on Area of Potential Effect (APE), pursuant to Section 106	Area of potential project effect, from the perspective of historical resources	• HDOT • FHWA	Concurrence on APE	• State of Hawai'i, DLNR, State Historic Preservation Division
6. Request species list	Request threatened and endangered species list	• HDOT	Submit species list	• FWS • NMFS
7. Issue Draft Biological Assessment* (initiate consultation)	Impacts on threatened and endangered species	• HDOT • FHWA	Biological Opinion	• FWS • NMFS
8. Circulation of DEIS	Provide participating agencies and public with copy or location of DEIS; publish notice in OEQC Environmental Notice and Federal Register; hold public hearing	• HDOT • FHWA	Comments on DEIS	All participating and cooperating agencies and public
9. Identification of Preferred Alternative	Identification of the preferred alternative	• HDOT • FHWA	Comments on preferred alternative	All participating and cooperating agencies
10. Federal CZM Consistency	Request Federal Consistency Determination on Coastal Zone Management determination	• HDOT • FHWA	Federal Consistency Determination Letter	• State of Hawai'i, DBEDT, Office of Planning

Table 2, Coordination Points, Information Requirements and Agency Responsibilities, continued

Coordination Point (see Notes)	Subject Matter for Coordination	Requesting Agency	Scope of Appropriate Response	Responding Agency
11. Coordination on Section 106 mitigation, if any	Identify potential impacts to Section 106 resources	• HDOT • FHWA	Input to mitigation efforts, if any	• Office of Hawaiian Affairs • State of Hawai'i, DLNR, State Historic Preservation Division, Hawai'i Island Burial Council • Other consulting parties
12. Circulation of FEIS	Send participating agencies a copy of the FEIS; publish notice in newspaper, the OEQC Environmental Notice and Federal Register; invite agencies and public to public meeting	• HDOT • FHWA	Comments on FEIS	All participating and cooperating agencies and public
13. Issue ROD	Provide participating agencies and public with copy of ROD	• HDOT • FHWA	Comments on ROD	• FHWA
14. Determination of 404 compliance	(documentation previously submitted)	• HDOT • FHWA	Determination of compliance; public interest review/ determination	• USACOE
15. Issue Clean Water Act permits	(documentation previously submitted)	• HDOT • FHWA	NPDES Permit	• DOH, Clean Water Branch
16. Issue CZM permits	Permit applications	• HDOT • FHWA	SMA Permit (not anticipated to be required)	• County of Hawai'i, Planning Dept.

3.3 Coordination Schedule

Please note that the schedule shown below in **Table 3** is only a preliminary project schedule and is subject to change. HDOT commits to promptly updating agencies of any schedule deviations, so relevant parties may plan accordingly.

Table 3: Anticipated Dates of Coordination Points

Coordination Point (see Notes)	Anticipated Date of Submission to Cooperating/ Participating Agency	Requesting Agency	Responses Due to FHWA/HDOT	Responding Agency
1. Invitation Letter to Participating and Coordinating Agencies	April 4, 2013	• HDOT • FHWA	TBD (30 days upon receipt)	All participating and coordinating agencies
2. Notice of Intent (NOI)	(published in Federal Register) March 2014	• HDOT • FHWA	n/a	n/a
3. Environmental Impact Statement Preparation Notice (EISPN)/Purpose and Need	May 23, 2012	• HDOT • FHWA	June 25, 2013	Some participating and cooperating agencies and public
4. Discuss alternatives being considered	January 15, 2014	• HDOT • FHWA	(30 days upon receipt) February 20, 2013	All participating and cooperating agencies and public
5. Concurrence on Area of Potential Effect (APE), pursuant to Section 106	January 15, 2014	• HDOT • FHWA	(30 days upon receipt) February 20, 2013	• State of Hawai'i, DLNR, State Historic Preservation Division
6. Request species list	December 15, 2013	• HDOT	(30 days upon receipt) January 20, 2014	• FWS • NMFS
7. Circulation of DEIS	TBD (public hearing) December 2014	• HDOT • FHWA	(**45 days** after publication) May 8, 2014	All participating and cooperating agencies and public
8. Identification of Preferred Alternative	TBD	• HDOT • FHWA	(30 days upon receipt) June 5, 2014	All participating and cooperating agencies
9. Federal CZM Consistency	TBD	• HDOT • FHWA	TBD	• State of Hawai'i, DBEDT, Office of Planning
10. Coordination on Section 106 mitigation, if any	TBD	• HDOT • FHWA	TBD	• Office of Hawaiian Affairs • State of Hawai'i, DLNR, State Historic Preservation Division, Hawai'i Island Burial Council • Other consulting parties
11. Circulation of FEIS	Winter 2015	• HDOT • FHWA	(30 days after publication) August 23, 2014	All participating and cooperating agencies and public
12. Issue ROD	Spring 2015	• HDOT • FHWA	(30 days upon receipt) September 10, 2014	• FHWA

Table 3, Anticipated Dates of Coordination Points, continued

Coordination Point (see Notes)	Anticipated Date of Submission to Cooperating/ Participating Agency	Requesting Agency	Responses Due to FHWA/HDOT	Responding Agency
13. Determination of 404 compliance	June 8, 2012 (assuming build alternatives identified in existing alternatives analysis)	• HDOT • FHWA	July 6, 2012 (30 days upon receipt)	• USACOE
14. Issue Clean Water Act permits	TBD	• HDOT • FHWA	TBD	• USACOE, Regulatory Branch • DOH, Clean Water Branch
15. Issue CZM permits	TBD	• HDOT • FHWA	TBD	• County of Hawai'i, Planning Dept.

CHAPTER 4: ISSUE/DISPUTE RESOLUTION PROCESS

The Lead Agency, Cooperating Agencies, and the Participating Agencies shall work cooperatively in accordance with the procedures in 23 U.S.C. 139 to identify and resolve issues that could delay completion of the environmental review process, or could result in denial of any permits or approvals required for the project.

Based on information received from the Lead Agency, Participating and Cooperating Agencies shall identify, as early as practicable, any issues of concern regarding the project's potential environmental of socioeconomic impacts. Issues of concern include any issues that could substantially delay or prevent an agency from granting a permit of other approval that is needed for the project.

This project will adhere to both the MAP-21 and NEPA/404 processes. The following issue/dispute resolution process is proposed:

- Project level staff and mid-level managers from the signatory agencies or project sponsor shall meet informally as needed during the course of the NEPA process to discuss and resolve issues.
- If all normal and reasonable resolution options have been exhausted, and issues have not been resolved in a timely manner:

MAP-21 provides a formal process for resolving serious issues that may delay the proposed project or may result in denial of a required approval for the proposed project. HDOT or the Governor of Hawai'i may invoke the Section 6002 process for issue resolution at any time. However, the conflict resolution process discussed below should be considered the first option for issue resolution prior to invocation of Section 6002.

Table 4 lists the cooperating agency contact persons who would be involved in each step of the conflict resolution process for the project.

Should an issue come to an impasse, the general process for addressing and resolving the issue would be:

1. Involved parties will identify and agree on the issue to be resolved at the project manager level.
2. The manager at the area, district, or section level will initiate the conflict resolution process.
3. HDOT or FHWA will notify the cooperating agency manager at the regional or deputy level.
4. HDOT or FHWA will compile and submit all pertinent information to involved parties.
5. Involved parties will determine whether all information necessary for issue resolution has been received.

6. HDOT or FHWA will hold a formal meeting (involving the first three tiers of management) to resolve the issue, followed by a 30-day review/decision period.

7. A decision will be made, recorded, and passed on to the appropriate team members.

8. The process is completed.

If issue resolution does not occur, a discussion of the issue and why resolution could not be reached will be submitted to the heads (administrator, director, or commander) of the cooperating agencies for further review.

- Written documentation of both informal and formal resolution efforts will be distributed to all participating agencies by the agency initiating the issue/dispute resolution process.

Table 4: Cooperating agency conflict resolution matrix

Management Level	FHWA	State DOT, Highways Division	State DLNR, SHPD	State DLNR, DOFAW	State DBEDT, Office of Planning
Tier 1 Project Manager	Environmental Manager	Project Manager	Project Manager	Project Manager	Planner
Tier 2 Manager of Section	Engineering Manager	Section Head	Section Head	Section Head	CZM Program Mgr.
Tier 3 Manager of Branch	Program Director	Branch Chief	Branch Chief	Branch Chief	Planning Program Administrator
Tier 4 Administrator	Division Engineer	Highways Administrator	SHPD Administrator	DOFAW Administrator	Planning Director

CHAPTER 5: REVISION HISTORY

This section of the CP tracks revisions of the document.

Note: If the schedule is the only item that requires modification, concurrence on the schedule change is required only if the schedule is being shortened and then only from cooperating agencies, not all participating agencies.

Table 4: Document Versions

Version	Date	Name	Description
1	April 4, 2014	Draft (Version 1)	Initial draft Coordination Plan.

CHAPTER 6: AGENCY CONTACT INFORMATION

The table below presents the agency contacts for the completion of the EIS and issuance of a ROD for this project. This table will be revised/updated as the project moves forward and new information is revealed that may result in contact adjustments.

Table 5: Agency Contacts

Agency	Contact Person/Title	Phone	E-mail
United States (U.S.) Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division	Mike Will, Engineering Manager	(720) 963-3647	michael.will@dot.gov 12300 West Dakota Avenue, Lakewood, CO 80228.
United States (U.S.) Department of Transportation, Federal Highway Administration, Central Federal Lands Highway Division	Nicole Winterton, Environmental Manager	(720) 963-3689	nicole.winterton@dot.gov 12300 West Dakota Avenue, Lakewood, CO 80228
Hawaiʻi Department of Transportation	Ken Tatsuguchi, Project Manager	(808) 587-1830	ken.tatsuguchi@hawaii.gov Highways Division 869 Punchbowl Street Honolulu HI 96813
U.S. Army Corps of Engineers (USACOE), Regulatory Branch	George Young, Chief	(808) 438-9258	CEPOH-EC-R@usace.army.mil U.S. Army Eng. District, Bldg 230 Ft. Shafter HI 96858-5440
USACOE, Regulatory Branch	Susan Meyer , Regulatory Project Manager	(808)438-2137	susan.a.meyer@usace.army.mil U.S. Army Eng. District, Bldg 230 Ft. Shafter HI 96858-5440
U.S. Department of the Interior (DOI), Fish and Wildlife Service	Loyal Mehrhoff, Field Supervisor	(808) 792-9400	loyal_mehrhoff@fws.gov Pac. Islands Fish & Wildlife Off. USFWS Div. of Ecological Serv. P.O. Box 50088 Honolulu HI 96850

Agency	Contact Person/Title	Phone	E-mail
U.S. DOI, Fish and Wildlife Service	Tim Langer, Fish and Wildlife Biologist	(808) 792-9469	Tim.langer@fws.gov Pac. Islands Fish & Wildlife Off. USFWS Div. of Ecological Serv. P.O. Box 50088 Honolulu HI 96850
U.S. DOI, Fish and Wildlife Service	Mele Coleman, Program Analyst	(808) 792-9470	mele_coleman@fws.gov Pac. Islands Fish & Wildlife Off. USFWS Div. of Ecological Serv. P.O. Box 50088 Honolulu HI 96850
U.S. DOI, Office of Environmental Policy and Compliance	Patricia Port, Regional Environmental Officer	(415) 296-3350	patricia_port@ios.doi.gov U.S. Department of Interior, Office of Environmental Policy and Compliance San Francisco Region 333 Bush Street, Suite 515 San Francisco, CA 94104
U.S. Environmental Protection Agency	Kathleen Martyn Goforth, EPA-Region 9, Environmental Review Section Manager	(415) 972-3521	goforth.kathleen@epa.gov U.S. EPA, Region 9 Environmental Review Section, ENF 4-2 75 Hawthorne Street San Francisco, CA 94105
U.S. Environmental Protection Agency	Zac Appleton, EPA-Region 9, NEPA Reviewer	(415) 972-3321	appleton.zac@epa.gov U.S. EPA, Region 9 Environmental Review Section, ENF 4-2 75 Hawthorne Street San Francisco, CA 94105
U.S. Environmental Protection Agency	Jared Blumenfeld, EPA-Region 9, Regional Administrator	(415) 947-8702	Blumenfeld.jared@epa.gov U.S. EPA, Region 9 75 Hawthorne Street San Francisco, CA 94105
U.S. Environmental Protection Agency	Dean Higuchi, Pacific Islands Contact Office	(808) 541-2710	higuchi.dean@epa.gov Pacific Islands Contact Office U.S. EPA, Region 9 P.O. Box 50003 Honolulu, HI 96850

Agency	Contact Person/Title	Phone	E-mail
U.S. Department of Agriculture, Natural Resource Conservation Service	Lawrence Yamamoto, Director, Pacific Islands Area	(808) 541-2600 x107	larry.yamamoto@hi.usda.gov 300 Ala Moana Blvd., Room 4-118 Honolulu HI 96850
U.S. Department of Homeland Security, Federal Emergency Management Agency	Colby Stanton, Pacific Area Office	(808) 851-7900	colby.stanton@dhs.gov 546 Bonney Loop, Bldg 520 Fort Shafter, HI 96858-5000
U.S. Department of Energy; NEPA Policy and Compliance	Carol Borgstrom, Director	(202)586-4600	carol.borgstrom@hg.doe.gov Office of National Environmental Policy Act (NEPA) Policy and Compliance 1000 Independence Avenue, S.W. Washington, DC 20585
State of Hawai'i, Department of Accounting and General Services	Dean Seki, Comptroller	(808) 586-0400	dean.h.seki@hawaii.gov P. O. Box 119 Honolulu, HI 96810-0119
State of Hawai'i, Department of Agriculture	Scott Enright; Chairperson	(808) 973-9560	hdoa.info@hawaii.gov 1428 S. King Street Honolulu, HI 96814
State of Hawai'i, Department of Business, Economic Development and Tourism (DBEDT), Office of Planning	Leo Asuncion, Acting Director	(808) 587-2846	leo.asuncion@dbedt.hawaii.gov P.O. Box 2359 Honolulu, HI 96804-2359
State of Hawai'i, Department of Education	Art Souza; Complex Area Superintendent	(808) 327-4991	art_souza@notes.k12.hi.us 75-140 Hualalai Road Kailua-Kona, HI 96740
State of Hawai'i, Department of Education	Valerie Takata; Complex Area Superintendent	(808) 974-6600	valerie_takata@notes.k12.hi.us 75 Aupuni Street, Room 203 Hilo, HI 96720

Agency	Contact Person/Title	Phone	E-mail
State of Hawai'i, Department of Health (DOH), Clean Water Branch	Alec Wong, Branch Chief	(808) 586-4309	CleanWaterBranch@doh.hawaii.gov P.O. Box 3378 Honolulu HI 96801-3378
State of Hawai'i, DOH, Environmental Planning Office	Laura Leialoha McIntyre, Manager	(808) 586-4337	Laura.McIntyre@doh.hawaii.gov P.O. Box 3378 Honolulu HI 96801-3378
State of Hawai'i, DOH, Solid and Hazardous Waste Branch	Steven Chang, Chief	(808) 586-4226	steven.chang@doh.hawaii.gov P.O. Box 3378 Honolulu HI 96801-3378
State of Hawai'i, DOH, Indoor and Radiological Health Branch	Daryn Yamada, Noise Section Supervisor	(808) 586-4700	daryn.yamada@doh.hawaii.gov P.O. Box 3378 Honolulu HI 96801-3378
State of Hawai'i, DOH, Office of Environmental Quality Control	Jessica Wooley, Director	(808) 586-4185	jessica.wooley@doh.hawaii.gov 235 S. Beretania Street, Ste. 702 Honolulu, HI. 96813
State of Hawai'i, DOH, Hawai'i District Health Office	Aaron Ueno, District Health Officer	(808) 974-6006	aaron.ueno@doh.hawaii.gov 75 Aupuni Street #201 Hilo, HI 96720
State of Hawai'i, Department of Land and Natural Resources (DLNR), State Historic Preservation Division	Alan S. Downer, Administrator	(808) 692-8040	State Historic Preservation Division 601 Kamokila Blvd., Rm. 555 Kapolei HI 96707
State of Hawai'i, DLNR, Division of Aquatic Resources	Frazer McGilvray, Administrator	(808) 587-0100	DLNR.aaquatics@hawaii.gov 1151 Punchbowl Street, Rm 330 Honolulu, HI 96813
State of Hawai'i, DLNR, Division of Forestry and Wildlife	Lisa Hadway, Administrator	(808) 587-0166	Lisa.J.Hadway@hawaii.gov 1151 Punchbowl Street, Rm 325 Honolulu, HI 96813

Agency	Contact Person/Title	Phone	E-mail
State of Hawai'i, DLNR, Land Division	Russell Y. Tsuji, Administrator	(808) 587-0446	russell.y.tsuji@hawaii.gov 1151 Punchbowl Street, Rm 220 Honolulu, HI 96813
State of Hawai'i, DLNR, Division of State Parks	Dan Quinn	(808) 587-0287	no email available 1151 Punchbowl Street, Rm 310 Honolulu, HI 96813
State of Hawai'i, DLNR, Hawai'i Island Burial Council	Kimo Lee, Chair	(808) 966-9325	klee@whshipman.com c/o State Historic Preservation Division 601 Kamokila Blvd., Rm. 555 Kapolei HI 96707
State of Hawai'i, Office of Hawaiian Affairs	Kamana'opono Crabbe, CEO	(808) 594-1835	info@oha.org 711 Kapiolani Blvd., Suite 500 Honolulu HI 96813
State of Hawai'i, University of Hawai'i	Kevin Nishimura, Director, Water Resources Research Center	(808) 956-7847	kpnishim@hawaii.edu 2540 Dole Street Holmes Hall Room 283 Honolulu, HI 96822
State of Hawai'i, Department of Civil Defense	Doug Mayne; Vice Director	(808) 733-4300	askcivildefense@scd.hawaii.gov 3949 Diamond Head Road Honolulu, HI 96816-4495
County of Hawai'i, Office of the Mayor	William Kenoi, Mayor	(808) 961-8211	cohmayor@co.hawaii.hi.us 25 Aupuni Street Hilo, HI 96720
County of Hawai'i, Office of the County Clerk	, Stewart Maeda, County Clerk	(808) 961-8255	smaeda@co.hawaii.hi.us 25 Aupuni Street Hilo, HI 96720
County of Hawai'i, Department of Environmental Management	Bobby Jean Leithead-Todd, Director	(808) 961-8083	cohdem@co.hawaii.hi.us 345 Kekūanāoʻa St., Suite 41 Hilo, HI 96720
County of Hawai'i, Planning Department	, Duane Kanuha, Director	(808) 961-8288	planning@co.hawaii.hi.us 101 Pauahi Street, Suite 3 Hilo HI 96720
County of Hawai'i, Department of Public Works	Warren Lee, Director	(808) 961-8321	public_works@co.hawaii.hi.us 101 Pauahi Street, Suite 7 Hilo HI 96720

Agency	Contact Person/Title	Phone	E-mail
County of Hawai'i, Department of Water Supply	Quirino Antonio, Manager	(808) 961-8050	dws@hawaiidws.org 345 Kekuanaoa Street, Suite 20 Hilo HI 96720
County of Hawai'i, Hawai'i Fire Department	Darren Rosario; Fire Chief	(808) 932-2900	fire@co.hawaii.hi.us 25 Aupuni Street Hilo HI 96720
County of Hawai'i, Department of Parks and Recreation	Clayton Honma, Director	(808) 961-8311	parks_recreation@co.hawaii.hi.us 101 Pauahi Street, Suite 6 Hilo HI 96720
County of Hawai'i, Hawai'i Police Department	Harry Kubojiri, Police Chief	(808) 935-3311	copsysop@co.hawaii.hi.us 349 Kapiolani Street Hilo HI 96720
Hawai'i Civil Defense Agency	Daryl Oliveira, Administrator	(808) 935-0031	civil_defense@co.hawaii.hi.us 920 Ululani Street Hilo HI 96720
County of Hawai'i, Department of Research and Development	Laverne R. Omori, Director	(808) 323-4700	chresdev@co.hawaii.hi.us 25 Aupuni Street Hilo HI 96720

APPENDIX A

National Environmental Policy Act (NEPA)

Clean Water Act (CWA) Section 404

and

NEPA 404 Memorandum of Understanding (MOU)

U.S. Department of Transportation
Federal Highway Administration

Central Federal Lands Highway Division

12300 West Dakota Avenue
Suite 390
Lakewood, CO 80228-2583
Office: 720-963-3448
Fax: 720-963-3453
ricardo.suarez@dot.gov

April 4, 2014

In Reply Refer To:
HFL-16

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

RE: Invitation to Become Participating Agency and Cooperating Agency on Saddle Road Extension, Queen Ka'ahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawai'i Island, State of Hawai'i

Dear Ms. Mehrhoff:

The Hawai'i Department of Transportation (HDOT) and the Federal Highway Administration (FHWA) have re-initiated a planning process, including the preparation of an Environmental Impact Statement (EIS), for the Saddle Road Extension Project. The project limits are from the intersection of Queen Ka'ahumanu Highway and Waikoloa Beach Road at its western terminus, to the intersection of the realigned Saddle Road (SR 200) and Mamalahoa Highway at the eastern terminus (see attached Figure 1). This project involves addressing the linkage between Saddle Road between Mamalahoa Highway and Queen Ka'ahumanu Highway. As shown in Figure 1, the project study area extends in an east-west direction for approximately 10.5 miles. In summary, the purpose and need of the Saddle Road Extension project are to:

- Improve the efficiency and operational level of traffic movement between East and West Hawai'i, particularly for traffic on the realigned Saddle Road;
- Improve safety; and
- Support special needs of commercial truck traffic and military traffic.

Your agency has been identified as an agency that may have an interest in the project due to the potential presence of federally listed species and designated critical habitat in the project corridor. With this letter, we extend your agency an invitation to become a participating agency and cooperating agency with the FHWA in the development of the EIS for the subject project.

FHWA also requests the participation of the U.S. Fish and Wildlife Service as a cooperating agency in the preparation of the DEIS and FEIS, in accordance with 40 CFR 1501.6 of the Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provision of the National Environmental Policy Act.

Pursuant to 23 United States Code (U.S.C) section 139, participating agencies are responsible to identify, as early as practicable, any issues of concern regarding the project's potential environmental or socioeconomic impacts that could substantially delay or prevent an agency from granting a permit or other approval that is needed for the project. We suggest that your agency's role in the development of the above project should include the following as they relate to your area of expertise:

1. Provide meaningful and early input on defining the purpose and need, determining the range of alternatives to be considered, and the methodologies and level of detail required in the alternatives analysis.
2. Participate in coordination meetings and joint field reviews as appropriate.
3. Timely review and comment on the pre-draft or pre-final environmental documents to reflect the views and concerns of your agency on the adequacy of the document, alternatives considered, and the anticipated impacts and mitigation.

Please respond to FHWA in writing with an acceptance or denial of the invitation by **April 28, 2014**. If your agency declines, the response should state your reason for declining the invitation. Pursuant to 23 U.S.C. section 139, any Federal agency that chooses to decline the invitation to be a participating agency must specifically state in its response that it:

- Has no jurisdiction or authority with respect to the project;
- Has no expertise or information relevant to the project; and
- Does not intend to submit comments on the project.

If you have any questions or would like to discuss in more detail the project or our agencies' respective roles and responsibilities during the preparation of the Environmental Impact Statement, please contact Nicole Winterton, Environmental Protection Specialist, at (720) 963-3689, or at Nicole.Winterton@dot.gov.

Thank you for your cooperation and interest in this project.

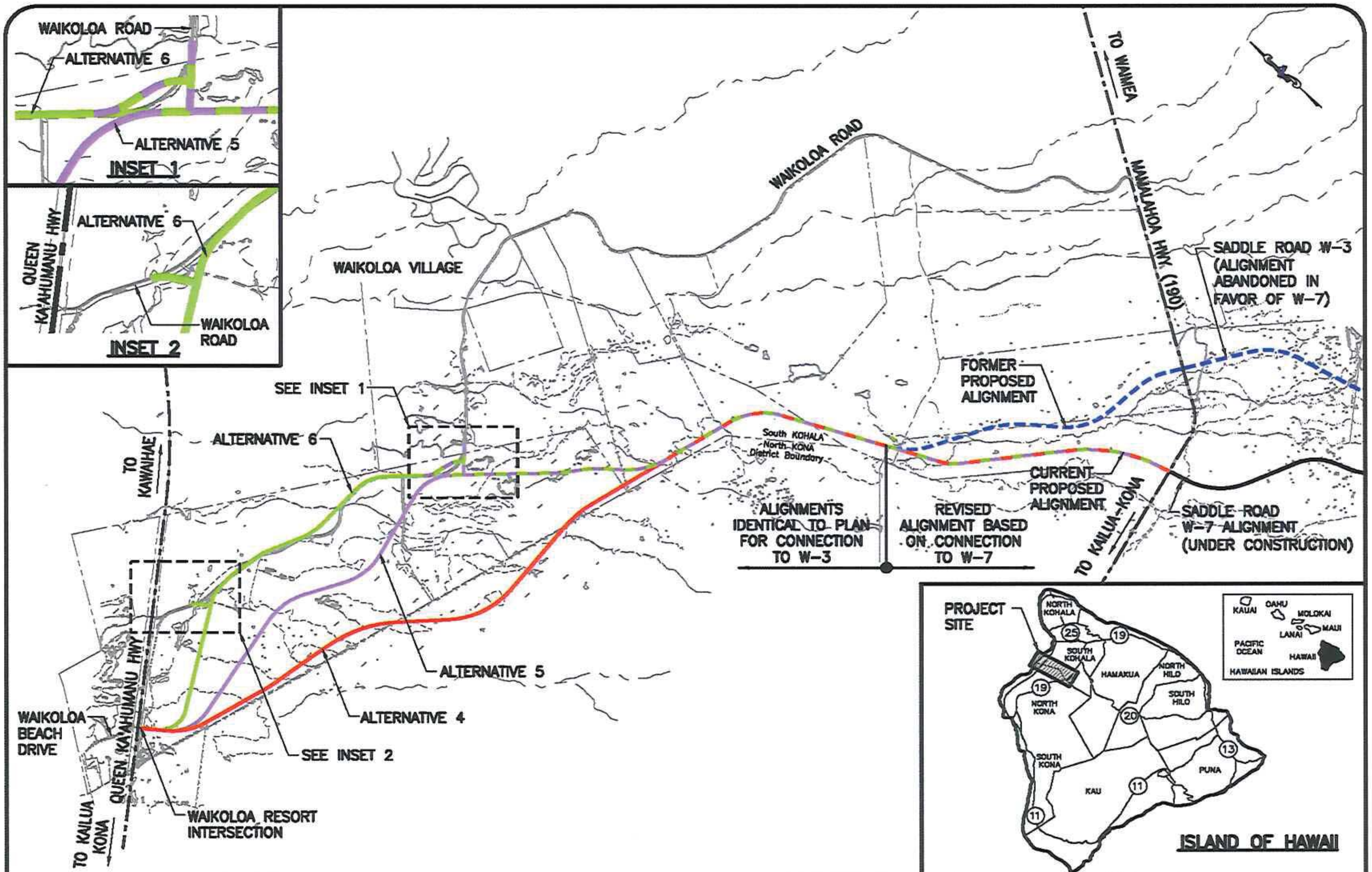
Sincerely,

Judy Salemonsen

Ricardo Suarez for
Division Engineer

Enclosure

cc: Tim Langer, Fish and Wildlife Biologist
Mele Coleman, Program Analyst



ALIGNMENT & ALTERNATIVES LOCATION MAP

SADDLE ROAD EXTENSION COORDINATION PLAN

FIGURE 1

DEPARTMENT OF THE ARMY
HONOLULU DISTRICT, US ARMY CORPS OF ENGINEERS
FT. SHAFTER, HAWAII 96858

April 28, 2014

Regulatory Office

Mr. Ricardo Suarez
Division Engineer
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 390
Lakewood, Colorado 80228-2583

Dear Mr. Suarez:

This is in response to your April 4, 2014 request for the U.S. Army Corps of Engineers (Corps) to be a participating and cooperating agency on the preparation of an Environmental Impact Statement (EIS) for the proposed Saddle Road Extension Project located in South Kohala on the Island of Hawaii, Hawaii. We have assigned Corps file number POH-2012-00038 to this action, which you should refer to in all future correspondence with our office on this project.

Your letter indicates Federal Highway Administration (FHWA) is working in partnership with the State of Hawaii, Department of Transportation (HDOT) on the development of the EIS pursuant to Hawaii Revised Statutes, Chapter 343 (HRS, Chapter 343) and the National Environmental Policy Act of 1969 (NEPA). The approximately 10.5-mile-long project is located between the intersection of Queen Kaahumanu Highway and Waikoloa Beach Road at its western terminus and the intersection of the realigned Saddle Road and Mamalahoa Highway at its eastern terminus. The proposed project would extend Saddle Road to provide a linkage between the Queen Kaahumanu and Mamalahoa highways for improved operational efficiencies, safety, and the support of commercial truck and military traffic in this east-west corridor.

Based on our May 22, 2012 approved jurisdictional determination (JD) letter addressed to Glenn M. Okimoto of HDOT, no jurisdictional waters of the United States occur in the proposed project site (i.e., within the JD review area), as depicted on the *Saddle Road Extension Project Alignment and Alternatives Location Map* (undated) provided to us in your April 4, 2014 correspondence and in HDOT's January 2012 *Report of Waters of the U.S. Within the Proposed Saddle Road Extension Alternative Corridors* document (Geometrician, 2012). Therefore, no Department of the Army (DA) permit would be required for the implementation of the proposed project, or its alternatives, as currently proposed. However, should new alternatives be proposed or existing alternatives be substantially modified through the HRS, Chapter 343 and/or NEPA environmental review processes such that areas outside our original JD review area would be affected, a new or supplemental JD would be required to determine whether waters of the United States are present.

Notwithstanding our current lack of geographic jurisdiction, I accept your invitation to be a cooperating agency in accordance with the Council on Environmental Quality Regulations on Implementing NEPA Procedures at 40 CFR 1501.6. If circumstances should change that would warrant the need for a DA permit, our involvement as a cooperating agency would be commensurate with the scope and intensity of impacts to waters of the United States.

I look forward to our office engaging in FHWA's NEPA process, as appropriate. If you have any questions, please contact Susan A. Meyer at (808) 835-4599 or at susan.a.meyer@usace.army.mil.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Office

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

APR 18 2014

Ricardo Suarez, Division Engineer
Federal Highway Administration
Central Federal Lands Highway Division.
12300 West Dakota Avenue, Lakewood, CO 80228

Re: Scoping Comments and Invitation to Become a Participating Agency and Comments for the proposed Saddle Road Extension, Queen Ka'ahumanu Highway to Mamalahoa Highway, Hawaii County, Hawaii

Dear Mr. Suarez:

The United States Environmental Protection Agency (EPA) has reviewed the Federal Register Revised Notice of Intent (NOI) published on March 18, 2014 regarding the Federal Highway Administration's (FHWA) decision to prepare an Environmental Impact Statement (EIS) for the proposed Saddle Road Extension project in Hawaii County, Hawaii. As described in the NOI, the proposed action is intended to add inter-regional capacity by connecting the east and west regions on the island of Hawaii, improving general traffic movement and supporting the unique modal needs of commercial and military transportation uses along this corridor. Our comments at this stage are provided to assist in preparation of the Draft EIS (DEIS) and are pursuant to National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508) and Section 309 of the Clean Air Act. Please disregard our letter dated March 27th, 2014, and apply our comments in this letter to the preparation of the DEIS for the proposed project.

Additionally, FHWA requested that EPA become a Participating Agency for the Saddle Road Extension project (April 4th, 2014 letter). EPA accepts FHWA's invitation to become a Participating Agency, as defined in MAP-21. As a Participating Agency, EPA will provide comments on the Purpose and Need, Range of Alternatives, DEIS, and at other milestones where we believe we can contribute to avoidance and minimization of potential impacts to resources during the development of the DEIS. We look forward to working with FHWA to ensure that our early coordination assists both of our agencies in meeting our statutory missions. EPA's status as a Participating Agency does not constitute formal or informal approval of any part of this project under any statute administered by EPA, nor does it limit in any way EPA's independent review of the Draft and Final EISs pursuant to Section 309 of the Clean Air Act.

<u>Purpose and Need</u>

Fifteen years have elapsed since the last purpose and need were defined for the proposed Saddle Road Extension project. The revised purpose and need should clearly identify the basis for proposing the current range of alternatives (40 CFR 1502.13) and concisely identify why the project is being proposed. The purpose and need statement should focus on the desired outcomes of the project (e.g. improve regional mobility) rather than prescribing a predetermined solution (e.g. provide new fully access-controlled facility). Specifically, the need for the proposed improvements must be articulated and justified with consideration of the existing and planned facilities in the area, and should clarify the urgency of action and consequences if the problem is not addressed at this time.

Scope of Analysis/Connected Actions

The EIS should address this project in the context of connected actions (40 CFR §1508.25). If the proposed highway project is triggered by other projects in the corridor, if one project cannot proceed without another, or if they are, collectively, interdependent parts of a larger action, then these other projects should be discussed within the scope of this EIS.

Aquatic Resources

Following conversations with staff, no impacts to jurisdictional Waters of the United States are anticipated. Should that determination change, EPA recommends engaging in the NEPA/Clean Water Act Section 404 coordinated review process to identify and address issues early. Though the proposed project area is on the Leeward side of Hawaii Island on a bed of cooled lava, EPA recognizes stormwater runoff from construction sites as a major source of degradation to coastal ecosystems generally, and supports early planning for rare extreme weather like the one that overwhelmed stormwater controls on the Leeward side of Oahu in 2011. Given the project's connection to the coastal highway, the DEIS should specifically address all techniques proposed for minimizing erosion and contamination of sensitive coastal resources due to increased runoff from both the temporary construction of new roads and the permanent change in runoff from additional highway surfaces.

Biological Resources

The EIS should identify all petitioned and listed threatened and endangered species and critical habitat that might occur within the project area. This section should preliminarily assess which species or critical habitat might be directly or indirectly affected by each alternative. We recommend that the EIS identify the time line and procedures FHWA intends to follow to fulfill its obligation under Section 7 of the Endangered Species Act. The EIS should describe efforts to avoid and/or minimize impacts to species and their associated habitats. In addition to coordination with the US Fish and Wildlife Service, EPA encourages FHWA, in accordance with Executive Order 13112 on Invasive Species, also coordinate with the Hawaii Invasive Species Council to adopt relevant best management practices to minimize the spread of invasive species and use native plant and tree species where revegetation is planned.

Air Quality

The proposed project intends to facilitate east-west commercial traffic on the Island of Hawai'i that could generate congestion hotspots leading into Kailua Kona. EPA therefore encourages FHWA to prepare a traffic study for the EIS that estimates future traffic, potential congestion hot spots, associated localized air pollution and sensitive receptors, and possible mitigation.

Environmental Justice

The EIS should, in accordance with Executive Order 12898, identify whether the proposed project alternatives may disproportionately and adversely affect low income, or minority populations such as Native Hawaiians, in connection to the proposed project and provide appropriate mitigation measures for any adverse impacts (40 CFR 1508.20). The EIS should clearly document the process used for community involvement and communication, including all measures to specifically reach out to potential environmental justice communities, and analyze results achieved by reaching out to these populations. Additional guidance can be found from the Council on Environmental Quality regarding how to address Environmental Justice in the environmental review process (http://ceq.hss.doe.gov/nepa/regs/ej/justice.pdf), and from the State of Hawaii Environmental Council on definitions and context for Native Hawaiians (http://oeqc.doh.hawaii.gov/Shared%20Documents/Misc_Documents/2008_Hawaii_Environmental_Justice_Report.pdf).

Please send one hard copy and one cd of the Draft EIS (DEIS), ATTN: Carol Sachs, Mail Code ENF-4-2, to the address above at the same time it is electronically filed. If you have any questions, please call me at (415) 972-3321.

Sincerely,

Zac Appleton
Environmental Review Section

cc: Nicole Winterton, FHWA Central Federal Lands Highway Office
Meesa Otani, FHWA Hawaii Federal-Aid Division Office
George Young, US Army Corps of Engineers
Ken Tatsuguchi, Hawaii Department of Transportation

From: Santos, Nathalie [mailto:parks_recreation@co.hawaii.hi.us]
Sent: Friday, April 25, 2014 12:32 PM
To: Winterton, Nicole (FHWA)
Cc: chonma@co.hawaii.hi.us; JKOMATA@co.hawaii.hi.us
Subject: US DOT - Invitation To Become A Participant To Develop Saddle Road Project

Hi Nicole,

P&R Director Clayton Honma would like to thank the Department of Transportation for considering P&R to be a part of this important process to plan the Saddle Road Extension Project, however, because of the many large projects our planning staff is managing throughout the island, we are unable to participate.

Thank you for your understanding.

Aloha,

Nat

Nathalie Santos
Secretary to the Director
Department of Parks and Recreation
County of Hawaiʻi
101 Pauahi Street, Suite 6
Hilo, HI 96720
Ph# 808-961-8561
Fax# 808-961-8411

William P. Kenoi
Mayor

Walter K.M. Lau
Managing Director

Darryl J. Oliveira
Civil Defense Administrator

County of Hawaii
CIVIL DEFENSE AGENCY

920 Ululani Street • Hilo, Hawai'i 96720-3958
(808) 935-0031 • Fax (808) 935-6460

April 25, 2014

U.S. Department of Transportation
Federal Highway Administration
12300 West Dakota Ave. Suite 390
Lakewood, CO 80228-2583

RE: Invitation to Become Participating Agency on Saddle Road Extension, Project No. DP-HI-0200(5).

To Whom It May Concern,

I would like to submit this letter of acceptance to become a participating agency in the aforementioned project EIS development process. I look forward to the opportunity to share agency input and perspectives on this project and to receiving confirmation of agency acceptance.

Sincerely,

Darryl Oliveira, Administrator
Hawaii County Civil Defense

From:	Henry, Sharron
To:	Winterton, Nicole (FHWA)
Cc:	Bobby Jean
Subject:	HFL-16 Saddle Road Extension Project DP-HI-0200(5)
Date:	Wednesday, April 30, 2014 1:03:15 PM
Attachments:	04-07-14 HFL-16 USDOT Invite to participate on Saddle Road Extension, Proj DP-HI-0200(5).pdf

Our Department is unable to participate as a reviewing agency as we have no jurisdiction or authority with respect the project. Our Director notes that either Planning or Department of Public Works would be appropriate agencies for this project.

Sharron Henry
Private Secretary to the Director
County of Hawai`i
Department of Environmental Management
345 Kekūanāoʻa Street, Suite 41
Hilo, HI 96720
Phone: 808.961.8083
Fax: 808.961.8086
Email: shenry@co.hawaii.hi.us
cohdem@co.hawaii.hi.us
http://www.hawaiicounty.gov/environmental-management
Hawai`i County is an equal opportunity provider and employer

William P. Kenoi
Mayor

Darren J. Rosario
Fire Chief

Renwick J. Victorino
Deputy Fire Chief

County of Hawai'i
HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Room 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

April 28, 2014

Mr. Ricardo Suarez
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue
Suite 390
Lakewood, CO 80228-2583

RE: Invitation to Become Participating Agency on Saddle Road Extension, Queen Ka`ahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawai'i Island, State of Hawaii

Dear Mr. Suarez,

In reference to the above project, we thank you for including our Department and accept your invitation to become a participating agency.

DARREN J. ROSARIO
Fire Chief

KT:lpc

From:	Ley, Rachelle
To:	Winterton, Nicole (FHWA); Suarez, Ricardo (FHWA)
Cc:	Surprenant, April
Subject:	Participating Agency Response - Project No. DP-HI-0200(5)
Date:	Friday, April 11, 2014 1:22:16 PM
Attachments:	COR-14-090991.tif

To Whom it May Concern:

The County of Hawai`i Planning Department is in receipt of your letter dated April 4, 2014 regarding an invitation to become a participating agency on the Saddle Road Extension, Queen Ka'ahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawai'i Island, State of Hawai'i. Pursuant to your request to respond with an acceptance or denial of this intimation, the Planning Department accepts the invitation and will be a participating agency.

If you have any questions or concerns, please contact us at 961-8288 or the address below.

Mahalo,

Rachelle Ley
Private Secretary to Planning Director Duane Kanuha
County of Hawai'i Planning Department
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone: (808) 961-8125
Fax: (808) 961-8742
Email: rley@co.hawaii.hi.us

Hawai'i County is an Equal Opportunity Provider and Employer

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAI'I
345 KEKŪANAŌ'A STREET, SUITE 20 • HILO, HAWAI'I 96720
TELEPHONE (808) 961-8050 • FAX (808) 961-8657

April 28, 2014

Mr. Ricardo Suarez
Design Engineer
Federal Highway Administration
12300 West Dakota Avenue, Suite 390
Lakewood, CO 80228-2583

INVITATION TO BECOME PARTICIPATING AGENCY ON SADDLE ROAD EXTENSION, QUEEN KA'AHUMANU HIGHWAY TO MAMALAHOA HIGHWAY, PROJECT NO. DP-HI-0200(5) HAWAI'I ISLAND, STATE OF HAWAI'I

The Department of Water Supply (DWS) respectfully declines the invitation to become a participating agency due to the fact the DWS does not have any water system facilities in the general area of the project.

Sincerely yours,

Quirino Antonio, Jr., P.E.
Manager-Chief Engineer

LB:dmj

. . .Water, Our Most Precious Resource . . . Ka Wai A Kāne . . .

NEIL ABERCROMBIE
GOVERNOR

KATHRYN S. MATAYOSHI
SUPERINTENDENT

STATE OF HAWAI`I

DEPARTMENT OF EDUCATION

P.O. BOX 2360

HONOLULU, HAWAI`I 96804

OFFICE OF SCHOOL FACILITIES AND SUPPORT SERVICES

April 28, 2014

Mr. Ricardo Suarez, Division Engineer
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highways Division
12300 West Dakota Avenue, Suite 390
Lakewood, CO 80228-2583

Dear Mr. Suarez:

Subject: **Request to Become Participating Agency on Saddle Road Extension, Queen Ka'ahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawai'i Island, State of Hawai`i**

The Hawai'i Department of Education (DOE) is in receipt of your letter dated April 4, 2014, addressed to Ms. Valerie Takata, Complex Area Superintendent. DOE has a keen interest in the Saddle Road Extension Project and would like to become a participating agency with the FHWA in the development of its EIS.

Please address all formal correspondences to the following address:

Ms. Kathryn S. Matayoshi, Superintendent
Department of Education
State of Hawaii
P.O. Box 2360
Honolulu, Hawaii 96804

Should you have any questions, please contact Roy Ikeda, Land Use Planner at (808) 377-8301 or at Roy_Ikeda@notes.k12.hi.us.

Sincerely,

Raymond F. L'Heureux
Assistant Superintendent

RFL:jmb

c: Valerie Takata, CAS, Hilo/Waiakea Complex Areas

AN AFFIRMATIVE ACTION AND EQUAL OPPORTUNITY EMPLOYER

NEIL ABERCROMBIE
GOVERNOR

MAJOR GENERAL DARRYLL D. M. WONG
DIRECTOR OF CIVIL DEFENSE

DOUG MAYNE
VICE DIRECTOR OF CIVIL DEFENSE

PHONE (808) 733-4300
FAX (808) 733-4287

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE
3949 DIAMOND HEAD ROAD
HONOLULU, HAWAII 96816-4495

April 23, 2014

Mr. Ricardo Sanchez
Division Engineer
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 390
Lakewood, Colorado 80228

Dear Mr. Sanchez:

Invitation to Become Participating Agency on Saddle Road Extension
Queen Ka'ahumanu Highway to Mamalahoa Highway
Project No. DP-HI-0200(5), Hawai`i Island, State of Hawai`i.

Thank you for the opportunity to participate in the above project. I have selected Mr. Ian Duncan, State Hazard Mitigation Officer, as the State Civil Defense representative for this project.

Please coordinate directly with Mr. Duncan at (808) 733-4300, extension 555, or email IDuncan@scd.hawaii.gov .

Sincerely,

DOUG MAYNE
Vice Director of Civil Defense

Enc.

NEIL ABERCROMBIE
GOVERNOR

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 916
HILO, HAWAII 96721-0916

MEMORANDUM

DATE: April 22, 2014

TO: Ricardo Suarez
Federal Highway Administration, Division Engineer

FROM: Newton Inouye
District Environmental Health Program Chief

SUBJECT: Invitation to Become Participating Agency on Saddle Road Extension, Queen Ka'ahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawai'i Island, State of Hawai'i

Construction activities must comply with the provisions of Hawaii Administrative Rules, Chapter 11-46, "Community Noise Control."

1. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules.

2. Construction equipment and on-site vehicles requiring an exhaust of gas or air must be equipped with mufflers.

3. The contractor must comply with the requirements pertaining to construction activities as specified in the rules and the conditions issued with the permit.

Should there be any questions on this matter, please contact the Department of Health at 933-0917.

c: EPO

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

LINDA ROSEN, M.D., M.P.H.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P. O. BOX 3378
HONOLULU, HI 96801-3378

In reply, please refer to:
EMD/CWB

04039PST.14

April 17, 2014

Mr. Ricardo Suarez
Division Engineer
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 390
Lakewood, Colorado 80228-2583

Dear Mr. Suarez:

SUBJECT: Invitation to Become Participating Agency on Saddle Road Extension, Queen Kaahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5) Between North Kona and South Kohala, Island of Hawaii, Hawaii

The Department of Health (DOH), Clean Water Branch (CWB), accepts your invitation to become a participating agency for the subject project. The DOH-CWB will review and comment on the pre-draft or pre-final environmental documents.

If you have any questions, please visit our website at: http://health.hawaii.gov/cwb, or contact the Engineering Section, CWB, at (808) 586-4309.

Sincerely,

Alec Wong

ALEC WONG, P.E., CHIEF
Clean Water Branch

ST:np

OFFICE OF PLANNING
STATE OF HAWAII

235 South Beretania Street, 6th Floor, Honolulu, Hawaii 96813
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

NEIL ABERCROMBIE
GOVERNOR

LEO R. ASUNCION
ACTING DIRECTOR
OFFICE OF PLANNING

Telephone: (808) 587-2846
Fax: (808) 587-2824
Web: http://planning.hawaii.gov/

Ref. No. P-14353

April 23, 2014

Mr. Ricardo Suarez
U.S. Department of Transportation
Federal Highway Administration
Central Federal Lands Highway Division
12300 West Dakota Avenue, Suite 390
Lakewood, Colorado 80228-2583

Dear Mr. Suarez:

Subject: Invitation to Become Participating Agency on Saddle Road Extension, Queen Kaahumanu Highway to Mamalahoa Highway, Project No. DP-HI-0200(5), Hawaii Island, State of Hawaii

Thank you for the invitation to become a participating agency in the Saddle Road extension project, as noted in your letter of April 4, 2014, reference number HFL-16.

Although the Office of Planning has interest in this project, we respectfully decline the offer to become a participating agency involved in the planning and preparation of the Environmental Impact Statement (EIS). The Office of Planning is a state coordinating agency and this project is outside our authority. However, our office will review the Draft and Final EIS document for such items as compatibility with the policies and objectives of the Coastal Zone Management Act, federal consistency compliance due to use of Federal Highway funding, and suitability of the project's use of land within the State of Hawaii.

If you have any questions regarding our response to your invitation, please contact Josh Hekekia at (808) 587-2845.

Sincerely,

Leo R. Asuncion
Acting Director

Department of Energy

Washington, DC 20585

April 25, 2014

Mr. Ricardo Suarez
Division Engineer
Central Federal Lands Highway Division
Federal Highway Administration
U.S. Department of Transportation
12300 West Dakota Avenue, Suite 390
Lakewood, CO 80228-2583

Regarding: HFL-16

Dear Mr. Suarez:

I am responding to your April 4, 2014, letter inviting the U.S. Department of Energy to be a participating agency in preparing an environmental impact statement for the proposed Saddle Road Extension Project on Hawaii Island.

Thank you for your interest in the Department of Energy's participation. We decline this invitation because the Department (1) has no jurisdiction or authority with respect to the project, (2) has no expertise or information relevant to the project, and (3) does not intend to submit comments on the project.

Please direct any questions to me at 202-586-4600.

Sincerely,

Carol Borgstrom

Carol Borgstrom
Director
Office of NEPA Policy and Compliance

OUTCOME OF INVITATIONS TO PARTICIPATE OR COOPERATE IN COORDINATION PLAN, 5/8/14

Agency	Cooperating/Participating Agency Accept or Decline	Letter Recipient
U.S. DOI Office of Environmental Policy and Compliance	No response	Patricia Port, Reg. Env Officer
U.S. Environmental Protection Agency, Region 9	**Participating Accept**	
USDA, Natural Resources Conservation Service	No response	Lawrence Yamamoto
U.S. Department of Energy, NEPA Policy and Compliance	Participating Decline	Carol Bergstrom
State of Hawaii DBEDT, Office of Planning	Participating Decline	Leo Asuncion
State of Hawaii Dept of Agriculture	No response	Scott Enright
State of Hawaii Dept of Education	**Participating Accept**	Valerie Takata
State of Hawaii Dept of Health Clean Water Branch	**Participating Accept**	Alec Wong
State of Hawaii Dept of Health Solid & Hazardous Waste Branch	Participating Decline (via voicemail msg)	Steven Chang
State of Hawaii Dept of Health Indoor & Radiological Health Branch	No response	Daryn Yamada
State of Hawaii Dept of Health Hawai'I District Office	No response	Aaron Ueno
State of Hawaii, DLNR SHPD	No response	Alan Downer
State of Hawaii, Dept of Accounting & General Services	No response	Dean Seki
State of Hawaii, Dept of Health Environmental Planning Office	No response	Laura Leialoha McIntyre
State of Hawaii, DLNR Division of Forestry and Wildlife	No response	Lisa Hadway
State of Hawaii, DLNR Land Division	No response	Russell Y. Tsuji
State of Hawaii, DLNR Hawaii Island Burial Council	No response	Kimo Lee, Chair
State of Hawaii Office of Hawaiian Affairs	No response	Kamana `opono Crabbe, CEO
State of Hawaii Dept of Civil Defense	**Participating Accept**	Doug Mayne
County of Hawaii Office of the Mayor	No response	William Kenoi, Mayor
County of Hawaii Dept of Environmental Management	Participating Decline	Booby Jean Leithead-Todd, Director
County of Hawaii Planning Department	**Participating Accept**	Duane Kanuha, Director
State of Hawaii Dept of Health, Office of Environmental Quality Control	Letter returned, re-sent and provided extension	Jessica Wooley, Director
State of Hawaii DLNR, Division of State Parks	No response	Dan Quinn

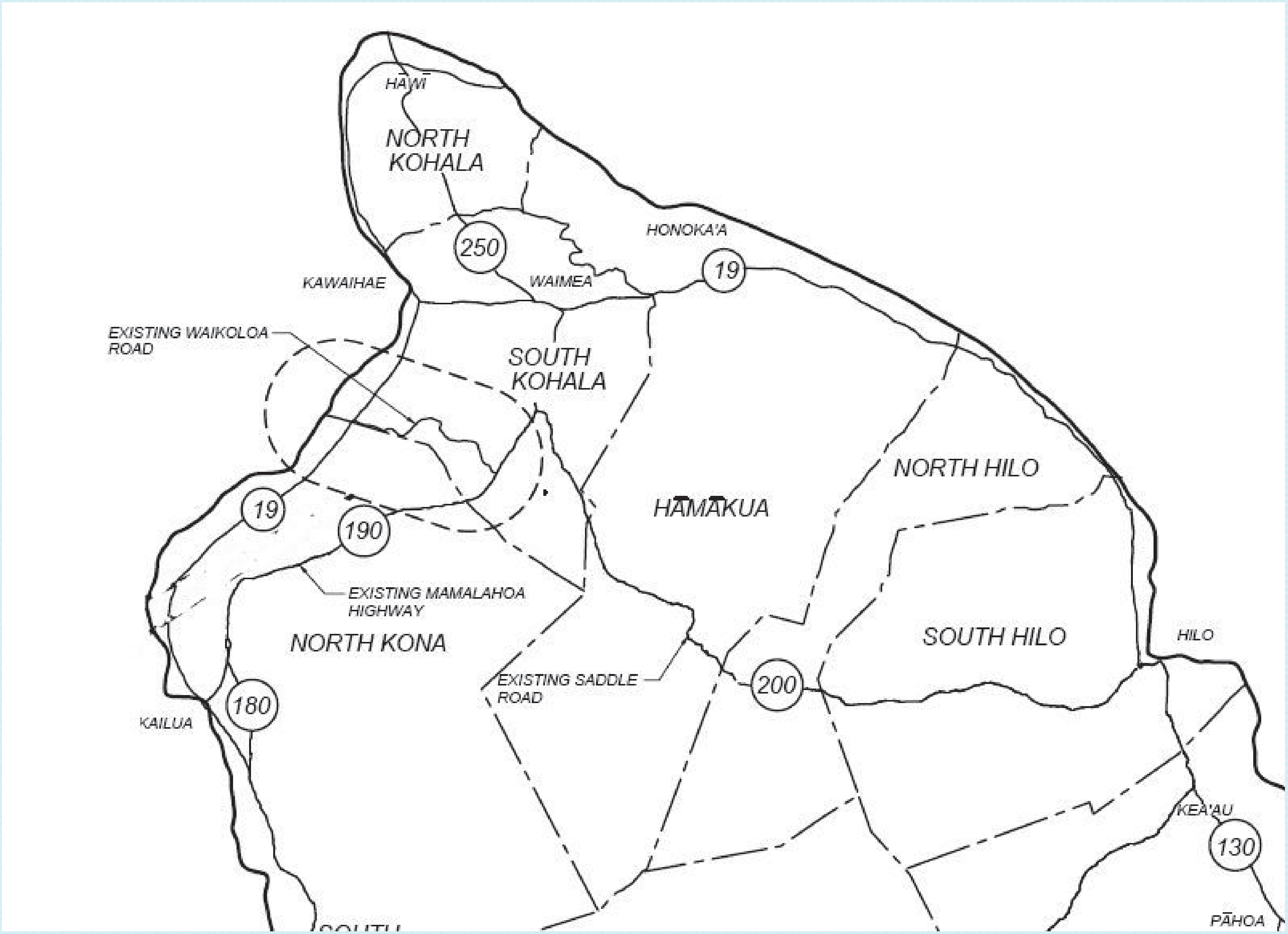
State of Hawaii DLNR, Division of Aquatic Resources	No response	Frazer McGilvray, Administrator
State of Hawaii, University of Hawaii, Water Resources Research Center	No response	Kevin Nishimura
County of Hawaii, Office of County Clerk	No response	Stewart Maeda
U.S. Army Corps of Engineers, Honolulu District	**Cooperating Accept**	George Young, Chief
County of Hawaii Dept of Public Works	No response	Warren Lee, Director
County of Hawaii Dept of Water Supply	Participating Decline	Quirino Antonio
County of Hawaii Fire Department	**Participating Accept**	Darren Rosario
County of Hawaii Police Department	**Participating Accept**	Harry Kubojiri, Police Chief
County of Hawaii Civil Defense Agency	**Participating Accept**	Daryl Oliveira
U.S. Dept of Homeland Security, FEMA	No response	Colby Stanton
U.S. Fish and Wildlife Service, Pacific Islands Office	No response	Loyal Mehrhoff, Field Supervisor
County of Hawaii, Dept of Parks and Recreation	No response	Clayton Honma
County of Hawaii Dept of Research and Development	No response	Laverne R. Omori, Director

Saddle Road Extension

State of Hawai‘i

Department of Transportation

Project Location NEW MAP



Project Needs

- Need for motor vehicle capacity between Mamalahoa Highway and Queen Ka`ahumanu Highway
- Need for direct route between Saddle Road terminus and Queen Ka`ahumanu Highway
- Need for appropriate route for commercial and military traffic

Project Purpose

- Improve the efficiency and operational level of traffic movement between East Hawai‘i and West Hawai‘i, particularly for traffic on the realigned Saddle Road;
- Improve safety; and
- Support special needs of commercial truck traffic and military traffic.

Project History

- Saddle Road Extension (SRX) EIS begun in 1999
- EISPN published in 1999
- Alternatives Study completed 2000
- Fieldwork conducted for archaeology and biology for three corridors 2001 - 2003
- U.S. Army started EIS for *Stryker Brigade Combat Team* in 2003
- Saddle Road Extension EIS put on hold in 2004
- *Stryker Brigade Combat Team* EIS completed in 2008, Army requested that Saddle Road alignment be shifted south
- Saddle Road Supplemental EIS with revised terminus (W-7) begun in 2009 and completed in 2010
- SRX project resumed in late 2011
- Revised SRX EISPN published in 2012
- Revised Alternatives Study completed in 2013
- Additional archaeological and biological fieldwork for revised corridor completed in 2013
- NEPA Coordination Plan process started in 2013
- Revised Notice of Intent in Federal Register in March 2014

Environmental Review Process
Agency Roles

Lead Agencies (Federal / non-Federal)

- Essential responsibility in preparing the EIS
- Manage environmental review and issue resolution process

Cooperating Agencies (Federal Jurisdiction / Expertise)

- May assume responsibility for preparing analyses based on expertise
- May adopt the EIS without recirculation

Environmental Review Process
Agency Roles

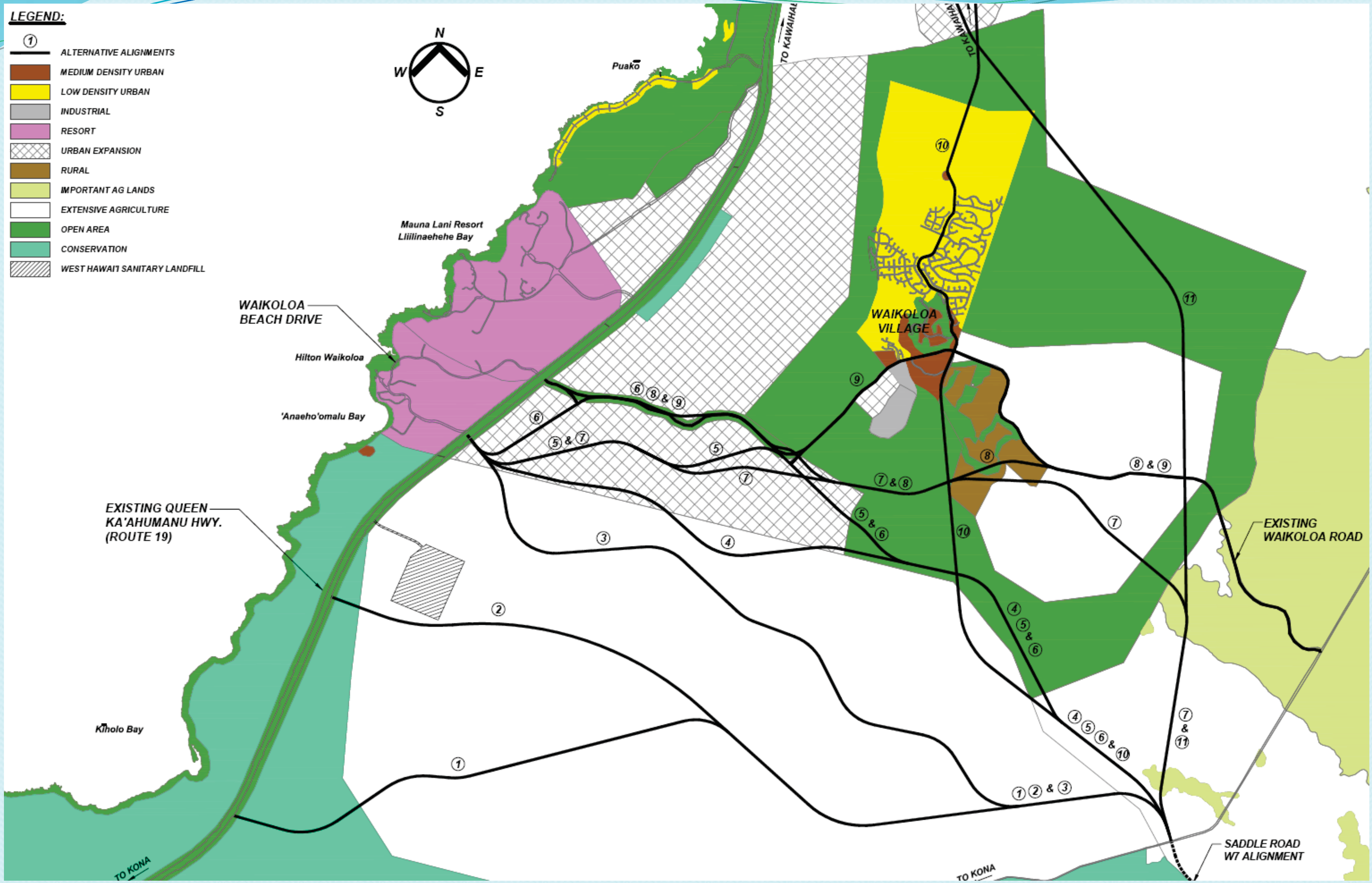
Participating Agencies (Interested Federal, State and Local Agencies)

- Participate in the NEPA process
- Identify issues of concern regarding potential environmental or socioeconomic impacts
- Provide meaningful and timely input
- Participate in the scoping process

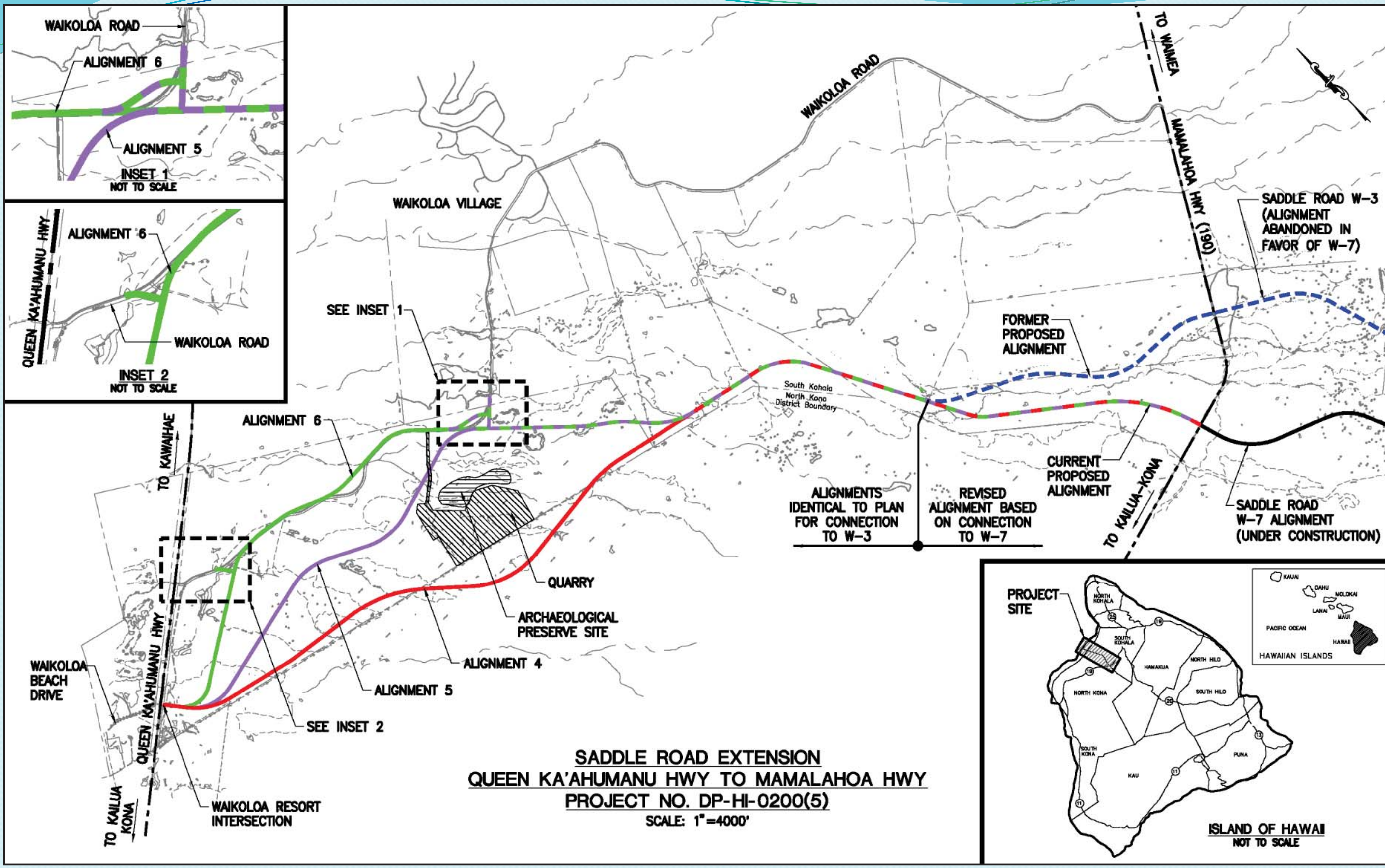
Alternatives Development

- Revisit of Alternatives Study
- Mass Transit
- Transportation Systems Management/ Travel Demand Management (TSM/TDM)
- Use of existing highways and roads
- New highways

Eleven Alternative Alignments Examined



Three Alternative Alignments Chosen to Advance



Proposed Conceptual Design

- Two 12-foot Travelway Lanes
- 8-foot Shoulders
- 12-foot Climbing Lane
- Minimum 100-foot Right-of-Way
- Design Speed: 50-60 mph
- Posted Speed: 45-55 mph
- Maximum Grade: 7 percent

Resource Activities to Date

- Flora and fauna research complete
- Archaeological fieldwork complete
- Jurisdictional determination per Section 404 of Clean Water Act concluded (no waters of U.S.)
- Traffic studies being refined based in Saddle Road west side completion

Stakeholder and Public Involvement Activities

- Public meeting after release of EISPN: September 23, 1999
- Public meeting after release of revised EISPN: June 4, 2012
- Other outreach: Meetings with Waikoloa Village Association, South Kohala Traffic Safety Committee, DLNR Shooting Range Steering Committee, Waikoloa Dry Forest Preserve, and Landowners.

Estimated Timetable

- Publish Draft EIS: December 2014
- Hold Public Hearing: Dec 2014/Jan 2015
- Publish Final EIS: March 2015
- Complete the EIS Phase: May 2015
- Right-of-Way Acquisition: 2015
- Construction Delivery: Contracting methods and dates to be evaluated post-DEIS
- Construction Duration: ~ 2-3 years

Looking for your Input

- Resource considerations in the study area
- Feedback on the following:
  - Purpose and Need
  - Range of Alternatives
- Project Schedule Considerations
- Project Coordination Plan

Coordination Milestones and Review Timelines

- 30 Day Review
  - Purpose and Need (Past and June 2014)
  - Project Coordination Plan (June 2014)
  - Range of Alternatives (June 2014)
  - Final EIS Circulation (Spring 2015)
- 45 Day Review
  - DEIS Circulation (Winter 2014/2015)

Project Contacts

- Michael Will – FHWA-CFLHD Project Manager (michael.will@dot.gov)
- Nicole Winterton – FHWA-CFLHD Environmental Lead (nicole.winterton@dot.gov)
- Ken Tatsuguchi – HDOT Project Manager (ken.tatsuguchi@hawaii.gov)

Written Comments

Please submit written comments by July 25, 2014 for the following:

- Purpose and Need (any new or changed circumstances)
- Range of Alternatives
- Project Coordination Plan
- Project Schedule Considerations
- Agency-specific Considerations

Please send comments to Michael Will at michael.will@dot.gov

SIGN IN SHEET

SADDLE ROAD EXTENSION - AGENCY COORDINATION MEETING

Thursday, June 26, 2014

NAME	AGENCY/COMPANY	PHONE NUMBER	EMAIL
Jason Cortez	HPP	887-3080	acortez@co.hawaii.hi.us
STERLING CHOW	HDOT	933-8836	sterling.chow.hawaii.gov
Ben Ishii	County DPW	961-8423	Bishii@co.hawaii.hi.us
Nicole Winterton	FHWA-CFLHD	720-963-3689	nicole.winterton@dot.gov
HANS SANTIAGO	COH-PLANNING	961-8165	hsantiago@co.hawaii.hi.us
ROBERT PERREIRA	HFD	932-2913	rperreira@co.hawaii.hi.us
Kirzen Eitzler	DPW-county	323-4851	keitzler@hawaiicounty.gov
Lennie Okano-Kendrick	Okahara & Assoc. Inc.	961-5527	lokano@okahara.com
Michael Will	FHWA	720-963-3647	michael.will@dot.gov
Bobby Command	Planning	808 895 2416	rcommand@co.hawaii.hi.us
WARREN LEE	DPW-COH	808-961-8324	wlee@co.hawaii.hi.us

SIGN IN SHEET

SADDLE ROAD EXTENSION - AGENCY COORDINATION MEETING

Thursday, June 26, 2014

NAME	AGENCY/COMPANY	PHONE NUMBER	EMAIL
Darryl Lum	DOH-CWB	586-4309	darryl.lum@doh.hawaii.gov
Edward Chen	DOH-CWB	586-4309	edward.chen@doh.hawaii.gov
DEAN YANAGISAWA	DOT-HWY/S	587-2623	dean.k.yanagisawa@hawaii.gov
KEN TATSUGUCHI	HDOT	587-1830	ken.tatsuguchi@hawaii.gov
Brian Tyau	HDOT	587-6390	brian.tyau@hawaii.gov

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix A Public Involvement and Agency Coordination
A4: AD-1006 and USDA-NRCS Correspondence

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From: Rolfes, Tony - NRCS, Honolulu, HI [mailto:Tony.Rolfes@hi.usda.gov]
Sent: Friday, December 05, 2014 2:13 PM
To: Ron Terry
Subject: RE: FPPA compliance for Saddle Road Extension project

Hi Ron

There are no important farmlands located in the Saddle Road Extension project area on the Island of Hawaii. I completed part II of the AD-1006 as needed when no Important Farmlands are in the project area.

Let me know if you have any questions.

Thank you

Tony Rolfes
Asst. Director for Soil Science and Natural Resource Assessments
USDA-NRCS Pacific Islands Area
300 Ala Moana Blvd. Room 4-118
Honolulu, HI 96850-0050 USA
Phone: 808-541-2600 x119
Mobile: 808-294-2025
Fax: 808-541-1335
Email: tony.rolfes@hi.usda.gov

U.S. Department of Agriculture

FARMLAND CONVERSION IMPACT RATING

PART I *(To be completed by Federal Agency)*	Date Of Land Evaluation Request November 2014
Name of Project Saddle Road Extension	Federal Agency Involved Federal HIghway Administration
Proposed Land Use Federal Aid 2-lane Highway	County and State Hawaii, Hawaii

PART II *(To be completed by NRCS)*	Date Request Received By NRCS 11/25/14	Person Completing Form: Tony Rolfes

Does the site contain Prime, Unique, Statewide or Local Important Farmland? *(If no, the FPPA does not apply - do not complete additional parts of this form)*	YES ☐ NO ☑	Acres Irrigated	Average Farm Size
Major Crop(s)	Farmable Land In Govt. Jurisdiction Acres: %	Amount of Farmland As Defined in FPPA Acres: %	
Name of Land Evaluation System Used	Name of State or Local Site Assessment System	Date Land Evaluation Returned by NRCS 12/05/2014	

PART III *(To be completed by Federal Agency)*		Alternative Site Rating			
		Site A	Site B	Site C	Site D
A. Total Acres To Be Converted Directly		306.9	315.1	320.0	
B. Total Acres To Be Converted Indirectly		0	0	0	
C. Total Acres In Site		306.9	315.1	320.0	
PART IV *(To be completed by NRCS)* Land Evaluation Information					
A. Total Acres Prime And Unique Farmland					
B. Total Acres Statewide Important or Local Important Farmland					
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted					
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value					
PART V (To be completed by NRCS) Land Evaluation Criterion Relative Value of Farmland To Be Converted (Scale of 0 to 100 Points)					
PART VI *(To be completed by Federal Agency)* Site Assessment Criteria *(Criteria are explained in 7 CFR 658.5 b. For Corridor project use form NRCS-CPA-106)*	**Maximum Points**	Site A	Site B	Site C	Site D
1. Area In Non-urban Use	(15)	11	9	9	
2. Perimeter In Non-urban Use	(10)	6	5	5	
3. Percent Of Site Being Farmed	(20)	0	0	0	
4. Protection Provided By State and Local Government	(20)	0	0	0	
5. Distance From Urban Built-up Area	(15)	n/a	n/a	n/a	
6. Distance To Urban Support Services	(15)	n/a	n/a	n/a	
7. Size Of Present Farm Unit Compared To Average	(10)	0	0	0	
8. Creation Of Non-farmable Farmland	(10)	0	0	0	
9. Availability Of Farm Support Services	(5)	5	5	5	
10. On-Farm Investments	(20)	1	1	1	
11. Effects Of Conversion On Farm Support Services	(10)	0	0	0	
12. Compatibility With Existing Agricultural Use	(10)	0	0	0	
TOTAL SITE ASSESSMENT POINTS	160	23	20	20	0
PART VII ***(To be completed by Federal Agency)***					
Relative Value Of Farmland *(From Part V)*	100	0	0	0	0
Total Site Assessment *(From Part VI above or local site assessment)*	160	23	20	20	0
TOTAL POINTS ***(Total of above 2 lines)***	260	23	20	20	0

Site Selected:	Date Of Selection	Was A Local Site Assessment Used? YES ☐ NO ☐

Reason For Selection:

Name of Federal agency representative completing this form:	Date:

(See Instructions on reverse side) **Form AD-1006 (03-02)**

STEPS IN THE PROCESSING THE FARMLAND AND CONVERSION IMPACT RATING FORM

Step 1 - Federal agencies (or Federally funded projects) involved in proposed projects that may convert farmland, as defined in the Farmland Protection Policy Act (FPPA) to nonagricultural uses, will initially complete Parts I and III of the form. For Corridor type projects, the Federal agency shall use form NRCS-CPA-106 in place of form AD-1006. The Land Evaluation and Site Assessment (LESA) process may also be accessed by visiting the FPPA website, http://fppa.nrcs.usda.gov/lesa/.

Step 2 - Originator (Federal Agency) will send one original copy of the form together with appropriate scaled maps indicating location(s)of project site(s), to the Natural Resources Conservation Service (NRCS) local Field Office or USDA Service Center and retain a copy for their files. (NRCS has offices in most counties in the U.S. The USDA Office Information Locator may be found at http://offices.usda.gov/scripts/ndISAPI.dll/oip_public/USA_map, or the offices can usually be found in the Phone Book under U.S. Government, Department of Agriculture. A list of field offices is available from the NRCS State Conservationist and State Office in each State.)

Step 3 - NRCS will, within 10 working days after receipt of the completed form, make a determination as to whether the site(s) of the proposed project contains prime, unique, statewide or local important farmland. (When a site visit or land evaluation system design is needed, NRCS will respond within 30 working days.

Step 4 - For sites where farmland covered by the FPPA will be converted by the proposed project, NRCS will complete Parts II, IV and V of the form.

Step 5 - NRCS will return the original copy of the form to the Federal agency involved in the project, and retain a file copy for NRCS records.

Step 6 - The Federal agency involved in the proposed project will complete Parts VI and VII of the form and return the form with the final selected site to the servicing NRCS office.

Step 7 - The Federal agency providing financial or technical assistance to the proposed project will make a determination as to whether the proposed conversion is consistent with the FPPA.

INSTRUCTIONS FOR COMPLETING THE FARMLAND CONVERSION IMPACT RATING FORM

(For Federal Agency)

Part I: When completing the "County and State" questions, list all the local governments that are responsible for local land use controls where site(s) are to be evaluated.

Part III: When completing item B (Total Acres To Be Converted Indirectly), include the following:

1. Acres not being directly converted but that would no longer be capable of being farmed after the conversion, because the conversion would restrict access to them or other major change in the ability to use the land for agriculture.
2. Acres planned to receive services from an infrastructure project as indicated in the project justification (e.g. highways, utilities planned build out capacity) that will cause a direct conversion.

Part VI: Do not complete Part VI using the standard format if a State or Local site assessment is used. With local and NRCS assistance, use the local Land Evaluation and Site Assessment (LESA).

1. Assign the maximum points for each site assessment criterion as shown in § 658.5(b) of CFR. In cases of corridor-type project such as transportation, power line and flood control, criteria #5 and #6 will not apply and will, be weighted zero, however, criterion #8 will be weighed a maximum of 25 points and criterion #11 a maximum of 25 points.

2. Federal agencies may assign relative weights among the 12 site assessment criteria other than those shown on the FPPA rule after submitting individual agency FPPA policy for review and comment to NRCS. In all cases where other weights are assigned, relative adjustments must be made to maintain the maximum total points at 160. For project sites where the total points equal or exceed 160, consider alternative actions, as appropriate, that could reduce adverse impacts (e.g. Alternative Sites, Modifications or Mitigation).

Part VII: In computing the "Total Site Assessment Points" where a State or local site assessment is used and the total maximum number of points is other than 160, convert the site assessment points to a base of 160.
Example: if the Site Assessment maximum is 200 points, and the alternative Site "A" is rated 180 points:

$$\frac{\text{Total points assigned Site A}}{\text{Maximum points possible}} = \frac{180}{200} \times 160 = 144 \text{ points for Site A}$$

For assistance in completing this form or FPPA process, contact the local NRCS Field Office or USDA Service Center.

NRCS employees, consult the FPPA Manual and/or policy for additional instructions to complete the AD-1006 form.

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix A Public Involvement and Agency Coordination
A5: June 14, 2012 Public Meeting Materials

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NOTICE OF PUBLIC INFORMATION MEETING

Notice is hereby given that the
STATE OF HAWAIʻI DEPARTMENT OF TRANSPORTATION
will conduct a Public Information Meeting on the
ENVIRONMENTAL IMPACT STATEMENT PUBLIC NOTICE /
ENVIRONMENTAL ASSESSMENT (EISPN/EA)
FOR THE
SADDLE ROAD EXTENSION
MĀMALAHOA HIGHWAY (STATE ROUTE 190) TO
QUEEN KAʻAHUMANU HIGHWAY (STATE ROUTE 19)
South Kohala and North Kona Districts, Island of Hawaiʻi

Date: Thursday, June 14, 2012
Time: 6 to 8 p.m.
Location: Waikoloa Elementary & Middle School
68-1730 Hoʻoko Street
Waikoloa, HI 96738

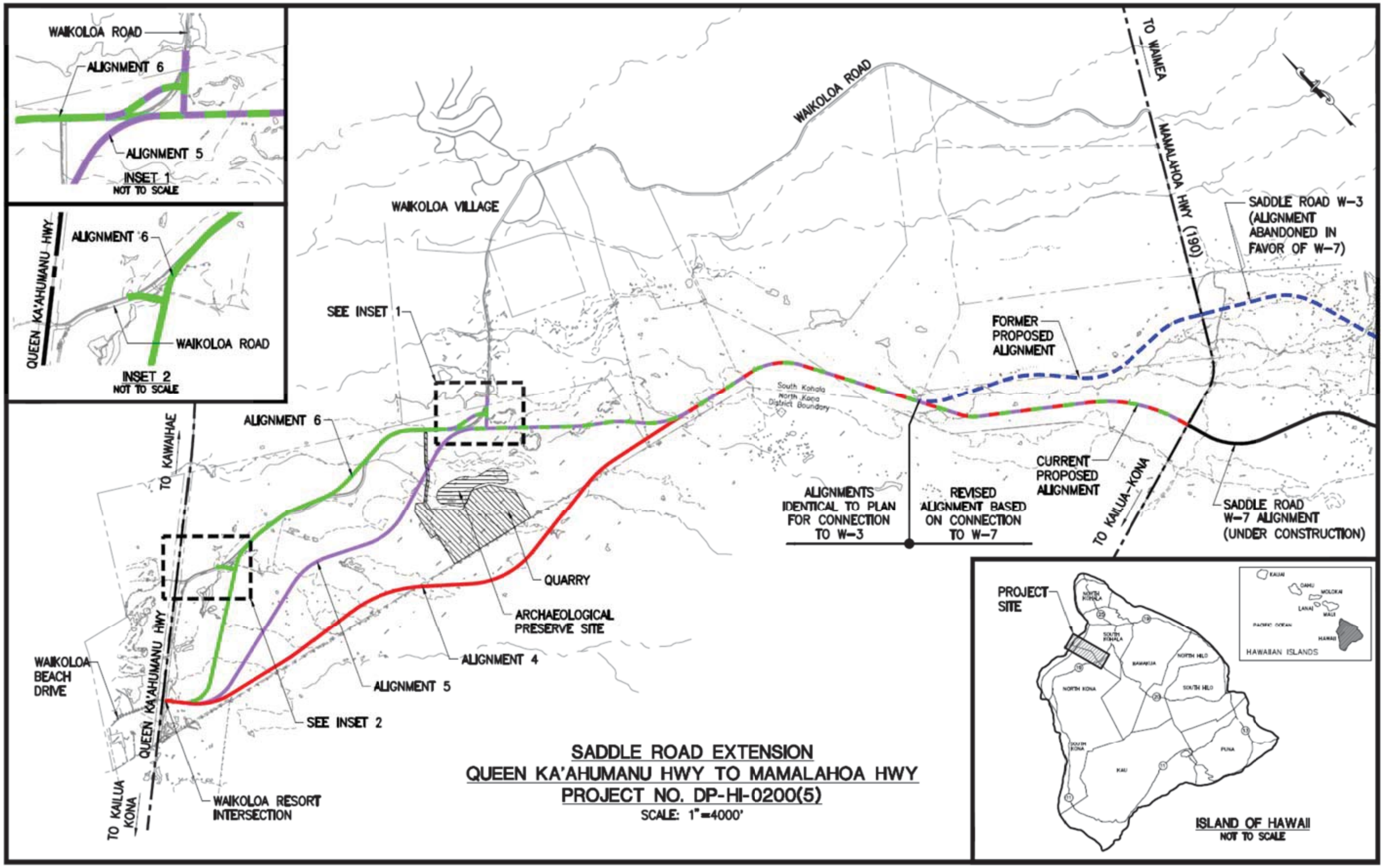
The Hawaiʻi Department of Transportation, in coordination with the Federal Highway Administration, proposes constructing the Saddle Road Extension from Māmalahoa Highway (State Route 190) to Queen Kaʻahumanu Highway (State Route 19). The eastern terminus of the proposed highway would be at the junction where the realigned Saddle Road (State Route 200) meets Māmalahoa Highway near Milepost 13. The western terminus would be at the junction of Queen Kaʻahumanu Highway and Waikoloa Beach Drive.

The preliminary purpose and need of the project are to: (A) Improve the efficiency and operational level of traffic movement between East and West Hawaiʻi, particularly for traffic on the realigned Saddle Road; (B) Improve safety; and (C) Support special needs of commercial truck and military traffic.

An Environmental Impact Statement for this project was begun in 1999 and an alternatives study generated three alternative alignments. However, since November 2003, issues with the U.S. Army's acquisition of the Keʻāmuku Parcel for *Stryker Brigade Combat Team (SBCT)* training affected both the alignment and terminus location of the realigned Saddle Road. As the location of the realigned Saddle Road terminus was critical for the Saddle Road Extension project, the Saddle Road Extension was put on hold pending resolution of these issues. The EIS process for the military training concluded in April 2008, and in February 2010, the Final Supplemental EIS for Saddle Road was completed for the shifted alignment, with the Record of Decision selecting the "W-7" alignment. After resolution of this key issue that had placed the Saddle Road Extension project on hold from 2003 to 2010, the Draft EIS for the Saddle Road Extension was finally resumed in late 2011.

The comment period for the EISPN/EA extends to June 22, 2012. Send comments to Geometrician Associates, P.O. Box 396, Hilo, HI 96721, Attention: Ron Terry; with copies to the Hawaiʻi Department of Transportation, 869 Punchbowl Street, Room 301, Honolulu, HI 96813, Attention: Dean Yanagisawa.

For more information regarding the meeting, please call Lennie Okano-Kendrick of Okahara and Associates, at (808) 961-5527. Any person requiring special accessibility or communication accommodations, may contact Ms. Okano-Kendrick before Tuesday, June 5, 2012.


WAIKOLOA ROAD
ALIGNMENT 6
ALIGNMENT 5
INSET 1
NOT TO SCALE
QUEEN KA'AHUMANU HWY
ALIGNMENT 6
WAIKOLOA ROAD
INSET 2
NOT TO SCALE
WAIKOLOA VILLAGE
WAIKOLOA ROAD
TO WAIMEA
MAMALAHOA HWY (190)
SADDLE ROAD W-3 (ALIGNMENT ABANDONED IN FAVOR OF W-7)
FORMER PROPOSED ALIGNMENT
SEE INSET 1
ALIGNMENT 6
TO KAWAIHAE
South Kohala North Kona District Boundary
CURRENT PROPOSED ALIGNMENT
ALIGNMENTS IDENTICAL TO PLAN FOR CONNECTION TO W-3
REVISED ALIGNMENT BASED ON CONNECTION TO W-7
TO KAILUA-KONA
SADDLE ROAD W-7 ALIGNMENT (UNDER CONSTRUCTION)
QUARRY
ARCHAEOLOGICAL PRESERVE SITE
ALIGNMENT 4
ALIGNMENT 5
SEE INSET 2
WAIKOLOA BEACH DRIVE
QUEEN KA'AHUMANU HWY
TO KAILUA KONA
WAIKOLOA RESORT INTERSECTION
PROJECT SITE
HAWAIIAN ISLANDS
ISLAND OF HAWAII
NOT TO SCALE
SADDLE ROAD EXTENSION
QUEEN KA'AHUMANU HWY TO MAMALAHOA HWY
PROJECT NO. DP-HI-0200(5)
SCALE: 1"=4000'

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SIGN-IN

SADDLE ROAD EXTENSION
PUBLIC INFORMATION MEETING NO. 1
Waikoloa Elementary and Middle School Cafeteria
June 14, 2012

NAME (please print)	GROUP (if applicable)	EMAIL/MAILING ADDRESS (optional)
Jerry Leggett		JerryLeggett@gmail.com
Rep Cindy Evans		Repevans@capitol.hawaii.gov
Aaron Stene		Caaron@Hawaii.rr.com
Arnold Okamura		atokamura@hawaiiantel.net
Herb McKelvy		herb,ac@gmail.com
Lorraine R. Inouye		ljrinouye@gmail.com
Mike Price		whro@hawaii.rr.com
Brian N. Chase		Bchase@EnvironetInc.com
Marianne Felker		Meff=mef@hawaii.rr.com
Cindy Conway		CConway
Mike Wolf		mikewolfworx@gmail.com
Thomas Takach		Thomas N. Takach
Merna Izawa		
John Simmerman		[illegible]
Jen Lawson		Jen Lawson
Kealakai Knoche		Kealakai Knoche

SIGN-IN

SADDLE ROAD EXTENSION
PUBLIC INFORMATION MEETING NO. 1
Waikoloa Elementary and Middle School Cafeteria
June 14, 2012

NAME (please print)	GROUP (if applicable)	EMAIL/MAILING ADDRESS (optional)
Judy Lane		Jlanehi@gmail.com
Gail Jackson		billgail.hi@gmail.com
Dave Hirt		dhirt@co.hawaii.hi.us
Jim CRUSE		CRUSEVEGAS@cox.NET
Erin Miller WHT		
Don Olsen		
K SYMIC		kelsum74@hotmail.com
Mark Mahaney		MAHANEY03@YAHOO.COM
Jake Henry	Waikoloa Dry Forest Initiative	
Ruth Bernstone		rbernstone@hawaii.rr.com
Jeff Manzo		Jeffreym1@Hawaii.rr.com
Ellie Sumic		808islands@gmail.com
Jason Nicholas		Rajakeenono@gmail.com
Peter Peshut	US Army-Pohakuloa	
Kym Sumic		Kimberly_Sumic@notes.k12.hi.us

SIGN-IN

SADDLE ROAD EXTENSION
PUBLIC INFORMATION MEETING NO. 1
Waikoloa Elementary and Middle School Cafeteria
June 14, 2012

NAME (please print)	GROUP (if applicable)	EMAIL/MAILING ADDRESS (optional)
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David Pratt		davepratt@gmail.com
JIM DUPONT		
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Anita Gloss	Malama Waikoloa Nightingales	waikoloanightingale@gmail.com

Page 4

SIGN-IN

SADDLE ROAD EXTENSION
PUBLIC INFORMATION MEETING NO. 1
Waikoloa Elementary and Middle School Cafeteria
June 14, 2012

NAME (please print)	GROUP (if applicable)	EMAIL/MAILING ADDRESS (optional)
W S LAWRENCE	Waikoloa Dry forest Initiative	
Ruth A Smith	Waikoloa School	raswaikoloa@aol.com
Karin Stanton	Hawaii247.com	news@hawaii247.com
ROGER WEHRSIG	WAIKOLOA Village Assn	gm@wvagolf.com
James M Donovan		jd-cpa@kona.net
Mark Lloyd	Fed Hwy	

SPEAKER SIGN-IN

SADDLE ROAD EXTENSION
PUBLIC INFORMATION MEETING NO. 1
Waikoloa Elementary and Middle School Cafeteria
June 14, 2012

PLEASE PRINT YOUR NAME CLEARLY

Arnold Okamura
Walter Kunitake
TAKEO IZAWA
John Simmerman
JIM CRUSE
Dave Pratt
Cindy Evans
Jim Donovan

DMT Consultant Engineers
200 Kohola Street
Hilo, Hawaii 96720

(808) 961-5527 Fax (808) 961-5529

MEETING NOTES

By L. Okano-Kendrick

Job No.: 99011
Project: Saddle Road Extension – Mamalahoa Hwy to Queen Ka'ahumanu Hwy
Subject: EISPN Public Meeting
Place: Waikoloa Elem School Cafeteria
Date:
Date: 6/14/2012

Question and Answer Session

1. ***Any major pros and cons to incline one way or another concerning Alternatives 4, 5, and 6?*** There have been no "red flags" yet. There is no major difference in characteristics between each alternative. The main difference is how the alternatives connect to Waikoloa Road and potentially impact traffic in Waikoloa Village. The traffic studies have not been done yet.

2. ***Where do the connections to Waikoloa Village occur?*** Alternatives 4 and 5 connect to Waikoloa Road approximately 1 mile below Waikoloa Village. Alternative 6 does not connect at all.

3. ***How does Alternative 5 connect to Waikoloa Road?*** Alternative 5 just touches Waikoloa Road and then heads makai. There will be an intersection. More details on the intersections are to follow in subsequent presentations.

4. ***How will traffic control be handled (along existing Waikoloa Road) if Alternative 6 is constructed? About how long would this part of the road be under construction?*** Traffic control would be similar to that used on the Saddle Road. Construction would take perhaps 6 months, although we will have a better idea when we are further along in design.

5. ***Why is bicycle traffic a new thing being considered in the EIS rather than before?*** Hawaii Bike Plan is now completed, there are many more bicyclists now, and Complete Streets is a goal for design, where appropriate.

6. *What is the relation in length between all three alternatives? Which one is longer?* Alternative 5 is the longest, and Alternatives 4 and 6 are slightly shorter (within approximately ½ mile).

7. *Why does Alternative 4 not connect to Waikoloa Village or Waikoloa Road?* Based on input from prior public meetings, at least a few Waikoloa Village residents expressed a preference for no connection to Waikoloa Village or Waikoloa Road. Since it is a direct route (from Mamalahoa Highway to Queen Ka'ahumanu Highway, it was considered for study.

8. *What is the time difference in construction between Alternatives 4 and 5, and Alternative 6?* Due to extra work in traffic control and the intersection with Waikoloa Road for Alternatives 4 and 5, it will take several months (possibly 6) longer than Alternative 6.

9. *Who owns the land that the Alternatives travel through?* Mostly private land owners. Only Alternative 6 traverses through some state land south of the quarry. State land is generally easier to acquire, though DLNR did not favor the road going through these lands because they are designated for hunting and for a future Shooting Range. It is necessary to slightly encroach into these lands for Alternative 4 in order to avoid the quarry. Regarding private land owners, there will be varying perspectives on how a new State highway would affect development plans, access points, etc. DOT will be working with individual landowners to discuss the process and take their input.

10. *Do all Alternatives go through Waikoloa Village Association land?* Yes.

11. *Are there any cultural components being factored into the selection of the Alternative?* Cultural studies are currently being done as part of the EIS.

12. *Is the project area being studied just for the Right-of-Way, or is it more?* The scope of the botany, biology, flora/fauna, archaeology surveys extend beyond the anticipated ROW of the road. Some study areas extend more than 500 feet beyond the ROW. A biological survey is being done to attempt to map every native tree within the Alternatives.

13. *What is the "Archaeological Preserve Site" near the quarry?* That site was set up when the quarry was done. Not sure on the details of that site.

14. *What is the length of the Alternatives?* Alternative 5 is approximately 10½ miles. Alternatives 4 and 6 are slightly shorter, within ½ mile.

15. *Will Waikoloa Road be closed after construction of the Extension?* No roads will be closed due the construction of the Extension.

16. *Is there a way to construct Alternative 4, but still connect to Waikoloa Road?* It may not be within the scope of the project, but DOT is here to listen to ideas.

17. *Do all Alternatives have 8-foot shoulders?* Yes.

18. *Alternative 5 is a more direct route; why is Alternative 6 an option?* It is prudent to study multiple routes, in case major issues arise during the different environmental studies. There is no big difference between the Alternatives 5 and 6. Alternative 6 disturbs less new ground and replaces an existing substandard road.

19. *Alternative 6 covers most of the existing Waikoloa Road?* Alternative 6 reconstructs about 2 miles of Waikoloa Road.

20. *If Alternative 6 is constructed, will the State become responsible for the repair and maintenance of this newly constructed section? Or will it remain under County jurisdiction?* The State will have jurisdiction over the newly constructed section. The County will continue to be responsible for the upper and lower parts of Waikoloa Road not affected by the Extension.

Comment Session

1. Arnold Okamura – SRTF member. Is in favor of the project. Prefers Alternative 4 most because its advantages far outweigh the disadvantages. Feels all residents, particularly hotel, restaurant, and shop employees, will benefit from the construction of the Extension, as their commute will be shortened.

2. Walter Kunitake – SRTF member. Wanted to thank everyone for participating in the meeting. Believes we all should have a common goal to finish the project.

3. Takeo Izawa – Resident of Waikoloa (either since 1975 or for 75 years). Feels new highway will improve the safety of motorists travelling in the area.

4. John Simmerman – Member of PATH. Would like to see cyclist needs considered in EIS/design of the road. Feels 8-foot shoulders are good at 45 mph. If road speed is increased to 55 mph, would like to see an increase in shoulder width to 10 to 12 feet. Would like provision for separated multi-use path. Would like project to take into consideration an alignment along HELCO distribution/transmission lines. Would like tourists and visitors to feel safe riding bicycles and walking in the community. Would like to offer technical expertise during design.

5. Jim Cruz – Lived in Hawaiʻi since 2006. When sports competitors (Lava Man, Iron Man) come to visit island, they stay in the Waikoloa beach resort area rather than the Waikoloa Village area, because the beach resort area offers a safer means for them to ride their bicycles to get to Queen Kaʻahumanu Highway. Favors Alternative 5, and feels that the highway may increase home values in Waikoloa.

6. Dave Pratt – Feels Waikoloa Village is an unsafe place for bicyclists to ride into and out of. Favors Alternative 4 since it would eliminate some traffic through Waikoloa Village. Feels Alternative 6 is the most disruptive for Waikoloa residents, and Alternative 5 is just a compromise between 4 and 6. Would like to see the preservation of the 8-foot shoulder. Feels rumble strip in the shoulder makes it dangerous for bicyclists. The rumble strip along Kawaihae Road does not follow the edge line. Feels a rumble strip ON the white edge line is the best option for rumble strip, and that rumble strips on the shoulder take away from the rideable area. Would like to see aggregate adjacent to the shoulder placed with sufficient enough slope that it does not kick-up onto the shoulder making it unsafe for bicyclists.

7. Cindy Evans – Feels Alternative 4 is most problematic since will have to deal with DLNR issues related to West Hawaiʻi Shooting Range. Favors Alternatives 5 and 6 for most connectivity within the ahupuaʻa. Favors 6 so State can take over responsibility of maintenance of part of Waikoloa Road. Feels redoing Waikoloa Road intersection with Queen Kaʻahumanu Highway would make for better traffic flow, but that Waikoloa Road would still be a problem.

8. Jim Donovan – Feels Alternative 6 is the most efficient but there is no way to access Waikoloa Village. Suggests a possible stub-out for the future. Requests considering roundabouts in intersection design. Agrees that bicycling on Waikoloa Road is extremely dangerous, and that only should be done on Queen Ka'ahumanu Highway. Also feels aggregate on road and rumble strips make it unsafe for bicyclists using shoulders. Feels area is pro-bicycle so should be considered in design of the highway.

Saddle Road update

http://w w w .haw aii247.com/2012/06/15/saddle-road-update-2/ June 15, 2012

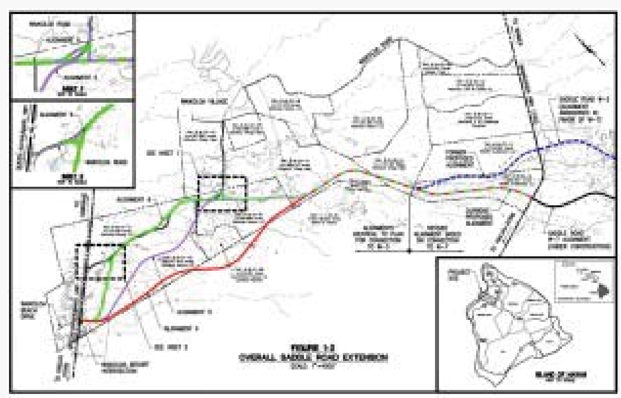
Karin Stanton | Hawaii 24/7 Editor

The newly aligned Saddle Road is expected to open in about 18 months, but the extension of the state highway to Queen Kaahumanu Highway likely won't be ready for seven more years.

Ron Terry explains the three alternate routes for the planned Saddle Road extension. (Hawaii 24/7 photo by Karin Stanton)

About 60 people gathered Thursday evening at Waikoloa Elementary School for an update on the project, which will bypass Waikoloa Village and connect Saddle Road to Queen Kaahumanu Highway at Waikoloa Beach Drive.

Saddle Road



Extension Map (click on map for larger image)

The project is described in the recently completed Environmental Impact Statement preparation notice, which is posted online in the state Office of Environmental Quality Control bulletin dated May 23.

Once the new section of Saddle Road – or State Highway 200 – is complete, the cross-island connector will reach Mamalahoa Highway about 3 miles south of Waikoloa Road, or about 7 miles south of its current junction.

Project consultant Ron Terry, of Hilo-based Geometrician Associates, said studies showed more than 50 percent of the west-bound traffic was heading toward Kona, so the southern alignment made the most sense and will slash about 20 minutes off the Hilo-Kona commute. In addition, it skirts land that recently was purchased by the U.S. military.

The Saddle Road project is months ahead of schedule and is anticipated to open to traffic in December 2013, Terry said. The current road also will remain open.

Once that section is complete, the state Department of Transportation and Federal Highway Administration will focus on the Saddle Road extension, which will connect the new junction with Queen Kaahumanu Highway at Waikoloa Beach Road, or about 1 miles south of the existing Waikoloa Road junction.

Extending Saddle Road to the lower highway is intended to improve traffic flow efficiency, improve safety and support the needs of commercial trucks and military traffic, Terry said.

The new road likely will include two 12-foot lanes, 8-foot shoulders, have a top speed of 55 mph and a maximum grade of 7 percent. The cost is estimated at $60-$70 million.

Terry said the current timeline means the draft Environmental Impact Statement will be complete in October, while the final EIS would be finished next February after a round of public hearings.

The design and right-of-way acquisition process then would begin in 2014. Much of the land along the three routes under discussion is privately owned.

Construction on the extension is expected between 2017 and 2019.

While the project is on the state DOT’s list of priorities, no state funds have yet been appropriated. Rep. Cindy Evans, who represents North Kona and South Kohala, said she expects her colleagues to fund the project, especially as U.S. Sen. Daniel Inouye has long championed Saddle Road improvements and likely will secure federal funding.

The three routes still under consideration include two that will link up with the lower portion of the existing Waikoloa Road. A third option parallels the existing road.

Terry said the three alternates are roughly the same distance – 10 miles – and none has any major advantages or drawbacks. It’s simply which route the public prefers, he said.

Residents have voiced opinions supporting all three alternates for various reasons, Terry said, with no clear favorite.

About one dozen residents testified at Thursday evening’s meeting, with much of focus on ensuring the state highway included safe bike lanes along the shoulders.

Evans said the southern most option, which parallels Waikoloa Road, encroaches on Puu Waawaa Game Management Area. Hunters and recreational users already have a master plan for the area, she said, which may be impacted by the road.

She said she would prefer the new road incorporate portions of the existing Waikoloa Road for a couple of reasons. The road would be designated as a state highway, which means the state rather than the county would bare the cost of maintenance.

That option also falls in line with the long-term vision for the area and promote connectivity between the Waikoloa Village and North Kohala communities.

The EIS will study the social and environmental impacts of the project and develop mitigation measures to avoid, minimize or compensate for impacts.

The final EIS will identify the preferred route.

Comments on the Environmental Impact Statement preparation notice are due June 22.

Mail comments to:
Ron Terry
Geometrician Associates
PO Box 396
Hilo HI 96721

To read the Environmental Impact Statement preparation notice, visit:
oeqc.doh.hawaii.gov/Shared%20D…

You

Residents review the map of the planned Saddle Road extension. (Hawaii 24/7 photo by Karin Stanton)

might be interested in:

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix B Waters of U.S. Report and Correspondence

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NEIL ABERCROMBIE
GOVERNOR

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

GLENN M. OKIMOTO
DIRECTOR

Deputy Directors
JADE T. BUTAY
FORD N. FUCHIGAMI
RANDY GRUNE
JADINE URASAKI

IN REPLY REFER TO:

HWY-PA
2.0813

February 8, 2012

Mr. George P. Young, P.E.
Chief
U. S. Department of the Army
Regulatory Branch
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Young:

Subject: Request for Waters of the U.S Jurisdictional Determination for Saddle Road Extension Alternative Alignments, South Kohala, County of Hawaii, State of Hawaii

This letter and its attachment are intended to supply the information that your agency requires to make a jurisdictional determination on the presence or absence of waters of the U.S. for a highway improvement project on the island of Hawaii. The project title is *Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Ka'ahumanu Highway (State Route 19)*. Our agency is cooperating with the Federal Highway Administration, Hawaii Division, to prepare a joint federal-State Environmental Impact Statement.

The attached report presents the methodology, results and conclusions of this investigation, and includes maps and photographs. In summary, in the judgment of Dr. Terry, with which we concur, no wetlands or special aquatic sites are present. Furthermore, the one ephemeral drainage feature present does not appear to meet the criteria of a water of the U.S. for a water of the U.S. Specifically, there are no traditional navigable waters (TNW), relatively permanent waters (RPWs), or non-RPW streams with a significant nexus to a TNW.

The area is rugged terrain with a limited area accessible by a 4-wheel drive vehicle; field visits to most of the area require hiking. Our consultants are available to accompany your staff to any part of all alignments.

We would very much appreciate an official determination from you agency so that we may proceed with the EIS process in the manner prescribed in the NEPA-404 Memorandum of Understanding developed among our agencies in 1994.

If you require any additional information to make the determination, please contact Pat Phung of the Federal Highway Administration, Hawaii Division, at 541-7305, or consultant Ron Terry at (808) 969-7090. As stated above, if desired, we can make our consultant team available to accompany your personnel on a site visit.

Very truly yours,

GLENN M. OKIMOTO, Ph.D.
Director of Transportation

Attachment

Report on Waters of the U.S.
Within Proposed Saddle Road Extension Alternative Corridors, Island of Hawai'i, State of Hawai'i

Geometrician Associates, Hilo, Hawai'i
January 2012

This report summarizes an evaluation by Geometrician Associates of Waters of the U.S. potentially present on a highway improvement project on the island of Hawai'i. The project title is *Saddle Road Extension, Mamalahoa Highway (State Route 190) to Queen Ka'ahumanu Highway (State Route 19)*. The work was conducted on behalf of the Hawai'i Department of Transportation, Highways Division (HDOT) as part of a joint federal-State Environmental Impact Statement (EIS).

This report is intended for use as background for a letter requesting jurisdictional determination (JD) for potential Waters of the U.S. from the U.S. Army Corps of Engineers (USACE) Honolulu District. *Waters of the United States* (U.S.) is a regulatory term referring to surface waters that are under the jurisdiction of the USACE. Surface waters may include streams, streambeds, rivers, lakes, reservoirs, arroyos, washes, other ephemeral watercourses and wetlands. Any actions that result in effects on Waters of the U.S. require compliance with the Section 404 of the Clean Water Act. The JD is requested to cover all three alternatives under consideration in the EIS: Alternatives 4, 5 and 6, along with connecting roadways that are common to one or more alternatives. **Figure 1** is a map of the project alternatives.

Project Background

As the Federal Highway Administration (FHWA) initiated its EIS for the Saddle Road Improvement project in 1996, it became increasingly likely that a federal-State partnership would gradually be realigning and rebuilding Saddle Road (SR 200). This project will provide a modern State Highway extending more than 80 percent of the way across the island, from Hilo to the Mamalahoa Highway (SR 190). In 1998, after the release of the Draft EIS for the Saddle Road Improvement project, HDOT began studying the potential for a new State Highway between the realigned Saddle Road terminus on Mamalahoa Highway and Queen Ka'ahumanu Highway (SR 19). This would greatly increase the utility of the Saddle Road and provide a nearly complete, direct, and modern State Highway connection from Hilo International Airport to Kona International Airport.

DMT Consultant Engineers was awarded a conceptual design and EIS contract for the Saddle Road Extension project in February 1999. Meetings with agencies, including the Corps of Engineers, were conducted in May of 1999. On July 13, 1999, a Notice of Intent to prepare an EIS was published in the Federal Register. An Alternatives Study was completed and approved in September 2000, allowing preliminary engineering and EIS studies to begin. On December 13, 2001, an official with the Regulatory Branch of the U.S. Army Engineer District, Honolulu accompanied a project consultant on an inspection of the alternative corridors for Alternatives 4, 5 and 6. In a letter of February

13, 2002, the USACE determined that there were no jurisdictional waters affected by the project and that a Department of the Army permit would not be required. (It should be noted that the alternative alignments examined in 2002 by the USACE have been modified slightly since that time to avoid an endangered species and an archaeological site, and shifted substantially on the eastern end for the reasons described below).

Project EIS studies proceeded during 2002-2003, but in November 2003, the U.S. Army began an EIS for the *Army Transformation of the 2nd Brigade, 25th Infantry Division (Light) to a Stryker Brigade Combat Team (SBCT)* project, which included plans to utilize the Ke'āmuku Parcel (the Parker Ranch land containing the western segment of the Saddle Road) for training. The EIS was approved in 2004, but lawsuits on the acceptability of the EIS ended in a decision by the U.S. 9th Circuit Court of Appeals compelling preparation of a supplemental EIS that considered locations other than Hawai'i for the permanent stationing of the 2/25th SBCT. In a Record of Decision issued in April 2008, the U.S. Army chose to implement the alternative that would station the 2/25th SBCT permanently at Schofield Barracks Military Reserve on the island of O'ahu, with a variety of maneuver training expected to occur at PTA, including the Ke'āmuku parcel.

The Saddle Road Extension project was thus essentially put on hold from 2003 to 2008 due to uncertainties about the location of the Saddle Road western terminus on Mamalahoa Highway, which would be the logical eastern terminus for the Saddle Road Extension. In 2008, the U.S. Army determined that the western terminus of the Saddle Road would have to move south to reasonably accommodate training activities in the newly acquired Ke'āmuku Parcel. Accordingly, the FHWA began preparation of engineering studies and a Supplemental Environmental Impact Statement to relocate the western part of the Saddle Road and study the impacts of this decision. In February 2010, the Final SEIS was completed and the Record of Decision prepared for the project, which included a western terminus that was relocated about a half-mile south of the terminus that had been presented in the 1999 EIS.

After resolution of this key issue, the Draft EIS for the Saddle Road Extension was finally resumed in 2011. Jurisdictional determinations are only valid for a period of five years, and nine years have elapsed since the February 2002 JD. Since that time, the USACE has substantially revised its practical definition of Waters of the U.S. and also its methods for assessing them. The latest guidance is contained in *JD Form Instructional Guidebook* and the *Approved Jurisdictional Determination Form*; these digital files are available on the Honolulu District website (http://www.poh.usace.army.mil/EC-R/EC-R.htm). In addition to these changes, the upper elevation portion of the project, termed the Common Alignment, has shifted to the south to accommodate the relocated Saddle Road western terminus.

This report covers the current alternative alignment locations and utilizes the updated methodology and forms referenced above. In particular, the methodology for this analysis is consistent with the latest guidance, the *U.S. Army Corps of Engineers Jurisdictional Determination Form Instructional Guidebook* (Rev. 5/23/07). In this guidance, which is available on USACE websites, the USACE has reaffirmed that all traditional navigable waters (TNW) are jurisdictional, and that any tributary stream that generally flows three continuous months of the year or more – called a relatively permanent water (RPW) – is also jurisdictional. It is understood that any wetlands adjacent to RPW, as well as non-RPW streams and wetlands adjacent to them, need to be evaluated to verify whether they have a significant nexus to a TNW. The USACE, interpreting a ruling by the U.S. Supreme Court, defines this as follows:

> "A significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or an insubstantial effect on the chemical, physical, and/or biological, integrity of a TNW. Principal considerations when evaluating significant nexus include the volume, duration, and frequency of the flow of water in the tributary and the proximity of the tributary to a TNW, plus the hydrologic, ecologic, and other functions performed by the tributary and all of its adjacent wetlands."

Therefore, the first task for the Saddle Road Extension analysis was to identify within the affected Alternatives 4, 5 and 6 corridors and connecting roads all TNWs, tributary RPWs, and tributary non-RPW streams, along with any wetlands or other special aquatic sites. After these were identified and mapped, certain waters would be by definition jurisdictional; for others, the issue of a significant nexus needed to be examined, and then a jurisdictional determination could be made.

Geological Setting

To understand the geology of the area crossed by the Saddle Road Extension alternative routes it is helpful to review the geology of a somewhat broader region from the North Kohala/South Kohala boundary to the South/Kohala Kona boundary (**Figure 2a, from** Wolfe, E.W., and Morris, J. 1996. *Geologic Map of the Island of Hawai'i.* USGS Misc. Investigations Series Map i-2524-A). This includes some of the oldest volcanic surfaces in northwest Hawai'i (mid-Pleistocene; geologic units labeled *pl* and *hw* on map) to some of the youngest (1,500 to 3,000 B.P.; units marked *k1y* and *k2* on map). A transect from north to south at about the 500-foot elevation traverses areas where rainfall is constant and low (~10 inches/year), in which the age of the surface is highly correlated with the degree of stream dissection. The topography on this progression from older to younger surfaces indicates the influence of significant hydrological action in the older areas and its complete absence in young lava flows. Honokoa Gulch on the Kohala Mountains near Kawaihae has developed gulches as deep as 330 feet, whereas Auwaeakeakua Gulch on older Mauna Kea Lavas (units labeled *hm* and *I* on map) has a maximum of 30 to 40 feet. On the youngest (5,000 to 10,000 B.P) Mauna Kea flows and similarly aged Hualalai flows (units labeled *h1o* and *h1y* on map) in the south, the channels are discontinuous and generally just a few feet deep. In the Kaniku lava flows of Mauna Loa, no stream dissection whatsoever has occurred.

Within the area traversed by the Saddle Road Extension alternative routes (**Figure 2b**), there is incipient stream development on late Pleistocene (older than 10,000 BP) Mauna

Kea and 5,000-10,000 year old Hualalai flows but none on the Mauna Loa flows, which mostly date from 1,500 to 5,000 years BP. Although the areas covered by lavas from these three volcanoes run roughly parallel to each other down the regional slopes, within the project area itself, the Mauna Kea and Hualalai surfaces are confined to the *mauka* 15 percent of the route, with almost all of the remaining *makai* 85 percent covered by Mauna Loa lavas.

On the Mauna Kea surfaces, the lava flows have a scale such that they formed natural hillocks 10-100 feet high spaced 100 to 500 feet apart (see **Figure 3a**). Because the regional slope is moderately steep, these rounded hillocks are elongated downslope, with meandering lines of low elevation between them. These features form the initial topography. Through time the hillocks have been smoothed and rounded by physical and chemical weathering as well as regional ash deposition episodes and subsequent aeolian deposits. After some period of geologic time enough soil accumulated on the surface and in the cracks that water began to run off rather than just sinking in. Most runoff occurs on the longer sideslopes and foreslopes and accumulates in the crevice-like valleys between the hillocks. These tend to fill up with shallow sediment deposits, forming elongated basins that are flattish but with a slight slope towards the sea that is not as steep as the regional slope (**Figure 3b**).

Rainfall events are infrequent and usually minor in this dry area, and runoff tends to be confined within these basins, where it percolates through to the water table, thousands of feet below at the basal lens, just a few feet above sea level. Some of the basins connect to each other in a series of "cascades," although this somewhat overstates the water's pace and volume. Water generally trickles rather than surges from one basin to another even when flow is very heavy. Occasionally, the topography is suitable for a channel to be carved in the shallow depositional basin, e.g., when two large, steep-sloped hillocks are close together and supply much more runoff much faster than is usual for the area. This is also usually absorbed in the next basin downslope, but sometimes there is enough flow to produce a gully feature that flows and erodes (**Figure 3c**).

The gully channel can actually carve deeply (up to 10 feet) in the very steep crevices between hillocks (**Figure 3d**) but it will be reduced to 1 or 2 feet in the flatter basins. If several of these basins connect, they may form a gully that stretches thousands of feet, varying between 10 feet to 1 foot deep. Photointerpreters for USGS maps commonly interpret these longer features as intermittent streams (see examples near Mamalahoa Highway on **Figure 4a**, in which the alternatives are mapped onto USGS 1:24,000 digital maps).[1]

In almost all cases in these Mauna Kea and Hualalai surfaces, basins with enough absorptive capacity to accommodate all the runoff are encountered and these intermittent streams disappear. Even when several such intermittent streams converge, they often do not form a unit that continues more than a mile or so. The channels begin shallow and

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[1] It should be noted that the 1:24,000-scale USGS maps do not distinguish between intermittent and permanent streams; smaller scale USGS maps such as the 1:250,000 series classify all streams in this area as intermittent.

vegetated, with little erosion, and then may form "mini-canyons" with 10-20 foot high channel walls and considerable erosion. In the end however, as the settling basins have done their work, the channels may be just a foot or so high and there are more distributaries than tributaries. The V-shaped channel shrinks and finally no channel at all is evident, as this runoff simply spreads and percolates in basins with no outlet channel. The water percolates through hundreds or thousands of feet of rock to high level aquifers or (more likely in this area of the island) the basal lens. These surface features are separated from Traditional Navigable Waters by many miles. These infrequently flowing hydrologic systems flow do not conduct runoff to any waters of the U.S., unlike intermittent streams such as those found near Waimea on older Mauna Kea flows, which develop a continuous channel from the mountain to the sea.

As observed above, the Mauna Loa flows, which are almost all younger than 5,000 years, have no stream development whatsoever. The rugged, mostly ʻaʻa surface promotes rapid percolation of rainfall percolates into the ground essentially where it falls. A few small *kipuka* (isolated islands of older surfaces) of somewhat older pahoehoe Mauna Loa flows are present (see areas marked *k1o* on **Figure 2b**) but these also lack drainage channels. **Figure 4b** shows the alternatives and the USGS-interpreted "streams" overlaid on Google Earth © imagery, in which the black recent lava flows are obvious. Curiously, photointerpreters for USGS maps have also interpreted features amid these recent lava flows as intermittent streams, as shown in **Figure 4a**.

FIELD METHODOLOGY

Alternative routes cross several features that are labeled on the maps as "blue-line" streams. These "blue-line" crossings are listed below and mapped on **Figure 4a**, which provides the approximate location of all project alternative routes on U.S. Geological Survey 1:24,000 series topographical maps.

On Common Segment:
- 4/5/6 C-1
- 4/5/6 C-2
- 5/6 C-1

On Individual Alternative Segments
- 4-1
- 5-1
- 5-2
- 6-1

The original fieldwork plan for this evaluation was to investigate the nature of each crossing and determine whether an RPW was present. Therefore, field visits to each USGS-mapped crossing were scheduled and facilitated using GPS coordinates generated from overlaying the alignments on the USGS maps. However, because the crossings were located in widely scattered, isolated areas, it was decided to walk almost the entire length of all routes on various days. This allowed inspection of not only the mapped crossings but also any other potential crossings of waters of the U.S., as well as unmapped streams or other waters of the U.S., such as wetlands.

On four separate days between October 2010 and February 2011, a team of between one and three scientists, engineers and technicians led by Ron Terry, Ph.D., systematically walked and closely examined the routes. The width of the examined study corridor was 500 feet. The primary investigation sites were the crossings from Table 1 above, but the plan also specified that any drainage encountered within this study corridor that appeared to have any potential to be considered as a Water of the U.S. would be also be systematically examined. Each crossing location was first located from its USGS map coordinates using a handheld global positioning system (GPS), verifying the location and refining it if appropriate. The sites were then photographed and evaluated using the criteria in the USACE data sheets jurisdictional determination.

FINDINGS

All blue-line crossings on the USGS maps were located as identifiable features in the field, generally in the precise location indicated on the USGS map. Their characteristics are noted below in **Table 1**, and **Figure 5a-h** provides photos of each. Each drainage crossing and linear lava flow feature is described in the bullets that follow **Table 1**.

The most important finding was that with the exception of Crossing 4/5/6 C-1, *none of other crossings noted on the USGS maps were drainages, but instead were linear features associated with lava flows, including lava channels and lava flow contact edges.* No additional drainage features were encountered. No other stream crossings nor any other Waters of the U.S. were found.

Table 1
Field Results for Saddle Road Extension Crossings of USGS-Mapped Drainages

Crossing Name	Location (lat/lon)	Landform Type	Details
4/5/6 C-1	19*51'55" 155* 46' 07"	Drainage crossing	Shallow intermittent gully
4/5/6 C-2	19*53'30" 155* 47' 49"	Lava flow feature	Linear flow channel
5/6 C-1	19*53'55" 155* 48' 21"	Lava flow feature	Linear flow channel/depression
4-1	19*53'35" 155* 48' 53"	Lava flow feature	Lava flow contact zone
5-1	19*54'36" 155* 49' 23"	Lava flow feature	Linear flow channel
5-2	19*54'31" 155* 49' 40"	Lava flow feature	Linear flow channel
6-1	19*54'56" 155* 49' 52"	Lava flow feature	Lava flow contact zone

- *Drainage crossing 4/5/6 C-1*. The meandering gully has scoured down through the +/- 2 feet of soil that covers the basin to pahoehoe lava surface, but has not really eroded the pahoehoe to any degree. The bed consists of rounded very small cobbles and pebbles, plus sand and silt. The channel is two feet deep and about 22 feet wide, with an average side slope of about 30 degrees. The slope of the stream is roughly 8 percent. The bank is stable, and there is no riparian corridor, and the vegetation in the channel consists of the same non-native species as vegetation outside it: fountain grass (*Pennisetum setaceum*), buffel grass (*Cenchrus ciliaris*), and seedlings of various herbaceous weeds. One of the few major storms that hit the leeward coast each year had just occurred about two weeks prior to the October 2010 visit to this gully, and sediment sorting and deposition as well as leaf litter marked the ordinary high water mark. The gully was followed downstream to a point approximately 0.4 miles from the crossing, by which point any traces of flow or evidence of a gully disappeared, precisely where the USGS map shows the stream disappearing (**Figures 5a-b**).

- *Lava Flow Feature 4/5/6 C-2*. The USGS map incorrectly classifies a meandering linear lava flow channel as a stream. There is no indication of any water flow or geomorphic feature related to drainage in or near this area (**Figure 5c**).
- *Lava Flow Feature 5/6 C-1*. The USGS map incorrectly classifies a meandering linear lava flow channel/depression as a stream. Unlike the previous "crossing", there is no clear channel or linear depression, and the photointerpretation of a stream here must have relied on connecting various linear depressions upslope with others downslope in a direct path. There is no indication of any water flow or geomorphic feature related to drainage in or near this area (**Figure 5d**).
- *Lava Flow Feature 4-1*. The USGS map incorrectly classifies a lava flow contact zone with highly contrasting vegetation as a stream. There is no indication of water flow or geomorphic features related to drainage here (**Figure 5e**).
- *Lava Flow Feature 5-1*. The USGS map incorrectly classifies a meandering linear lava flow channel in recent black lava as a stream. There is no indication of any water flow or geomorphic features related to drainage here (**Figure 5f**).
- *Lava Flow Feature 5-2*. The USGS map incorrectly classifies a meandering linear lava flow channel as a stream. There is no indication of any water flow or geomorphic features related to drainage here (**Figure 5g**).
- *Lava Flow Feature 6-1*. The USGS map incorrectly classifies a lava flow contact zone with two contrasting dark shades of recent lava and a V-shaped contact zone as a stream. There is no indication of any water flow or geomorphic feature related to drainage here (**Figure 5h**).

None of the seven "crossings" appear to meet the definition of a Water of the U.S. Six of the seven are lava features that are completely unrelated to drainage and do not conduct water. One of the crossings involves a very ephemeral drainage with a depth of about 2 feet and a width of 22 feet. This channel rapidly decreases in depth and width downstream, and after 2,000 feet it has been completely absorbed in the natural settling basins and disappears. This drainage is not tributary in any way to any relatively permanent waters (RPWs), such as an intermittent stream, and thereby to potential traditional navigable waters (TNWs). This intermittent drainage provides no habitat for native reptiles or amphibians (none of which exist in Hawai'i), and no waterbirds, fish, or aquatic invertebrates are present. Similarly, there are no wetlands or riparian plants or vegetation associated with the drainage.

No other streams nor any springs, wetlands or special aquatic sites were observed in any location within the entire study area covered during these field investigations, and none are known to exist in the general area.

SUMMARY

In summary, no jurisdictional Waters of the U.S. appear to be present, as no wetlands or special aquatic sites are present, and the one ephemeral and poorly developed drainage feature does not appear to meet the criteria of a Water of the U.S. for streams. Specifically, there are no traditional navigable waters (TNWs), relatively permanent waters (RPWs), or non- RPW streams that are tributary to RPWs and/or have a significant nexus to a TNW.

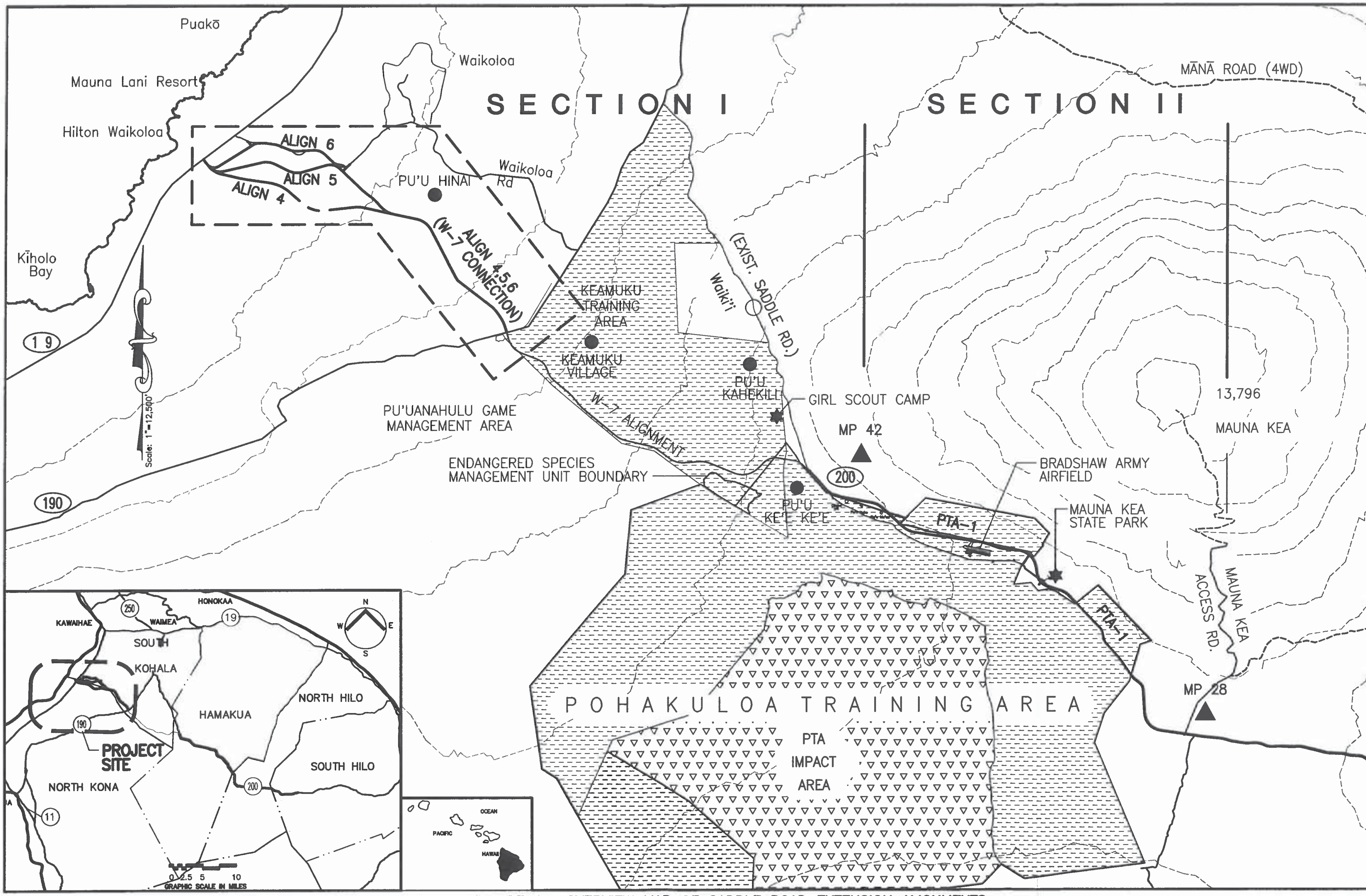
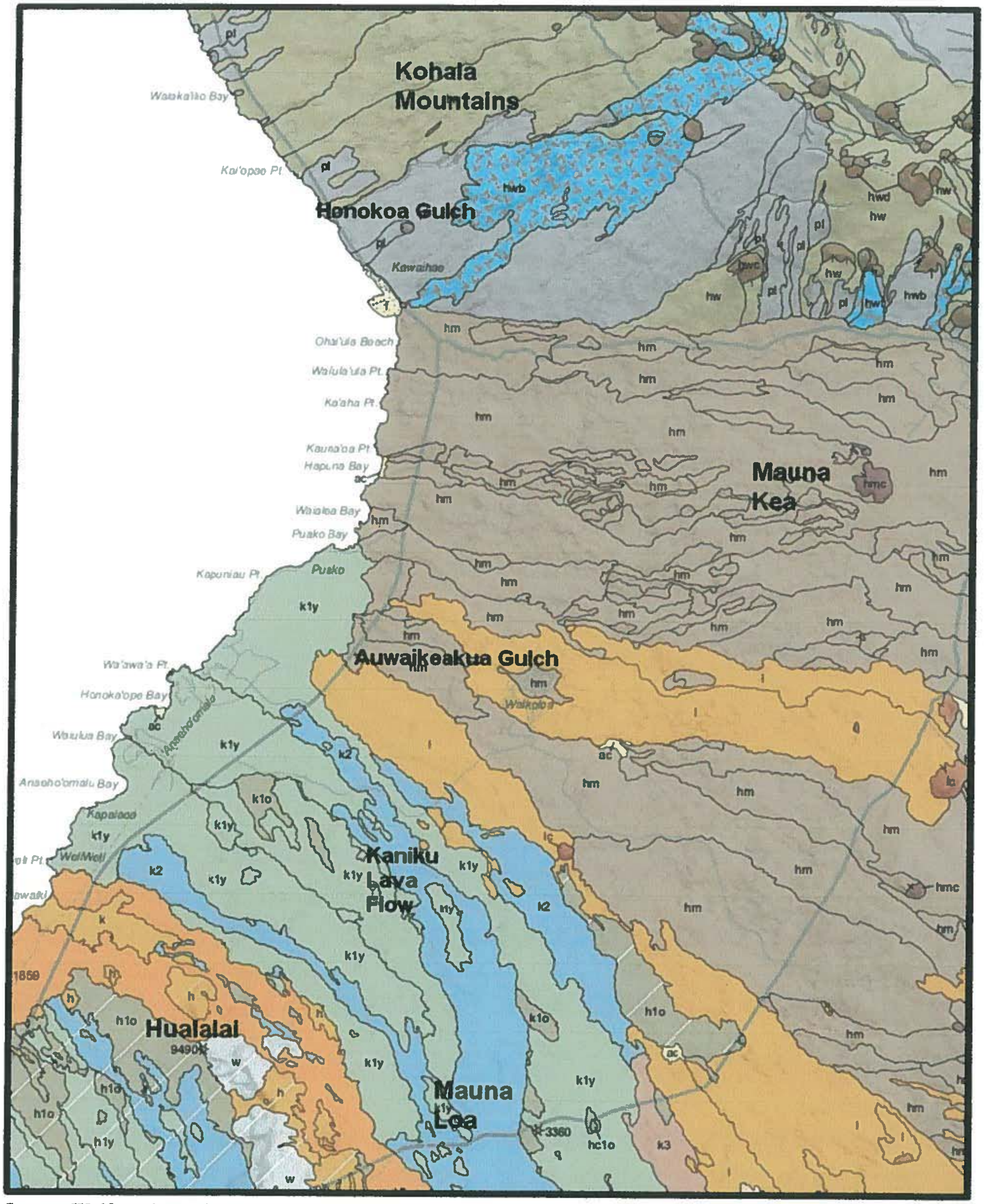


FIGURE 1: OVERVIEW MAP OF SADDLE ROAD EXTENSION ALIGNMENTS

O:\Oproj\Joel\99011 – 190 to Queen K\hilo-cadd\graphics\ron\Fig.1-SRX Aligns overview.dwg

Figure 2a Geology of Project Area



Source: Wolfe and Morris 1996

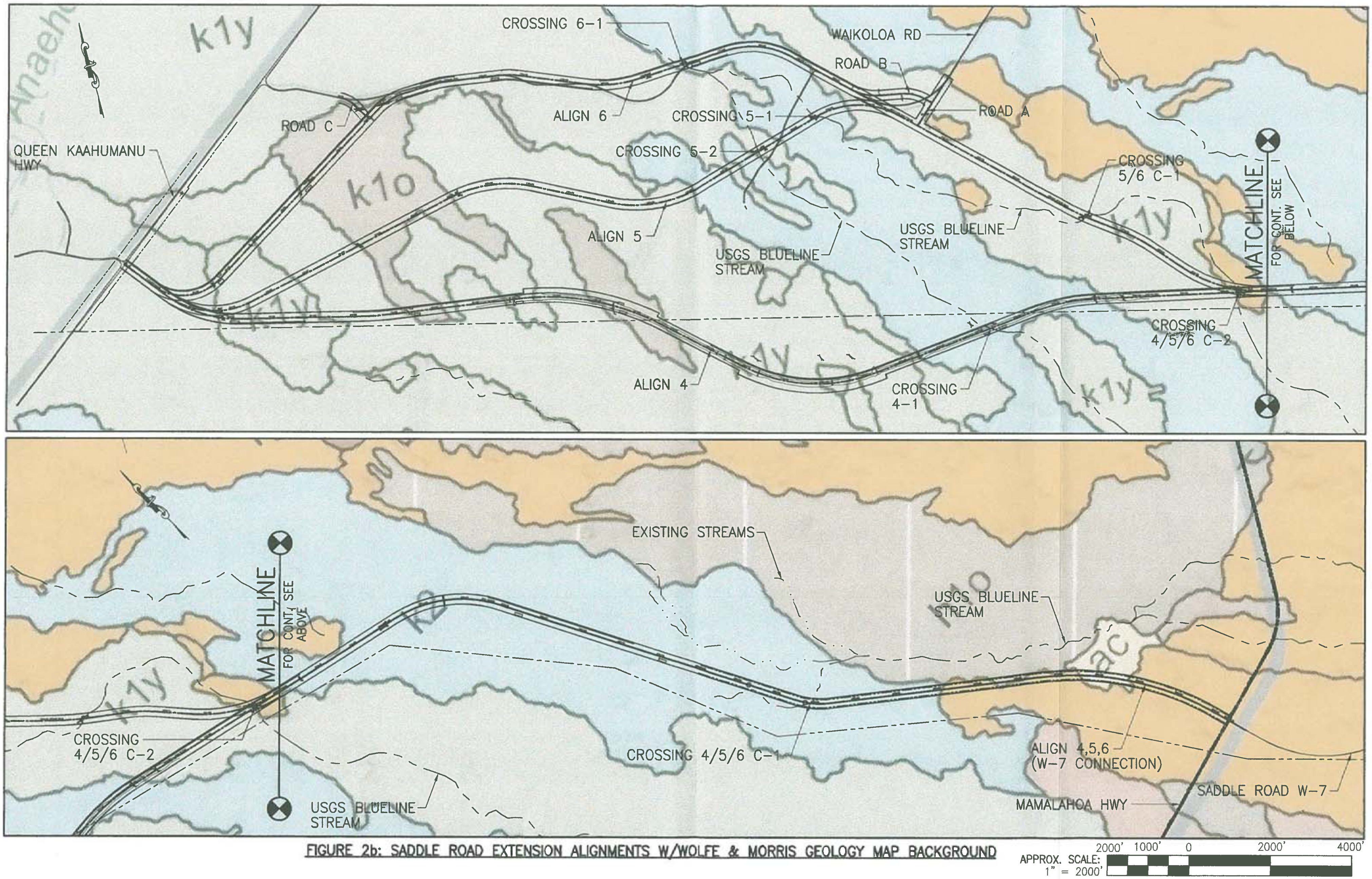


FIGURE 2b: SADDLE ROAD EXTENSION ALIGNMENTS W/WOLFE & MORRIS GEOLOGY MAP BACKGROUND

Figure 3a General Topography of Mauna Kea Surfaces

Figure 3b Typical Small Basin Between Hills with no Outlet

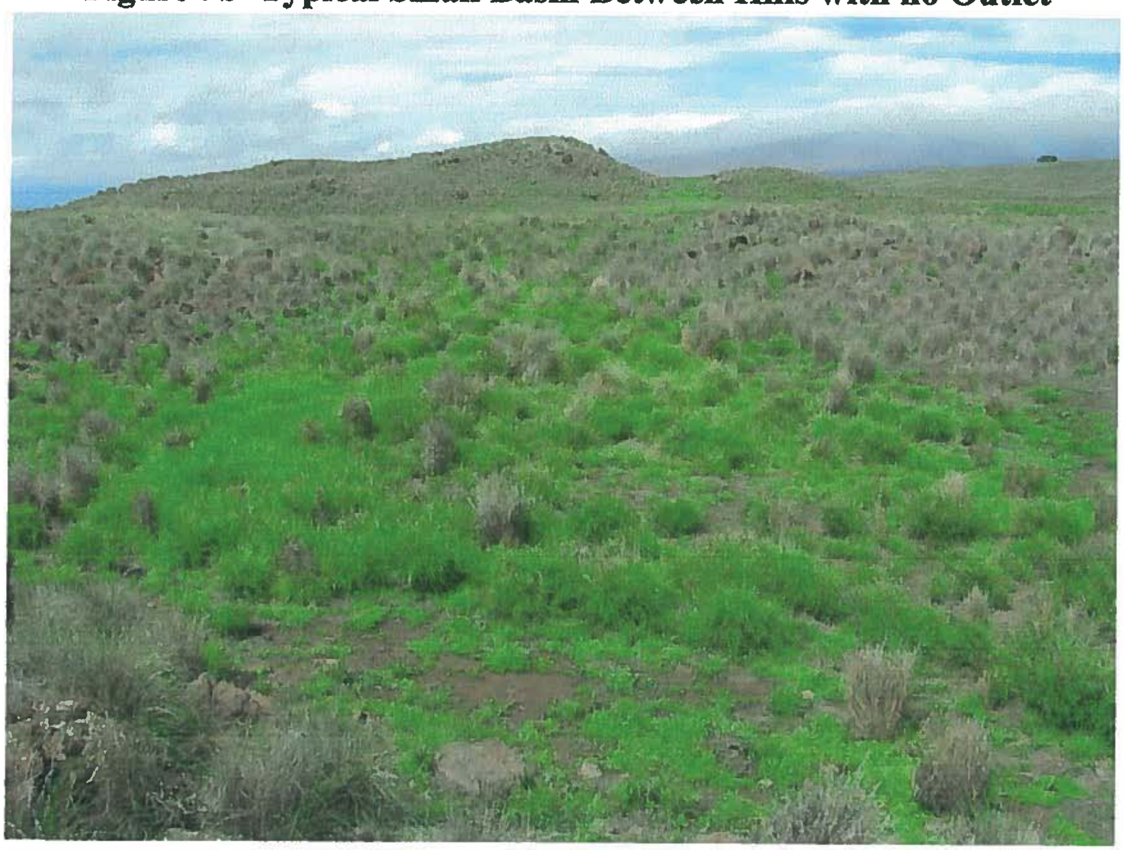


Figure 3c Gully Feature from Repeated Basin Overtopping

Figure 3d Deep Gully Dissection in Steep Section Between Hillocks

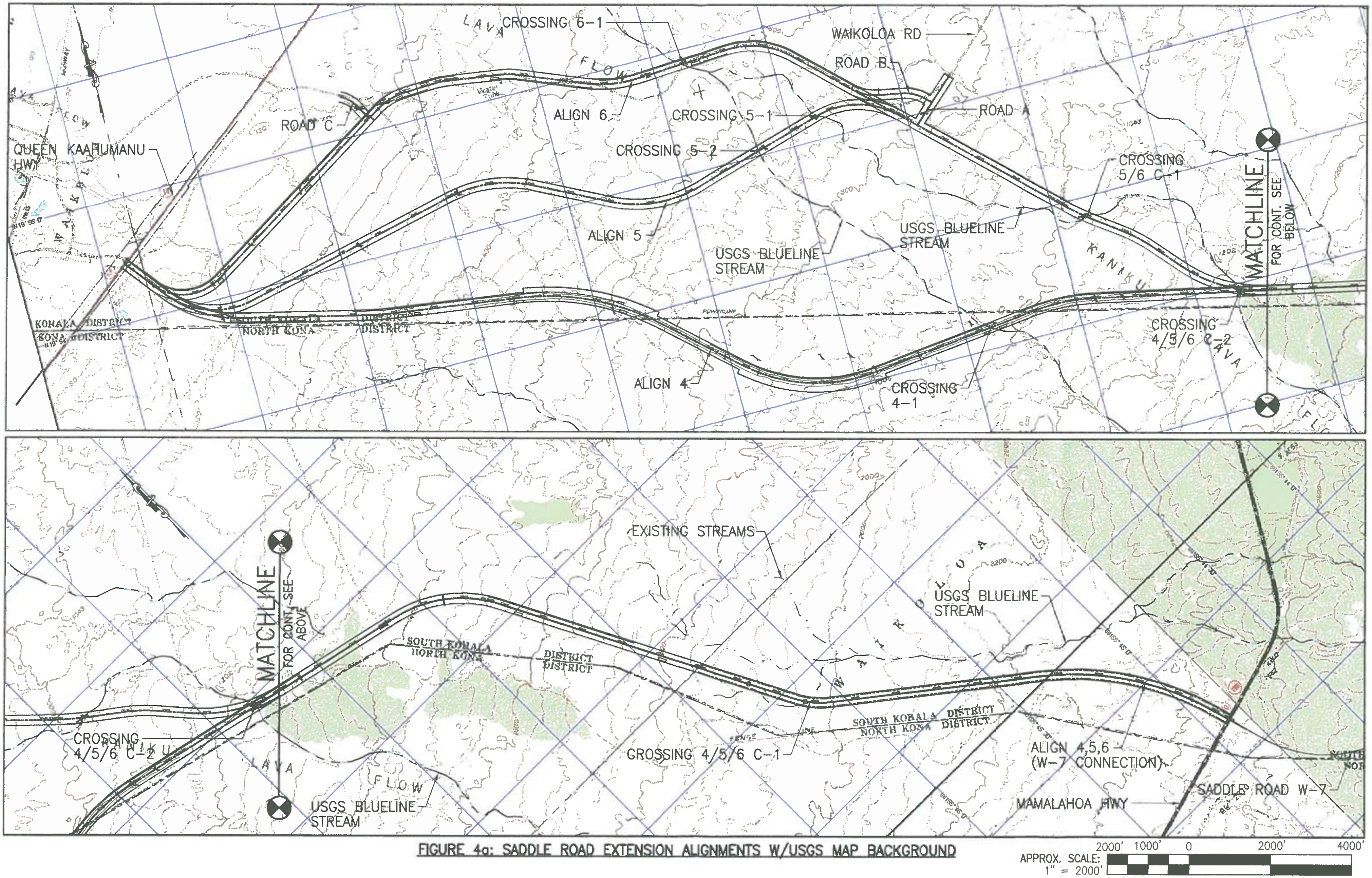


FIGURE 4a: SADDLE ROAD EXTENSION ALIGNMENTS W/USGS MAP BACKGROUND

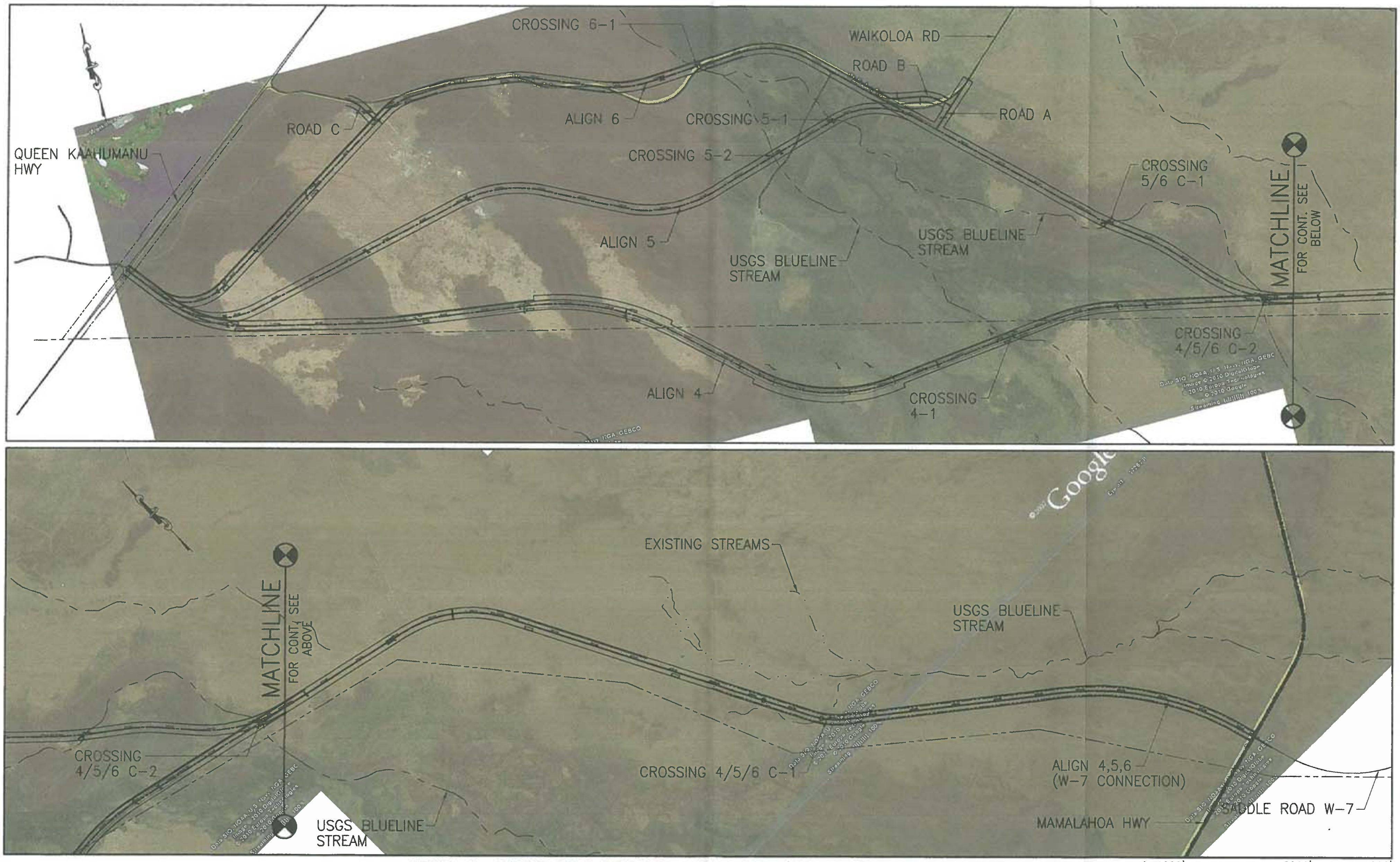


FIGURE 4b: SADDLE ROAD EXTENSION ALIGNMENTS W/GOOGLE EARTH BACKGROUND

APPROX. SCALE:
1" = 2000'
2000' 1000' 0 2000' 4000'

Figure 5a Crossing 4/5/6 C-1

Figure 5b Terminus of Gully for Crossing 4/5/6 C-1

Figure 5c Crossing 4/5/6 C-2

Figure 5d Crossing 5/6 C-1

Figure 5e Crossing 4-1

Figure 5f Crossing 5-1

Figure 5g Crossing 5-2

Figure 5h Crossing 6-1

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

May 22, 2012

Regulatory Branch

File No. POH-2012-00038

Dr. Glenn M. Okimoto
State of Hawai'i
Department of Transportation
869 Punchbowl Street
Honolulu, Hawai'i 96813-5097

APPROVED JURSIDICTIONAL DETERMINATION

Dear Dr. Okimoto:

This is in response to your letter dated February 8, 2012, requesting a Department of the Army (DA) Jurisdictional Determination (JD) for the proposed extension of Saddle Road from Mamalohoa Highway (State Route 190) to Queen Ka'ahumanu Highway (State Route 19) near Waikoloa, County of Hawai'i, Island of Hawai'i, Hawai'i.

Your proposed project site was reviewed pursuant to Section 10 of the Rivers and Harbors Act of 1899 (Section 10) and Section 404 of the Clean Water Act (Section 404). Section 10 requires that a DA permit be obtained for certain structures or work in or affecting navigable waters of the United States (U.S.), prior to conducting the work (33 U.S.C. 403). Navigable waters of the U.S. are those waters subject to the ebb and flow of the tide shoreward to the mean high water mark in waters determined to be navigable by the Honolulu District. Section 404 requires a DA permit be obtained for the placement or discharge of dredged and/or fill material into waters of the U.S., including adjacent wetlands, prior to conducting the work (33 U.S.C. 1344). For regulatory purposes, the Corps of Engineers defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

Based on our review of the information you furnished, staff site visit to the proposed project location, and other resources available to our office, we have determined that your proposed project site does not contain waters of the U.S., nor any adjacent wetlands. However, please be aware that an isolated, non-jurisdictional stream was observed and will be crossed by the proposed project alignment. **Therefore, the proposed project site is not subject to Section 10 of the Rivers and Harbors Act of 1899 or Section 404 of the Clean Water Act, and any structure, work, or discharge of fill material does not require a Department of the Army permit.**

This letter contains an approved JD for the property in question and is valid for a period of five (5) years unless new information warrants revision of the determination before the expiration date. If you object to this determination, you may request an Administrative Appeal under Corps regulations at 33 Code of Federal Regulations (CFR) Part 331. We have enclosed a Notification of Appeal Process and Request For Appeal (NAP/RFA) form. If you request to appeal this determination, you must submit a completed RFA form according to the instructions in the RFA to the Corps' Pacific Ocean Division office at the following address:

Thom Lichte, Appeals Review Officer
U.S. Army Corps of Engineers
Pacific Ocean Division, ATTN: CEPOD-PDC
Building 525
Fort Shafter, HI 96858-5440

Should you have any questions, please contact Ms. Emilee Stevens of this office at the above address or telephone at (808) 835-4310 (FAX: (808) 835-4301) or by e-mail at emilee.r.stevens2@usace.army.mil. Please refer to File Number **POH-2012-00038** in all future communications with this office regarding this or other projects at this location.

Thank you for giving us the opportunity to review this proposal and for your cooperation with our regulatory program. Please be advised you can provide comments on your experience with the Honolulu District Regulatory Branch by accessing our web-based customer survey form at http://per2.nwp.usace.army.mil/survey.html.

Sincerely,

George P. Young, P.E.
Chief, Regulatory Branch

Enclosures

Final JD Form
Flowchart
RFA Document

Copy Furnished:

Mr. Ron Terry, Ph.D., Geometrician Associates, LLC, P.O. Box 396, Hilo, HI 96721

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix C Botanical Report

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FINAL DRAFT

VEGETATION STUDY FINAL REPORT

For

Saddle Road Extension,

Queen Kaahumanu Highway to Mamalahoa Highway

May 23, 2014

Prepared for:

Department of Transportation
State of Hawaii

Prepared by:

Grant Gerrish, Ph.D.
PO Box 91
Paauilo, HI 96776

And

DMT Consultant Engineers
200 Kohola Street
Hilo, HI 96720

FINAL DRAFT

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VEGETATION STUDY FINAL REPORT

For

Saddle Road Extension,

Queen Kaahumanu Highway to Mamalahoa Highway

1.0 EXECUTIVE SUMMARY

1.1 Project Description and Study Methods

This vegetation study is part of an environmental impact analysis for the proposed "Saddle Road Extension from Queen Ka'ahumanu Highway to Mamalahoa Highway" a straight-line distance of about nine miles. The purpose of the project is to improve safety, efficiency and operational capacity of traffic between East and West Hawaii, particularly for traffic on the recently realigned Daniel K. Inouye Highway (also known as Saddle Road), and to support special needs of truck and military traffic. An initial set of 11 alternative alignment segments was reduced to the five alternative alignments (Figure 1) now under consideration (Alignments #4, #5, #6, #4/5 and #4/5/6).

The project area is on the leeward slopes of Mauna Loa and Hualalai volcanoes in South Kohala and North Kona extending from 50 ft. elevation to about 2500 ft. elevation. Constructed features near the proposed alignments are limited to a few fences and unpaved "jeep roads," a power-line, and the two highways to be connected.

This vegetation study identifies plant (botanical) resources and analyzes the potential impacts, favorable and adverse, of the proposed action. The field studies included a "pedestrian," 100%-visual survey of a 250 foot-wide staked corridor for each alternative alignment. Attention was also directed outside the staked corridor to any nearby conspicuous plant or topographic feature.

1.2 Existing Environment

1.21 Vegetation Characteristics

A total of 35 different vascular plant species were detected within the alignments during the field surveys (Appendix A, Table A1). Of these, 3 are *endemic* (native to only Hawaii and found only in Hawaii), 4 are *indigenous* (native to Hawaii and other places), 28 are *introduced* (also called *alien* or *exotic* species).

The vegetation of the entire project area is dry grassland, sometimes with scattered trees. The most conspicuous biological feature of the study area is the ubiquitous presence of fountaingrass (*Cenchrus setaceus*, formerly *Pennisetum setaceum*), including the near-100% cover at higher elevation and the tenacity of sparse fountaingrass on raw lava flows where no other plants grow at all. Almost the entire ground cover is fountaingrass except in those parts of the project area where the surface is barren lava. A small number of native and introduced trees and shrubs occur with the fountaingrass in various places.

The percent cover of fountaingrass and the presence of various tree and shrub species was used to identify three general vegetation zones that occur at different elevations within the project area (Table 3; Figure 1). *Sparse Fountaingrass with Very Scattered Kiawe* is the low elevation vegetation zone, occurring from 50 ft. to about 850 ft. elevation. Much of this is extremely rough *'a'a* lava. Fountaingrass cover may be less than 0.1% and rarely more than 5%*;* the rest of the surface is barren lava. *Fountaingrass with Scattered Native Trees and Kiawe* occurs between 850 ft. and 1400 ft. elevation. Fountaingrass cover increases with elevation, generally varying from 40% to 100% cover; however, some areas are near barren with fountaingrass cover of 5% or less. Trees are still widely scattered, but much more frequent than at lower elevation. In addition to *kiawe* (*Prosopis pallida*), native trees can be found, although few and widely scattered. The most common of these are *wiliwili* (*Erythrina sandwicensis*) and *lama* (*Diospyros sandwicensis*). A very few individuals of rarer native tree species were also found in this vegetation zone. *Fountaingrass Pasture* is the predominant vegetation zone above the fence at approximately 1400 ft. elevation extending to the upper end of the project area near 2500 ft. elevation. Very few other plant species occur here. This land is currently used for cattle production

1.22 Endangered and Rare Plant Species

No endangered or rare native plant species occur in the study corridor or the immediate vicinity. In 2001 two individual plants of endangered species were found within 100 m of the staked study corridor. These were a single living *uhiuhi* (*Caesalpinia kavaiensis*) tree and a single living *hala pepe* (*Pleomele hawaiiensis*) tree. However, in 2003, both of these were found to have died, apparently due to natural causes.

1.23 Ecosystem Conditions and Trends

Climatic dryness and shallow soils combine to provide harsh growing conditions throughout the project area. Mean annual rainfall is between ten and about twenty inches. Much of the project area is on young lava flows with little or no soil. The original vegetation was mostly native trees and shrubs adapted to these conditions. There was probably only a sparse groundcover of native grasses and shrubs between the trees. These native dry-forest and dry shrublands have been completely altered by wildfire, domestic cattle, feral sheep and goats, and especially the invasion by fountaingrass, an aggressive introduced grass. All the native dry forest and dry grassland ecosystems throughout the state have been similarly degraded, leading to the observation that these are among Hawaii's most imperiled biological resources.

Domestic cattle have been pastured above 1400 ft. elevation for a long time and feral goats have ranged throughout the area. These ungulates (hoofed mammals) eat and kill tree seedlings and all young trees within their reach, preventing the re-growth of native trees. Fountaingrass invaded the area in the early 1900s with its ability to grow on near-barren lava. Fountaingrass also crowds-out and suppresses tree seedlings, but far worse, it promotes wildfire in a landscape that previously provided little fuel for fires. Wildfire also kills young, and sometimes older, trees but fountaingrass grows back quickly. Fountaingrass is now the dominant plant species throughout the project area. The remaining native trees are not able to reproduce; many are dying due to advancing age and they are disappearing from the landscape.

The fountaingrass-dominated vegetation has some beneficial values. In some places, the dense ground cover reduces soil erosion and subsequent water pollution. Fountaingrass is the basis for cattle ranching and goat hunting.

Although most of the project area is currently open or vacant land, this region is not likely to be an important area for conservation of native plant resources for several reasons. The area has few valuable plant resources remaining, has severe environmental degradation, and most of the land is privately owned and is not zoned or classified for conservation.

1.24 Probable Impacts and Recommendations

1.241 Wildfire

Analyses of regional wildfires conclude that the principle fuel is the dry leaf litter of fountaingrass and almost all fires start at roads (Personal Communication, M. Castillo US FWS, 2002). Construction, maintenance and operation of the proposed road would provide human access into areas that are now remote. It should be expected that fires would be started along the road accidentally and, perhaps, intentionally. This probability is greatest in areas where fountaingrass cover is sufficiently continuous to carry fire, approximately above the elevation of 1200 ft. The proposed roadway would, in some cases, be an aid in fighting wildfires ignited at other locations. It would provide access into areas that are now inaccessible to ground travel and the roadway itself would have the beneficial effect of providing a fuel break that might be sufficient to stop fires from crossing the road.

Wildfire is a serious threat to the remnant of native biodiversity in the study area and could spread to areas of higher conservation value outside the study area. Wildfire negatively affects beneficial ecosystem-functions, such as reduction of soil erosion. Wildfire reduces the economic value of lands used for pasture and could threaten homes and other structures in the Waikoloa area. In general, the areas that are prone to repeated wildfires are at higher elevations and on older substrates where fountaingrass cover is near 100%. Fires are infrequent below about 1200 ft; above this elevation wildfires may repeat at intervals of about ten years

1.242 Recommendations

It would be prudent to incorporate the fire prevention measures listed below into the design and maintenance of the entire roadway regardless of the alignment selected. It is recommended that basic fire prevention design, such as maintenance of wide, grass-free shoulders be adopted even in barren areas because of the possibility that fountaingrass cover may increase in future years.

1. Design the entire length of the roadway to keep sources of ignition from the road, such as discarded cigarettes and hot automobile exhaust systems, away from dry grass along the roadway.
2. Design the entire length of the roadway to be a fuel break as an aid in suppressing fires that originate at other locations.
3. Implement an aggressive maintenance program to keep the roadway grass-free.
4. Implement a policy of annual field survey of road and fuel conditions and adapt maintenance program as indicated.

2.0 INTRODUCTION

2.1 Project Description and Purpose

This vegetation study is part of an environmental impact analysis in accordance with the National Environmental Policy Act (NEPA) for the proposed "Saddle Road Extension from Queen Ka'ahumanu Highway to Mamalahoa Highway."

The proposed action is the construction and use of a new State Highway between Mamalahoa Highway (State Highway 190) and Queen Ka'ahumanu Highway (State Highway 19), a straight-line distance of about nine miles. The proposed new road would also provide a safe and efficient State highway link between Queen Ka'ahumanu Highway and State Highway 200, the Saddle Road (also known as Daniel K. Inouye Highway: State Highway 200) which currently terminates at Mamalahoa Highway. The purpose of the project, as stated in the Alternatives Analysis (DMT 2013) is to improve safety, efficiency and operational capacity of traffic between East and West Hawaii, and to support special needs of truck and military traffic travelling to the Pohakuloa Training Area.

Scoping activities and the Alternatives Analysis reduced an initial set of 11 alternative alignment segments for the proposed road to three alternative alignments (Figure 1) now under consideration (Alignments #4, #5, and #6, and shared portions). Beginning at Queen Kaahumanu Highway, the three alignments offer alternative routes for approximately five miles, then share common routes (Alignments #5/6 and #4/5/6) for the remainder of the distance to Mamalahoa Highway.

2.2 Scope of This Vegetation Study

The vegetation study for this proposed action included ground surveys of all proposed alternative alignments, study of archival documents such as maps and reports, and consultations with knowledgeable persons. The purpose of the study is to identify plants and plant (botanical) resources of the project area that might be affected by the proposed action. This report covers vascular plants only (ferns and flowering plants, not mosses, liverworts, algae, fungi or lichens). A discussion of the human values associated with various plant resources is included. The study endeavors to analyze the potential

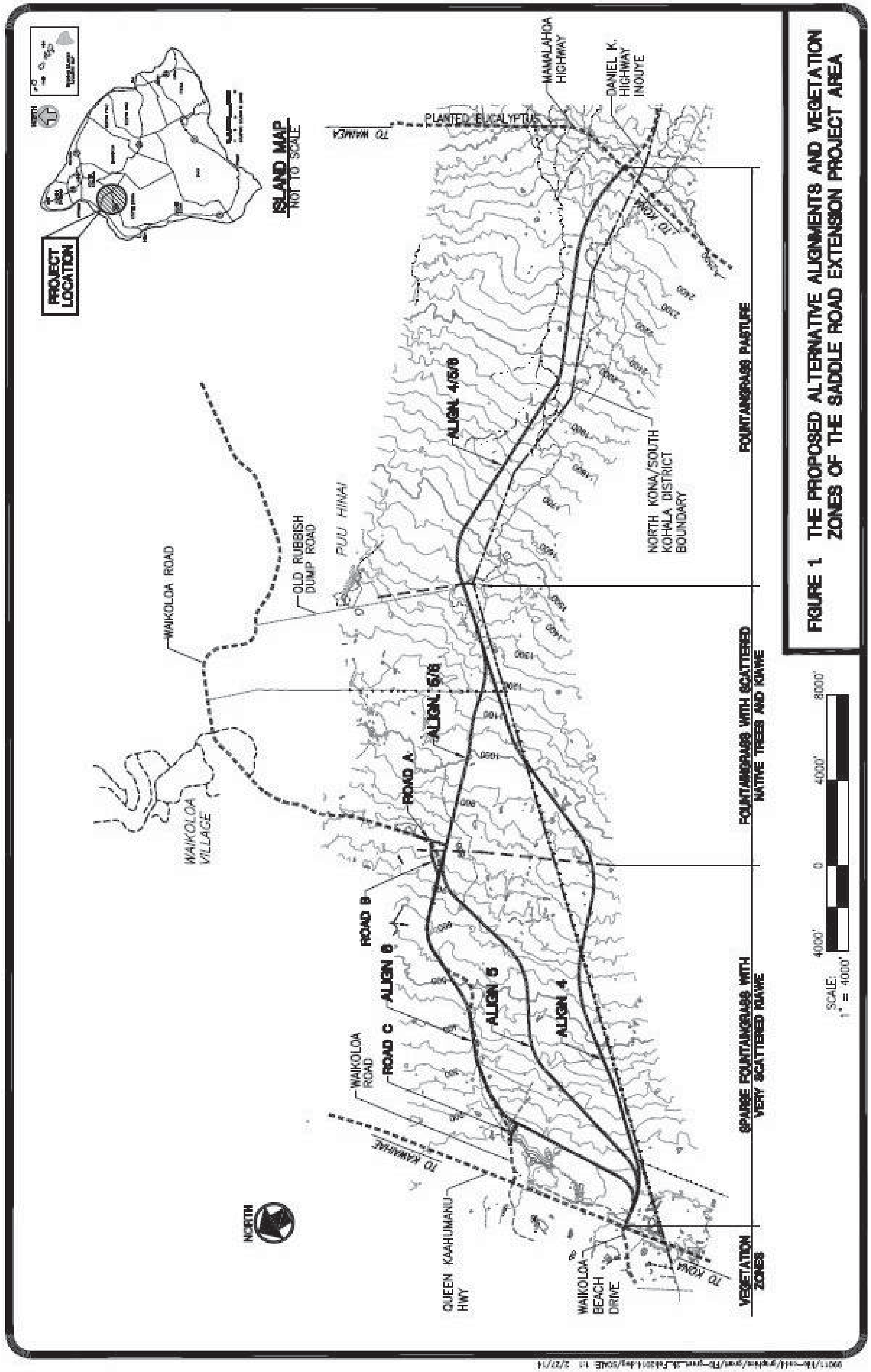

Figure 1. Map of the Study Area and the Alternative Alignments and Vegetation Zones.

impacts, favorable and adverse, of the proposed action on the plants and plant resources. The study includes recommendations to reduce any potential adverse impacts. Analysis of long-term, indirect effects caused by socio-economic change are beyond the scope of this vegetation study.

3.0 METHODS AND PROJECT AREA

3.1 Description and Locations of Proposed Alternative Alignments

The proposed action would take place within the part of the Island of Hawaii (Hawaii County) known as West Hawaii (Figure 1). Most of the project is within the District of South Kohala with a short portion of proposed Alignment #4 crossing into the District of North Kona. The project area is on the leeward slopes of Mauna Loa and Hualalai volcanoes extending from about 50 ft. elevation above sea level to about 2500 ft. elevation. Human land-use in the area includes cattle grazing, gravel quarrying and open land. Constructed features near the proposed alignments are limited to a few fences and unpaved “jeep roads,” a power line, and the two highways to be connected. Additionally, Alignment #6 follows the existing County road, known as Waikoloa Road, for about 2.5 miles. More detailed environmental description is given in the Results section, entitled “Major Factors Affecting the Vegetation of the Project Area.”

In this vegetation report, the terms “study corridor,” “study area,” and “project area,” are used with specific meanings. The study corridor is a precise 250 foot-wide zone that would include the proposed 120 foot-wide (minimum) right-of-ways of each proposed alternative alignment. These study corridors have been surveyed by land surveyors and stakes placed at 300-foot intervals along the center-line and along the outer limits of this 250 foot-wide zone. It is anticipated that almost all direct construction impacts would be within the right-of-way, and all such impacts well within the 250 foot-wide study corridor. Most of the direct impacts of road operation would also fall within this corridor.

“Study Area” is a less precise term used to include the study corridors and their immediate surroundings. The study area is the area that the team conducting the botanical field surveys could easily observe on the ground, in and near the study corridor. The study area is of variable width depending on the terrain. Most of the study area is in the South Kohala *ahupua'a* of Waikoloa; the approximate 1.5 miles of proposed alignment #4 that is in North Kona is in the *ahupua'a* of Puu Anahulu.

The "project area" is that portion of the South Kohala-North Kona region surrounding the proposed action. This project area shares the environment of the proposed action, is the region that would be most affected by the proposal, and is the area that can best provide examples and insights of the potential impacts of the proposed action.

3.2 Vegetation Study Methods

All parts of this vegetation study were conducted by Grant Gerrish (Ph.D. in Botanical Sciences from University of Hawaii at Manoa in 1988).

The vegetation study for the proposed action has three components: scoping activities, botanical field studies, and archival studies. The scoping activities included a low altitude helicopter flight over the entire project area in July, 1999, and preliminary review of maps and documents to determine which of the initial 11 proposed alternative alignments should be dropped from further review in the Environmental Impact Statement.

The field studies included a "pedestrian" survey of study corridors of all alternative alignments, meaning personnel walking along the staked alignments. The field team consisted of the botanist (Grant Gerrish) and one or more assistant. An assistant assumed major responsibility for locating survey stakes along the centerline of the study corridor, thus freeing the botanist to concentrate on botanical observations. The team examined one side of the study corridor at a time, thus completing a "100% visual survey" of one-half of the study corridor, i.e. a zone 125 feet-wide extending from the staked center-line to the staked outer boundary. A second pass was made to examine the other half of the study corridor. Exception was made for a 2000 foot length of Alignment #6 between 450 and 530 feet elevation and a 3000 foot length of Alignment #4 between 990 and 1180 ft. elevation where the only vegetation is very sparse fountaingrass and the terrain is extremely difficult 'a'a lava. The 250 ft. wide study corridor was surveyed in a single pass in these two sections. Attention was also directed outside the staked corridor to any nearby conspicuous plant or topographic feature. All plants seen were recorded with notes of their abundance and distribution (Table 1.). Notes were made of environmental and ecological conditions such as evidence of wildfire or the presence of goats.

Table 1. Meaning of the abundance terms used to describe plants of the study area. These terms were assigned based on visual estimates made by the same botanist throughout the project.

Dominant: Found throughout the vegetation zone in great abundance and dominating the function of the ecosystem.

Common: widely distributed throughout the vegetation zone and numerous enough to be conspicuous from many observation points; this includes trees that are widely scattered, but conspicuous because of the open nature of the vegetation.

Frequent: widely distributed throughout the vegetation zone but low in numbers and not a prominent component of the vegetation.

Infrequent: found only in one or a few locations within the vegetation zone and low in numbers; includes species with only one individual found.

Planning and environmental assessments for the Saddle Road Extension were begun prior to the year 2000. The initial botanical survey of all the proposed alternative alignments was conducted in November of 2001. Subsequently, four revisions were made to two of the originally proposed alignments to avoid sensitive resources discovered during the initial field surveys or for other reasons. Additional surveys were conducted in 2002 and 2003 to cover these minor revisions and to view the study area under different seasonal conditions. The field surveys were again updated in 2006. In June and July of 2012 all the alignments above 800 feet elevation were again studied by a pedestrian survey to detect any changes to the vegetation and to survey the revised upper terminus of Alignment 4/5/6. Data from all these field surveys are integrated in this report.

The archival studies sought information from all available sources, including maps, published literature, unpublished papers and technical reports, and interviews with persons knowledgeable about the area and the plant resources there. These studies included a literature search to determine which, if any, plant species listed or proposed for listing as endangered or threatened by the U. S. Fish and Wildlife Service might occur within project area. Such listed plants are legally protected by federal and State law. The lists of threatened and endangered plants provided by USFWS, Pacific Islands Office, Honolulu were reviewed. The ranges of listed and proposed endangered plants were determined from the Manual of Flowering Plants of Hawai'i (Wagner et al. 1990). The botanical field studies and archival studies were fully integrated and overlapped in time.

In this report, the names (nomenclature) used for flowering plants follow Wagner et al. (1990) with updates from "Flora of the Hawaiian Islands" as posted on the Smithsonian Museum of Natural History website (Smithsonian Institution and the National Tropical Botanical Garden). Fern identification and nomenclature follows Palmer (2003). In this report, plant species are identified by common name with the botanical name given the first time the species name is mentioned. Species lists are given in Appendix A with plants listed alphabetically by botanical name in Table A1 and alphabetically by common name in Table A2.

4.0 RESULTS

4.1 Summary of All Plant Species Found

A total of 36 different vascular plant species were seen during the field surveys (Appendix A, Table A1). Of these, 4 are *endemic* (native to only Hawaii and found only in Hawaii), 5 are *indigenous* (native to Hawaii and other places), 27 are *introduced* (brought to Hawaii by people; also called *alien* or *exotic* species). One of the introduced species, yellow wood sorrel (*Oxalis corniculata*), was introduced by the early Polynesian settlers.

The study area was found to have low diversity, both in terms of the total number of plant species and the disproportionate representation of just one species: fountaingrass (*Cenchrus setaceus*). Fountaingrass is far more abundant than all of the other plant species combined and is the only species present in all four vegetation zones (Table 2 & 3). This bunchgrass characterizes the entire project area more than any other species. Of the remaining 35 species, only three were ranked as "common" and of these, only *kiawe* was common in more than one vegetation zone. Four species were ranked as "frequent" and the remaining 28 species are "infrequent." Of the 4 endemic species, two tree species (*lama*, *wiliwili*) are common in the study area, but in only one vegetation zone. In addition to *lama* and *wiliwili*, three other endemic trees were found within the study area, but outside the study corridor. Only one individual of each of these three species was found (see Section 4.6).

Table 2. Summary of plant species of the three vegetation zones grouped according to "abundance" (see Table 1 for explanation of terms; "infrequent" species not shown). Letter codes before species names indicate Origin (E = endemic, I = Indigenous, and X = Introduced) and Life Form (T = Tree, S= Shrub, H = Herb, G = Grass or grass-like).

	Zone I	Zone II	Zone III
Dominant	X G fountaingrass	X G fountaingrass	X G fountaingrass
Common	X T *kiawe*	E T *lama* X T *kiawe* E T wiliwili	
Frequent	X G buffelgrass I S *uhaloa*	X H *'akulikuli* X G buffelgrass	X T *koa haole*

Table 3. The three vegetation zones of the proposed alternative alignments.

	ALIGNMENTS IN ZONE				
	4	5	6	5/6	4/5/6
ZONE I Sparse Fountaingrass and Very Scattered Kiawe	X	X	X		
ZONE II Fountaingrass with Scattered Native Trees and Kiawe	X			X	X
ZONE III Fountaingrass Pasture					X

4.2 Summary of Botanical Resources of Project Area

4.21 Fountaingrass Cover

The most conspicuous biological feature of the study area is the ubiquitous cover of fountaingrass, including the near-100% cover at higher elevation and the tenacity of sparse fountaingrass on raw lava flows where almost no other plants grow at all. This large bunchgrass is an introduced species and forms a completely non-native vegetation cover. Putting aside, just for the moment, the serious concern that fountaingrass interferes with native species and makes their recovery in the region all but impossible, the fountaingrass grassland can be evaluated for ecosystem values and services that it may provide.

Two basic services of the fountaingrass cover can be identified: it provides plant forage for mammals, mostly domestic cows and feral goats, and it reduces wind and water erosion. The grazing of cattle is of some economic benefit, the feral goats provide some hunting opportunities. Prevention of erosion protects regional air and water quality and maintains productivity of the land. It is difficult to determine if there might be other species better able to perform these services in this area. Fountaingrass clearly has the ability to grow and thrive in this harsh, dry environment.

4.22 Native Trees and Shrubs

The two endemic tree species (*lama*: Diospyros sandwicensis, and *wiliwili*: Erythrina sandwicensis) that were found in the study corridor are restricted to dry habitats in Hawaii. These two are relatively common, although widely scattered, in the study area between 850 ft. and 1400 ft. elevation. Seven living *lama* and one *wiliwili* trees were found within the study corridors of Alignment 5/6 and 4/5/6 in 2012. (UTM coordinates in Appendix B.) It is estimated that roughly 100 to 200 individuals of each species might occur within sight of the study corridor. Only mature trees were found in the study area, no seedlings or small trees. Several dead trees of each species were also found within the study corridor and dead trees are common in the nearby study area.

4.23 Introduced Trees and Other Plants

No notable introduced plants or communities of such plants occur in the study area. No introduced plants known to have significant economic, social or cultural values were found. However, as explained in the next section, one introduced plant, tree tobacco (*Nicotiana glauca*) may contribute to the welfare of an endangered Hawaiian animal.

4.24 Tree Tobacco: Host for an Endangered Endemic Insect

Pulelehua (*Manduca blackburni*) is a large endemic moth also known as Blackburn hawk moth or Blackburn's Sphinx Moth, and is a listed endangered insect. The caterpillar of this moth feeds on members of the nightshade family, including some introduced species such as tree tobacco (*Nicotiana glauca*). Tree tobacco occurs throughout the Waikoloa area.

Three tree tobacco plants were found within the study corridors and others were observed outside the study corridor. The locations of these plants are given below.

Table 4. Location of tree tobacco (*Nicotiana glauca*) in and near the study corridor in 2012.

Location	Elevation (ft.)	Observation
Inside Align #5/6	1150	1 plant
Inside Align #4/5/6	1350	1 plant
Outside Align #4/5/6	1890 to 1990	Population
Outside Align #4/5/6	2139	2 plants
Inside Align #4/5/6	2393	1 plant

4.3 Original Vegetation of the Project Area

It is not clearly known what the original vegetation of South Kohala and North Kona was since it appears that the early Polynesians had modified the vegetation prior to western contact in the late 18th century. It is likely that the natural vegetation was a dry forest of native tree species in anyplace where mean annual rainfall is greater than about 20 inches. Native dry grasslands were probably prevalent at lower elevations and coastal areas with less than 20 inches of rainfall. Early Hawaiians may have reduced the extent of forest by intentionally setting fires that favored the spread of *pili* grass (*Heteropogon contortus*) at the forest's expense. (Gagne and Cuddihy 1990; Mueller-Dombois and Fosberg 1998).

In early times, the young lava flows in the driest regions were essentially barren. Today, above 900 ft. elevation where annual rainfall is between 10 and 20 inches, the native *lama* (*Diospyros sandwicensis*) and *wiliwili* (*Erythrina sandwicensis*) are widely scattered on lava flows despite the near-absence of soil. These trees appear to be a relic of the earlier dry forests of the project area that were probably more diverse. The twentieth century invasion by fountaingrass profoundly altered the landscape, dotting the once naturally barren flows with tussocks of grass. In the somewhat moister, higher elevations of the project area, the fountaingrass usually forms a single-species cover over 50 to 100% of the land surface.

4.4 Summary of the Present Vegetation Zones of the Project Area

The vegetation of the entire project area is dry grassland, sometimes with scattered trees. Fountaingrass (*Cenchrus setaceus*), an introduced grass, is the single dominant species throughout the study area and the entire surrounding area. In fact, almost the entire ground cover is fountaingrass except in those parts of the project area where the surface is barren lava. The basic biological properties of fountaingrass strongly determine ecosystem characteristics. These properties include the ability to become established and thrive on dry, barren lava flows where few other plants can; and the tendency to promote wildfire. A small number of native and introduced trees and shrubs occur with the fountaingrass in various places.

Two plant community characters that vary within the project area are the cover, or extent, of fountaingrass and the presence or absence of widely scattered trees. "Cover" is the average percentage of the ground area covered by fountaingrass shoots. Fountaingrass cover within the project areas varies from less than one percent to one hundred percent. In general, the percent cover of fountaingrass increases with increasing elevation and on older lava flow substrates that have accumulated more soil or fine rock fragments. Nearly all the surface not covered by fountaingrass is barren. The introduced *kiawe* tree (*Prosopis pallida)* is the most widely distributed tree in the study area. The two endemic trees, *wiliwili* and *lama* are frequently seen at certain mid-level elevations.

The percent cover of fountaingrass and the presence of various tree and shrub species can be used to identify the following three general vegetation zones that occur at different elevations within the project area (Table 2; Figure 1).

Sparse Fountaingrass with Very Scattered Kiawe is the low elevation vegetation zone, occurring from 50 ft. to about 850 ft. elevation. Much of this low elevation band is on an expanse of extremely rough *'a'a* lava. Here, fountaingrass cover may be less than 0.1% and rarely more than 5%. Nevertheless, goat droppings are found all across the barren *'a'a* and widely scattered grass bunches may show evidence of recent wildfire. The small areas of smoother *pahoehoe* lava usually have more fountaingrass cover, up to 50% or more. A few introduced *kiawe* trees and the small, indigenous shrub, *uhaloa* (*Waltheria indica*) may be found on either lava type.

Fountaingrass with Scattered Native Trees and Kiawe occurs between 850 ft. and 1400 ft. elevation. Fountaingrass cover increases with elevation, generally varying from 40% to 100% cover; however, some areas are near barren with fountaingrass cover of 5% or less. Trees are still widely scattered, but much more frequent than at lower elevation. In some places near the proposed alignments, trees are numerous enough to form open groves. In no place do trees form a closed stand with their canopies forming a complete cover. It is in this vegetation zone that, in addition to *kiawe*, native trees can be found. The most common of these are *wiliwili* and *lama*. A few individuals of rarer native tree species were also found in this vegetation zone.

No seedlings, saplings or small trees of the native trees, *wiliwili* and *lama* were seen in the study area. The observation of only mature trees is a strong indication that these trees are not reproducing in this area. Furthermore, a large number of dead and dying *wiliwili* were observed. If these trends continue, these native species will gradually disappear from the area. Personal observations indicate that this is the trend throughout the North Kona/South Kohala Dry Forest and Grassland habitat The frequent wildfires often, but not always, kill the trees in their path.

Fountaingrass Pasture is the predominant vegetation zone above the Old Rubbish Dump Road and fence at approximately 1400 ft. elevation. The vegetation from 1400 ft. to the upper terminus at Mamalahoa Highway at 2500 ft. elevation is identified as *Fountaingrass Pasture* because very few other plant species occur here and this land is currently used for cattle production. In most places, fountaingrass forms a dense cover over nearly 100% of the surface. With few exceptions, living trees are limited to a few individuals that grow in lava tube skylights or collapsed portions of lava tubes. Apparently, these pits provide a combination of improved soil moisture and protection from wildfire and from grazing and browsing that allow mature native and introduced trees to survive. Seedlings, saplings or other small trees are entirely lacking. Standing and fallen dead tree trunks and dead shrubs indicate that there were considerably more woody plants here in the past. Many standing dead trunks and logs show burn marks, but it cannot be concluded that fire was the cause of death. At any rate, it appears that there has been a trend towards fewer woody plants, leaving only fountaingrass.

4.5 Detailed Vegetation Description Along Alignments

In this section, the vegetation along each of the five alternative alignment segments, with all revisions, is described from low (*makai*) elevation to high (*mauka*). These descriptions cover the plants within the 250 foot-wide study corridors and the adjacent areas. The location of any specific resource, such as a rare native tree, is specifically stated as inside or outside the study corridor.

4.51 Vegetation of Alignment #4

Alignment #4 begins at the lower terminus of the proposed highway and follows the South Kohala/North Kona boundary to the junction with proposed Alignment #5/6 at 1280 ft. elevation (Figure 1). A power transmission line and service road also follow this boundary. The proposed alignment deviates to the south from the boundary between 550 and 1000 ft. elevation to provide a safety buffer around the nearby quarry.

Alignment #4 traverses the *Sparse Fountaingrass with Very Scattered Kiawe* and the *Fountaingrass with Scattered Native Trees and Kiawe* vegetation zones. In fact, there is very little vegetation anywhere along this alignment except the fountaingrass ground cover. The general appearance is of extensive, rugged lava flows with variable fountaingrass and widely scattered trees.

Alignment #4 begins at 50 ft. elevation on an extensive flow of rough ‘a’a lava that is nearly devoid of plant life. A few sprigs of fountaingrass and shrubs of *uhaloa* grow on this flow. Between 100 and 240 ft. elevation the alignment crosses a smooth pahoehoe flow with about 30% fountaingrass cover and widely scattered *kiawe* trees. From 240 ft. to 360 ft. elevation the alignment traverses ‘a‘a with 1 to 2 % fountaingrass cover. From 360 ft. to about 460 ft. elevation the substrate is again pahoehoe lava with up to 60%. Abundant fecal pellets of goats and signs of recent wildfire were found throughout the section described in this paragraph in 2001.

From 460 to 980 ft. elevation the alignment traverses a desolate stretch of ‘a’a lava with 1 to 5% fountaingrass cover and very few *kiawe trees.* A couple of pahoehoe patches within this section support denser stands of fountaingrass, averaging about 50% cover with a few *kiawe* trees. At the higher elevations, the fountaingrass cover on the ‘a’a increases to 50% or more. No other species were recorded on either lava type, except ephemeral introduced pasture herbs and the indigenous fern, *pololei*, following winter rains.

From 980 ft. elevation to the upper end of this segment at 1280 ft. elevation, the alignment is within the *Fountaingrass with Scattered Native Trees and Kiawe* vegetation zone. The substrate is mostly ‘a’a lava with highly variable fountaingrass cover sometimes reaching 100%. Native *wiliwili* and *lama* trees are sparsely scattered through this region but only one *lama* falls within the study corridor. North of the alignment, near 1100 ft. elevation, a broad *kipuka*-like swale supports several large and conspicuous *wiliwili* trees, as well as a number of *lama* and *kiawe*.

4.52 Vegetation of Alignment #5

Proposed Alignment #5 begins at the lower terminus of the proposed highway and ends at a point on the existing Waikoloa Road at 750 ft. elevation where it joins with proposed Alignment #6 (Figure 1).

This alignment is entirely within the *Sparse Fountaingrass with Very Scattered Kiawe* vegetation zone. It begins at 50 ft. elevation on a near-barren flow where only a few small plants of fountaingrass and *uhaloa* grow. From 100 to 190 ft. elevation the alignment crosses a pahoehoe flow with an average cover of 50% fountaingrass and *kiawe* trees scattered with an average spacing of about 150 ft.

From 190 to 320 ft. elevation, the alignment is on a mosaic of substrates including smooth pahoehoe and a lava type "transitional" between 'a'a and pahoehoe. The pahoehoe portions support 50% fountaingrass cover and *kiawe* growing in an open grove. The transitional substrate is the only part of the project area that is not dominated by fountaingrass! An extent of about 800 feet of the alignment near 250 ft. elevation is partly within a different plant community dominated by a native grass *kawelu* (*Eragrostis variabilis)*. This species was not encountered anywhere else within the study area, but it is well-known in this region. Two other plant species were found with the *kawelu* that did not occur, or were very uncommon, elsewhere. These are the small native shrub, *'ilima* (*Sida fallax*), and an introduced grass, brome fescue (*Vulpia bromoides*). Very little fountaingrass occurred within this grassland community. This *kawelu* grassland community extended a short distance north of the alignment but no other patches were found in the area. The transitional lava type is much more extensive than the *Kawelu* grassland and is dominated by fountaingrass in all other areas. It is not known why this distinct grassland community occurs at this place.

The alignment passes through a rock quarry from 320 to 380 ft. elevation. This entire area is either graded or has been deeply quarried and is devoid of vegetation. From 380 ft. elevation to the intersection of Waikoloa Rd. at 750 ft. elevation the terrain is rugged, near-barren 'a'a. Overall, fountaingrass cover is, perhaps, 0.1% and no other plants were found. Nevertheless, goat fecal pellets were observed on this nearly-impassable lava flow.

4.53 Vegetation of Alignment #6

Proposed Alignment #6 begins at the lower terminus of the proposed highway and then continues to the nearest point on the existing Waikoloa Rd. at about 150 ft. elevation. From this point, it follows the right-of-way of Waikoloa Rd. to about 750 ft. elevation where it joins proposed Alignment #5.

The entire alignment, from 70 to 750 ft. elevation is within the *Sparse Fountaingrass with Very Scattered Kiawe* Vegetation Zone. Most of this alignment is either across barren a'a' devoid of plant life, except for a miniscule sprinkling of fountaingrass clumps, or follows the existing Waikoloa Rd., approximately between milepost 1 and 3.

This alignment begins at 70 ft. elevation and the first 1000 feet cross rough ‘a’a lava with a very few individual fountaingrass and *uhaloa* plants. At this point the alignment enters a *kipuka* of older pahoehoe lava that supports a cover of fountaingrass averaging 20% and scattered *kiawe*; no other plant species were recorded within the alignment here. From 100 to 120 ft. elevation the alignment is again on barren ‘a’a.

For an extent of 2000 feet, from 100 to 150 ft. elevation, the alignment crosses an area that appears to have been graded, perhaps in connection with the nearby old quarry. The surface appears as weathered pahoehoe and there are a couple of deep gorges that appear to be sites where material was excavated. This disturbed area supports slightly more plant life than the surrounding natural lava flows, including fountaingrass, buffelgrass, *uhaloa*, and several crown flower trees (*Calotropis gigantea*).

The alignment joins the existing Waikoloa Rd. at 150 ft. elevation and follows it, with two departures to straighten curves, to the alignment’s end at 750 ft. elevation. The terrain outside the existing roadway in this segment is barren ‘a’a lava with a very few fountaingrass plants. Wide berms and other graded or disturbed areas have been created along much of the existing roadway such that the proposed alignment #6 would disturb very little new surface here. Eleven species of introduced roadside weeds, including grasses, herbs and low shrubs, that were not found elsewhere occur on the shoulders of the existing road.

4.54 Alignment #5/6

Proposed Alignments #5 and #6 join at Waikoloa Rd., forming proposed Alignment #5/6 that continues to 1280 ft. elevation where it joins with proposed Alignment #4.

A short distance above Waikoloa Road, Alignment #5/6 enters the *Fountaingrass with Scattered Native Trees and Kiawe* vegetation zone. Near 800 ft. elevation the alignment passes near a grove of *kiawe* trees that is visible from Waikoloa Road. Around 950 ft. elevation the alignment passes near the first native *wiliwili* and *lama* trees. These native trees become somewhat more frequent above this point with five living *lama* trees and one living *wiliwili* tree within the study corridor between 860 and

1120 ft. elevation (Appendix B). Within this segment fountaingrass cover is variable but averages about 5 to 10%.

In the initial survey in 2001, an endangered tree was found near 1000 ft. elevation (see Section 4.6). A revision of the alignment was made to maintain a minimum distance of 100 ft. between the tree and the proposed right-of-way. A re-survey in 2003 found that this tree had died, apparently of natural, stress-related causes.

Above the junction with the Powerline Road at 1170 ft. elevation to the junction with proposed Alignment #4 at 1280 ft. elevation, the substrate is again a pahoehoe-ʻaʼa transitional type of lava averaging 50 to 60% fountaingrass cover.

4.55 Alignment #4/5/6

Proposed Alignment #4/5/6 is formed from the junction of Alignments #4 and #5/6 at 1280 ft. elevation and continues to the upper terminus of the proposed highway at the junction with Mamalahoa Highway and Saddle Road at about 2500 ft. elevation.

At and above the origin at 1280 ft. elevation this alignment traverses a substrate of transitional pahoehoe-ʻaʼa lava. A few *lama* trees occur here and large *wiliwili* trees are conspicuous, although widely spaced, and none within the study corridor. There is little change in vegetation between this point and the lower pasture fence at 1370 ft. elevation. Signs of goats are abundant and charred fountaingrass clumps showed evidence of wildfire in 2001. A few weedy species were found widely scattered, including partridge pea, *'akulikuli* (*Portulaca pilosa*), and tree tobacco (*Nicotiana glauca*), as well as a small amount of the pasture grass known as “buffelgrass” (*Cenchrus ciliaris*).

The *Fountaingrass Pasture* Vegetation Zone begins at the lower pasture fence at 1370 ft. elevation. This zone extends from this point to the terminus at 2500 ft. elevation. The substrate is rugged, weathered pahoehoe that supports a cover of 50 to 100% fountaingrass, perhaps averaging 90% cover. A small amount of buffelgrass and a very few other weedy plants are mingled with the fountaingrass. Goat fecal pellets and charred fountaingrass tussocks are abundant along this segment. The most interesting features within this area are "skylights" of collapsed lava tubes that have several tree species in them. All these skylights or pits are accessible to goats and people and some show signs that wildfire has burned into them. The trees found in skylights include *haole koa*, large *wiliwili* trees, and one ʻ*ohe makai* (*Reynoldsia sandwicensis*), a rare endemic tree (In 2003, this tree was found to have died). The original alignment crossed a string of these skylights near 2080 ft. elevation. Two pits harboring large *wiliwili* trees were within the alignment. The *ʻohe makai* was a short distance south of the alignment. The alignment as now proposed has been revised to minimize adverse impact by avoiding these pits and the resources they harbor. Virtually no trees or shrubs occur in this area except in these numerous pits. .

As the alignment approaches the upper terminus at Mamalahoa Highway, evidence of intensive cattle grazing becomes more evident. The fountaingrass and the very few shrubs present are heavily grazed. Only a very few *haole koa* and indigo shrubs were found living in 2012. A number of dead small trees and shrubs were found, apparently of the two species just named.

4.56 Vegetation of Roads A and B

These short alignments are between 700 and 800 ft. elevations on mostly barren ʻaʻa. Road A has fountaingrass cover varying from 1 to 20% cover and several mature *kiawe* trees in the proposed alignment. Road B has less than 1% fountaingrass cover with some *kiawe* north of the alignment, but none within it.

4.57 Vegetation of Road C

This alignment makes a short connection Between proposed Alignment #6 and the existing Waikoloa Road near 150 feet elevation. This is an area where the lava has been graded and disturbed with scattered vegetation of fountaingrass, buffelgrass, a few crown flower trees and other weedy introduced species

4.6 Endangered and Rare Plants Found In The Project Area

No listed endangered or threatened plant species occur within the 250 foot-wide study corridors of the alternative alignments nor are any living rare or endangered plants known within the immediate vicinity of the study corridors.

During the initial survey in 2001, single individuals of two listed endangered tree species, *uhiuhi*, (*Caesalpinia kavaiensis*) and *hala pepe* (*Pleomele hawaiiensis*) were found near, but not in, the study corridor and one individual tree of a "species of concern," '*ohe makai*, (*Reynoldsia sandwicensis*), was also found near the study corridor. Unfortunately, all three of these rare trees were found to have died by June 2003. The locations of these three trees have been provided to the US Fish and Wildlife Service and the State of Hawaii Division of Forestry and Wildlife. Precise locations are not given in this report. See section 5.221 in the Discussion for further evaluation of these plants and the species they represent as part of the native biota of the study area.

4.7 Major Factors Affecting the Vegetation of the Project Area

4.71 Rainfall and Soil

The climate of the project area is sunny and dry, with little variation month-to-month (Juvik and Juvik 1998). The mean annual rainfall of the study area ranges from about ten inches at the lowest elevation to somewhat more than twenty inches at the highest elevation (DLNR 1986). Low rainfall and intense sunshine result in low moisture that restricts plant growth.

The climatic dryness is exacerbated by poorly developed soils. Study area substrates range from solid lava to shallow, sandy soils that store little moisture. From Mamalahoa Highway down to about 1,400 ft. elevation the substrate is mostly 5000 to 10,000 year old lava flows from Hualalai with very fine sandy soils. Below this elevation, the substrates are all Mauna Loa lava flows with virtually no soil present. Most of the area is covered with very rugged 'a'a flows between 1500 and 5000 years old. Smaller areas are made up of pahoehoe lava 5000 to 10,000 years old that provides somewhat better plant habitat than the younger 'a'a flows.

4.72 Land Use

All of the study area within Waikoloa, South Kohala is privately owned. The 1.5 mile section of Alignment #4 in Puu Anahulu, North Kona is owned by the State of Hawaii and is part of the Puu Anahulu Game Management Area (GMA). The GMA is open to public hunting. However, access to this portion of the GMA is restricted by locked gates on all jeep roads across the private lands of Waikoloa.

A relatively large area of Alignment #6 between 120 ft. and 380 ft. elevation has been disturbed by rock quarrying activity. The disturbance ranges from surface grading to the digging of deep gravel pits. Another, newer rock quarry is in operation between 700 and 950 ft. elevation on land between Alignments #4 and #5.

The study area land above 1400 feet is used by Parker Ranch to graze cattle. Few cross-fences exist in this pasture and it appears that management and grazing is not intensive at this time.

One power-line traverses much of the study area and a jeep road is maintained to service it.

4.73 Introduced Species

As has been amply stated above, the vegetation of the project area is dominated by the introduced fountaingrass and this grass determines the nature of the whole region. This species makes up the bulk of plant biomass that supports the herbivores of this ecosystem. At the higher elevations, the dominance of fountaingrass is at the expense of other species, including the original native vegetation of this environment. In many areas below 1400 feet elevation, and especially below, 850 feet elevation, fountaingrass is becoming established on lava substrates where no other species is able to survive. Fountaingrass produces dry litter that promotes wildfire and is itself stimulated by burning.

Kiawe is another introduced species of some ecological significance. This introduced tree, like fountaingrass appears to be able to thrive in dry environments where few other plants can. It is the tallest growing tree in or near the study corridor Because *kiawe* is widely scattered in the study area, it is unlikely to have a strong, negative impact on native plants.

Introduced animals, especially feral goats, play a major role in this ecosystem. Evidence of feral goats is abundant throughout the study area and many were seen during each of the field studies, even on nearly barren lava flows. Trees of all species have a “browse line” about five feet above the ground showing the height the goats can reach in pursuit of twigs and young leaves. The grazing of introduced cattle, mentioned above, has an effect similar to that of goats. Trees or tree seedlings less than 5 feet high are nearly non-existent, at least partly due to these browsing and grazing activities.

4.74 Wildfire

4.741 Information sources

The sources of the wildfire history discussed here are observations from the 2001botanical survey of the proposed alternative alignments and a map entitled "Draft North Kona Fire History" prepared in 2001 by the U.S. Fish and Wildlife Service, Pacific Islands Office. This map was compiled from a Geographic Information System (GIS) database maintained by the State of Hawaii, Department of Land and Natural Resources, and the US Fish and Wildlife Service. This database contains wildfire location information from the 1950s to the present time. However, it appears that records from the 1950s and 1960s may be incomplete. The data from the 1980s, 1990s and early 2000s is probably very reliable. The map shows few fires in the 1970s; it is not know if this reflects a time of few fires or incomplete information.

The following analysis seeks to find environmental factors correlated with the historical pattern of wildfires. Major factors investigated are elevation and substrate age (USGS 1996), and to a lesser extent, vegetation density.

4.742 Recent Regional Wildfire History

The fire history maps show that a large number of wildfires have occurred in South Kohala and North Kona, including many that burned the proposed alternative alignments. Some areas have never been burned in the last 50 years, some have been known to burn once, and some have burned two, three or possibly more often, in this time period.

In general, the areas that are prone to repeated fires are at higher elevations and on older substrates. One of the largest concentration of fires repeatedly burning the same areas is in the land of Puu Anahulu immediately southeast of the study area and within the upper elevations of the project area itself. Numerous wildfires have burned above (up-slope) the Mamalahoa Highway at about 2500 ft. elevation; a lesser number of wildfires have been recorded between 1200 ft. and 2500 ft. elevation. The prevalence of wildfires above Mamalahoa Highway may be related to two factors: higher fuel availability associated with higher vegetation density at this elevation and the role of the highway as a source of ignition of human-caused fires coupled with the tendency of wildfires to burn up-slope. The higher vegetation density at higher elevation is, in turn, correlated with older lava flows, more developed soil, and slightly higher rainfall and cooler air temperatures that allow more fuel to accumulate.

It is important and informative for this project to examine the low elevation fires that defy the above generalization. Three large, low-elevation fires near the project area are recorded. The "1973 Lalamilo" fire burned from 200 to 1200 ft. elevation north of Waikoloa Road on very old Mauna Kea substrates. The "1989 Puu Anahulu" fire burned from 650 to 1300 ft. elevation across Mauna Loa lava flows ranging in age from 1500 to 5000 years old. The "1999 Puu Waawaa" fire burned from about 300 ft. elevation to the Mamalahoa Highway near 2500 ft. elevation and was on lava flows from Hualalai ranging from 3,000 to 10,000 years old. These latter two fires overlapped some of the same area, showing that ten years of fuel growth may be sufficient to support the return of wildfire even at low elevation.

In summary, there have been historical fires at nearly all combinations of elevation and lava flow age corresponding to those found in the project area. Fires are infrequent, at elevations below about 1200 ft. and on lava flows less than 3,000 years old. On lands above this elevation with lava substrates 3,000 years old or older, wildfires may repeat at intervals of ten years or more.

4.743 Wildfires of the Study Area

Three large, overlapping wildfires are recorded from Mamalahoa Highway down to the elevation of Puu Hinai (about 1200 ft.). These occurred in 1969, 1987 and 1998. Field notes from the botanical survey show that above this elevation fountaingrass cover averages at least 50%. Below this elevation, fountaingrass average cover rapidly drops to below 5% and to 1% or lower over extensive areas.

No wildfires are recorded within the study area below 1200 ft. elevation. However, the botanical survey in 2001 found remnants of burned grass, clear evidence of wildfire, over a relatively large area between 100 and 500 ft. elevation along Alignments #4 and #5. If these observation points indicate the occurrence of a single, connected fire within the last several years, they would indicate a burn area of at least 4,000 feet in diameter. Some of this area is pahoehoe lava with up to 50% fountaingrass cover, but much of it is 'a'a lava with only 1 to 2% fountaingrass cover. It was observed that scattered clumps of fountaingrass had been burned, even when clumps were isolated by ten feet or more of barren lava.

4.744 Factors Governing Pattern of Wildfires

Wildfires require fuel and an ignition source, and are promoted by warm, dry conditions. The regional climate is hot and dry, at least at times, throughout the project area. The principle fuel is the dry leaf litter of fountaingrass, a large bunchgrass. Analyses of regional fires conclude that almost all fires start at roads by the accidental or intentional actions of humans (Personal Communication, M. Castillo US FWS, 2002)

The fuel-load of fountaingrass and other plants is variable within the project area. The density and ground cover of fountaingrass can be related to available moisture, which is in turn determined by the interaction of rainfall and substrate or soil type. In the project area, rainfall increases somewhat from low elevation to high elevation. Older substrates with more developed moisture-holding soil also occur at higher elevations in the project area. Correlation between the fire history map and field observations during the botanical survey indicate that most fires have occurred in areas that are currently supporting a fountaingrass cover of 50% or more of the surface. However, observations indicate that fires can burn in areas with fountaingrass cover as low as 1%. Perhaps sparse fountaingrass burns on these ‘a’a flows when they are near other flows with denser fountaingrass that provide a windblown shower of sparks when it burns.

The fuel-load of fountaingrass also varies over time. Analysis of the fire history map show that at least ten years usually passes between wildfires at the same place, but this observation is based on only a few decades of good records and should be considered tentative. The drier areas that appear to have insufficient fuel to carry fire may slowly accumulate sufficient fuel more slowly. It is also possible that there is a long-term trend in parts of the project area of continuing invasion by fountaingrass and future years will see increasing cover (Gagne and Cuddihy 1990). An increase in cover, even on near-barren lava flows would be expected in the event of several years with rainfall greater than the norm.

It must be recognized that wildfire suppression leads to ever-increasing fuel load. An intense wildfire is certain to happen, eventually, if the fuel load is not reduced. Most of the terrain is far too rugged for mowing with tractors. Methods such as hand-clearing, weed whacking, bull dozing or herbicide application may be useful for creating or maintaining fuel-breaks but are not feasible for large areas. Wildfire, itself, temporarily reduces the fuel-load but has negative consequences discussed elsewhere in this report. Two other factors that may reduce the fuel-load are grazing and vegetation change.

Grazing by domestic cattle may be effective in preventing wildfire if the grazing is maintained at a frequency and intensity that prevents the buildup of dry grass litter. As previously mentioned, heavily-grazed pastures above Mamalahoa Highway in Waikoloa have not burned since the 1960s while ungrazed lands in neighboring Puu Anahulu burned in the 1960s, 1980s and 1990s. Field observations indicate that grazing or browsing by feral goats appears to be insufficient to prevent wildfire in this region, but may slow the accumulation of fuel.

The type of vegetation may also affect the probability of wildfire. The fire history map shows wildfire avoiding the strip of eucalyptus trees above Mamalahoa Highway, possibly because shade or competition from these trees prevents the growth of sufficient ground cover to support fire. It might be possible to prevent fire by changing the vegetation to less combustible trees or shrubs.

Studies of natural tree regeneration in the fountaingrass-infested Kaupulehu Dry Forest Preserve, about 12 miles south of the project area, found that fountaingrass strongly suppressed regeneration of trees. Cattle and goats had been fenced out of the preserve for over forty years, yet very few seedlings of the native trees of the preserve had become established. Only after controlling fountaingrass by hand-clearing and herbicide application have *lama* (*Diospyros sandwicensis*) and other native tree species been able to regenerate from seed. Therefore, it might be possible to establish vegetation less prone to wildfire, but only if the problems of low moisture, grazing and browsing mammals, and fountaingrass infestation are overcome. Establishing these plantings would initially be difficult, requiring a supply of irrigation water and dry-land landscaping expertise that may not currently exist. This approach would probably be unfeasible for large areas but might be useful for creating “green firebreaks,” i.e. bands of plants that stay green, do not readily burn and, once established and can shade out fountaingrass. This approach to fire control has not been proven effective in the region and would be considered an experimental method.

4.75 Climate and Temporal Change

Botanical Surveys were carried out over more than ten years providing insights into the dynamics of the vegetation of the study area over this time interval. Directional trends were noted and the effects of variable rainfall were observed. Prolonged dry periods occurred during this interval. Both the 2001 and the 2012 botanical surveys were during multi-year droughts (Figure 2).

The 2006 survey was conducted during a wetter than average year, preceded by two wetter than average years. I thought that the wetter weather might cause seeds from a greater diversity of species to sprout, possibly including seedlings of native trees or other rare native plants. However, contrary to this hypothesis, each successive survey found fewer species of plants within the study corridor, regardless of the rainfall. No seedlings of native tree species were seen anywhere in the revisit. No new species of plants were found that were not recorded in the original 2001 survey. In 2006, visual estimates of the cover of fountaingrass were higher than in 2001 for some areas. No other differences were noted.

During the 2012 survey, I observed that the vegetation of the *Fountaingrass Pasture* vegetation zone was extremely dry and very little green matter was visible. In addition to lack of rainfall, it was apparent that cattle had recently been in the pasture and grazed heavily. Other than the abundant,

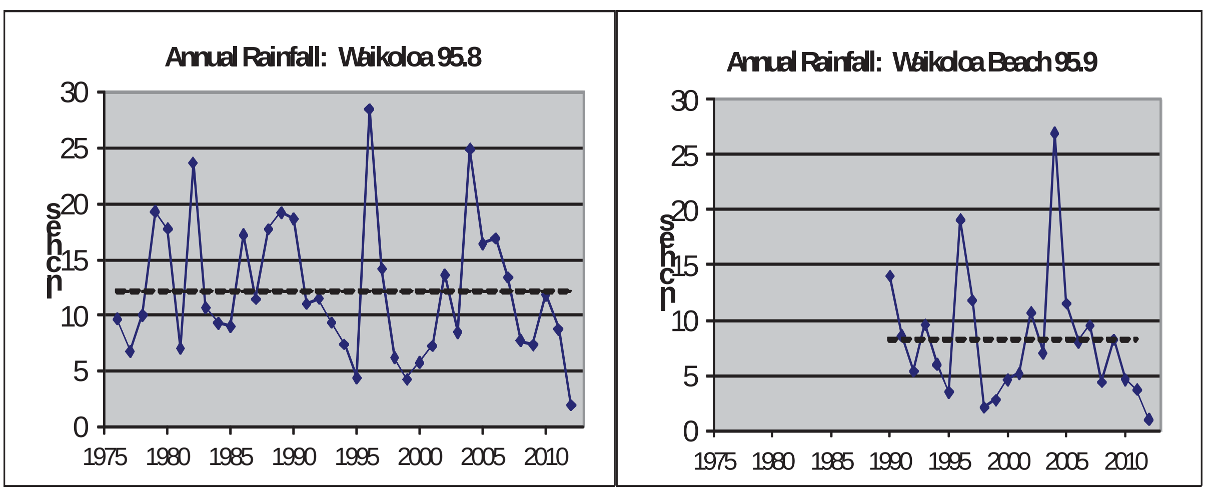

Figure 2. Annual rainfall measured at Waikoloa weather station 95.8 at 870 feet elevation and at Waikoloa Beach weather station 95.9 at 80 feet elevation. Mean annual rainfall shown with dotted line. Source: National Oceanic and Atmospheric Administration (www1.ncdc.noaa.gov).

dry fountaingrass it was difficult to recognize any living plant species. A couple of dry herbs, including fireweed, and small shrubs such as indigo and Spanish clover were seen. A couple of *haole koa* with a few green leaves were also within the study corridor.

It appears that the number of trees of all species is declining within the *Fountaingrass Pasture* and the *Fountaingrass with Scattered Native Trees and Kiawe* vegetation zones. A number of long-dead trees can be seen or found lying on the ground. It appears that most of these within the *Fountaingrass Pasture* were *kiawe*. Dead trees of native species and *kiawe* can be found in the *Fountaingrass with Scattered Native Trees and Kiawe*. These observations support the conclusion that the number of trees are declining in these areas.

5.0 DISCUSSION AND RECOMMENDATIONS

5.1 Current Trends and Land Use

5.11 Current Environmental Trends

The environmental factors described in the previous section, (climate and soil, land use, introduced plant and animal species, and wildfire) interact in ways that produce a highly stressful environment that has all but eliminated native plants from the study area. The death of three rare, native trees between 2001 and 2003 is further evidence of the harsh environment (Section 4.6). The natural dryness of climate and soil slows growth rates and limits the species that can become established. Grazing by cattle and browsing by goats has reduced or eliminated native Hawaiian plant species that evolved without the presence of such mammals. Competition from fountaingrass suppresses tree seedlings (Cabin et al 2000) and fountaingrass promotes frequent wildfire.

Seedlings and young trees are especially vulnerable to all of these stresses. Not one seedling, sapling or small tree of any native tree species was observed in the study corridor. If these current trends continue into the future, no native trees will survive in the study area.

5.12 Land Use and Regional Conservation

Although most of the project area is currently open or vacant land, this region is not likely to be an important area for publicly funded conservation of native plant resources for several reasons. The area has few valuable plant resources, has severe environmental degradation, and the land is privately owned and is not zoned or classified for conservation. Current county zoning is for agricultural use. A major landowner (Waikoloa Land Company) has prepared a master plan seeking to develop much of the area (DMT 2013). Two Hundred Seventy-five acres has been designated the "Waikoloa Dry Forest Preserve" a privately funded dry forest preserve and forest restoration project. This preserve contains endangered trees and other native plant species and has been fenced to exclude cattle and feral ungulates. The preserve is actively managed by the Waikoloa Dry Forest Initiative. (Waikoloa Dry Forest Initiative, undated). In contrast, most of the *ahupua'a* of Pu'u Anahulu and Pu'u Waawaa, south of the project area, are owned by the State of Hawaii and are managed for conservation, including game management and native plants sanctuaries and refuges.

5.2 Resource Value of Plants and Vegetation of the Project Area

5.21 Criteria for Determining Resource Value of the Vegetation

All vegetation has general resource value regardless of the species present, whether dominated by native or alien plants, or the rarity or abundance of the species present. General values, such as control of soil erosion, retention of water in the soil, atmospheric cooling and noise reduction, are called "ecosystem services." "Utilitarian values" are general resource values that provide more direct economic or material value to humans. These include grazing for livestock, hunting opportunities and other recreation. The vegetation of the project area provides these general resource values to the West Hawaii community.

"Biodiversity value" is used here to refer to values that individual species have because of their rarity, uniqueness or important role in supporting the ecosystem. A community with a unique combination of plant species or that is habitat for valuable animal species also has biodiversity value. For the purposes of the present assessment, introduced plants, and communities dominated by introduced plants, are considered to have general resource value but no biodiversity value because these species are abundant elsewhere in the world and their presence in Hawaii often displaces native plants and communities. An introduced plant that may be beneficial to native animals is an exception to the rule stated above and such an introduced species would have biodiversity value (See section 4.24).

Conservation biology assigns positive value to diversity within the landscape, recognizing that the variety of land uses, plant communities and ecosystems affect the well-being of the human population as well as the flora and fauna of the region. In addition to biodiversity value, native plant communities may have educational and cultural uses.

Vegetation attributes that have biodiversity value are 1) rare or endangered native plants; 2) other native, especially endemic, plant species; 3) plant communities dominated by native plants, especially if the community is a combination of plant species found only in that area; and 4) plants or plant communities that support native animal species.

5.22 Evaluation of Biodiversity Conservation Values within the Study Corridor

The native ecosystems of the project area have been severely degraded by a long history of human use coupled with wildfire and invasion by destructive introduced plants and animals. All the native dry forest and dry grassland ecosystems throughout the state have been similarly degraded, leading to the observation that these are among Hawaii's most imperiled biological resources (Gagne and Cuddihy 1990; Stone and Scott 1985). Therefore, any remaining native plants and native plant communities in this region, however degraded, may be significant because they represent all that remains and may provide essential resources for the recovery of dry forest or dry grassland species and communities.

5.221 Endangered and Rare Native Plants

No endangered or threatened plant species occur within the 250 foot-wide study corridor. No living individuals of endangered plant species are known within the study area.

A number of native plant species that are now rare are known to have been part of the original flora of the study area. At the time of the initial survey in 2001, three individuals of three rare plant species were discovered living near the present study corridors (Section 4.6). All three of these trees were found to have died by 2003, apparently of natural causes. The habitat of these trees has been severely degraded by introduced mammals, fountaingrass and wildfire

More information about these three trees is given below.

5.2211 An Endangered Tree: Uhiuhi (Caesalpinia kavaiensis)

A single living *uhiuhi* tree was found near 1000 ft. elevation on November 16, 2001, within the study corridor of Alignment #5/6, as the alignment was configured at that time. Following that discovery, the proposed alignment was deflected to provide a minimum buffer of 100 feet (30 m) around the *uhiuhi*. A subsequent visit in June of 2003 discovered that this tree had died. A decision was made to retain the revised alignment avoiding the site of the now-dead tree. In part, this was done to protect *uhiuhi* seeds that might be in the soil and could sprout at a later time. Seeds had been collected for propagation from this tree, while living, by U.S. Fish and Wildlife personnel.

When observed in 2001, the *uhiuhi* tree had five main stems branching at ground level, but only the largest was then alive. The stem length of that portion was 15 ft. reaching a height of about 12 ft. above the ground as it was leaning to the south. The diameter of the living stem was 7 inches. On December 1, 2001, only about 10% of the crown of the living stem supported green foliage; many of the branches and twigs were dead. Some twigs had new, immature leaves or leaf buds that were just breaking. About ten seed pods were hanging on the tree; most appeared to contain one seed. One other seed pod was found on the ground. The tree had a “browse-line” at about five feet height, with no living foliage below this height. A second tree about 15 feet northwest of the then-living tree appeared to be a dead *uhiuhi*.

Following the discovery of this *uhiuhi* a search was conducted in an expanded area centered on the tree. The expanded area is 1000 feet-wide, measured perpendicular to the slope and 2500 feet along the slope, spanning an elevation of about 200 feet. Three nearby areas with a higher density of trees were also searched. These areas were partially transitional *pahoehoe* with some soil accumulation. All of the trees in these areas proved to be *lama*, *kiawe* or *wiliwili,* with the exception of one *Jacaranda* tree. No other *uhiuh*i were found or are known within the vicinity of any of the proposed alignments.

The site was revisited on January 31, 2002, following substantial rainfall. The living part of the crown supported new foliage. At least 15 inflorescences held open flowers with bees and other insects nearby. The buds of many more inflorescences had not opened. No seedlings were found near the tree.

As stated above, the tree was found to be dead in June 2003. The immediate cause of death was not apparent.

In 2006, the site of the dead tree was again visited to see if any seedlings had emerged. Seeds of dryland trees, such as *uhiuhi*, commonly survive in the soil (the "soil bank") for many years awaiting enough moisture and other appropriate conditions to stimulate germination. However, no seedlings were found under or near the dead tree. Conditions around the tree make it unlikely that seedlings could survive even if buried seeds did germinate. It was observed that the fountaingrass clumps are very dense and tall around the base of the dead tree. A trail through the grass next to the trunk shows that feral goats regularly walk next to the tree. Research shows that native trees of Hawaiian dry forests rarely succeed at establishing seedlings under these conditions (Cabin et al 2000). The fountaingrass chokes the seedlings and may promote and support wildfire. Tree seedlings are an attractive food for feral goats. I have seen *uhiuhi* seedlings outside of the study area growing within fountaingrass only to find on subsequent visits that they have been killed by browsers (personal observation 1989).

The most recent visit, July 2012, to the site of the dead *uhiuhi* found no seedlings.

<u>*5.2212 An Endangered Tree:* Hala Pepe (Pleomele hawaiiensis)</u>

One *hala pepe* tree was found on November 23, 2001, near, not in, Alignment #4/5/6, as it was then configured, above 2000 ft. elevation. In June, 2003, this tree was found to have died. The *hala pepe* was growing in a pit formed from the collapse of a lava tube about 20 feet deep. The pit can easily be entered by people and by goats. The vegetation within the pit includes abundant fountaingrass and one *wiliwili* tree. The surrounding area is weathered, brown *pahoehoe* lava with about 90% cover of fountaingrass and scattered *'a'ali'i* (*Dodonaea viscosa*) shrubs. When discovered in 2001, the *hala pepe* was about 15 feet tall and of moderate vigor. No flowers or fruits were present. The tree was browsed by goats to a height of about 8 ft. and the base of the tree is scarred by fire. No other *hala pepe* were found during the pedestrian botanical survey.

Revisions have moved Alignment #4/5/6 a substantial distance farther south of the location of the dead *hala pepe*.

*5.2213 Species of Concern: ʻ*Ohe makai (Reynoldsia sandwicensis)

One ʻ*ohe makai* tree was found on November 23, 2001, near Alignment #4/5/6 above 2000 ft. elevation above sea level. The *ʻohe makai* was growing in one of a long series of collapsed lava tube pits. The pit also contains fountaingrass and *haole koa* trees and does not provide protection from browsing goats or from wildfire. The surrounding area is weathered, brown *pahoehoe* lava with fountaingrass. In June 2003, it was found that this tree had died.

The tree was 25 feet tall and 14 inches in diameter at four feet above the ground. In 2001, the tree appears to be of average health; it had newly leafed-out and had numerous large inflorescences in the bud stage. However, the base of the tree was badly scarred, perhaps from goat browsing and fire.

After the initial surveys in 2001, proposed Alignment #4/5/6 was relocated to the south to avoid the collapsed lava tube and the resources it contained. The site of the dead *ʻohe makai* is not in the study corridor as now configured.

5.222 Other Native Plants

Only four endemic species and four very common indigenous species were found in the entire study area. In addition to the three rare trees described above (all now dead), two other trees are important components of the dry forest ecosystem, *wiliwili* and *lama*. Although widely scattered in the region, these two trees are fairly conspicuous and represent a remnant of the original dry forest. This botanical study found no evidence that these trees are reproducing. Seedlings or other young trees appear to be eliminated by some combination of fountaingrass, goat browsing and cattle grazing, and wildfire. If this trend continues, these species may disappear from the region. In light of human inability to remove these threats from the study area, it might be prudent to collect seed for storage and use in reforestation projects in North Kona and South Kohala.

5.223 Native Plant Communities

Almost the entire study area is vegetated by introduced fountaingrass communities or is barren lava. The sole exception is an 800-foot extent of Alignment #5 at about 250 ft. elevation. This area is a dry grass and shrub community dominated by an endemic bunchgrass, *Kawelu* (*Eragrostis variabilis*). Other common species in this community are the indigenous shrub, *'ilima* (*Sida fallax*) and an introduced grass, brome fescue (*Vulpia bromoides*). This is the only location in the study area where any of these species were found. It is not clear why this different community occurs at this particular location. *Kawelu* occurs on all the main Hawaiian islands, often on dry sites that have been disturbed. This does not appear to be a remnant of the original dry lowland grasslands. (Gagne and Cuddihy 1990).

5.23 Evaluation of General Conservation Values

The fountaingrass-dominated vegetation has some beneficial values. In some places, the dense ground cover reduces soil erosion and subsequent water pollution. The fountaingrass is the major food source for most animals of the area, including cattle and goats. Thus, fountaingrass is the basis for cattle ranching and goat hunting.

However, fountaingrass performs these services for a price. This species suppresses nearly all competing plants of the region, resulting in a low diversity landscape with a dwindling number of trees. The tendency of fountaingrass to promote wildfire ensures that there will be periods after fires when the soil will be subject to erosion and when food for goats and cattle will be scarce. These wildfires may threaten human structures and uses, as well as the remnant of native plants and vegetation, in the region.

5.24 Potential Impacts of the Proposed Action and Recommendations

5.241 Endangered and Rare Species

5.2411 Potential Impacts

The potential for direct, construction-related impacts are nil, since no endangered plants occur in the study corridor or in its near vicinity. It is possible that a low number of widely-scattered endangered plants occur in the region. These plants, if any, could be damaged by wildfire ignited at the proposed road. Potential impact of wildfire and mitigating recommendations are discussed later in a separate section for wildfire.

5.2412 Recommendations

No endangered or rare plants now live within the study corridor and none are known within the surrounding study area. The locations of the two endangered and one rare tree (all now dead) were reported to the Fish and Wildlife Service (USFWS) in 2001. A field inspection was arranged in January 2002 for USFWS personnel. Seed were collected from two of the trees and transmitted to a propagation facility. Since these trees are now dead, no further action is recommended at this time.

5.242 Other Native Species

5.2421 Potential Impact

Direct construction impacts would be of little consequence for the native species of the study area because the number of individuals within the study corridor is small compared with their numbers in the region and elsewhere on the island. One *wiliwili* and seven *lama* trees occur within the study corridor of Alignment #5/6 and Alignment #4/5/6.

Wildfire could destroy or damage native plants. Native plants could be adversely affected by alien plants brought into the area by construction or operation of the proposed roadway.

5.2422 Recommendations

1) Avoid unnecessary damage to *wiliwili* and *lama* trees near the alignment during construction.
2) When feasible, use native plants for landscaping, if any, along the roadway.
3) Avoid wildfire.
4) Avoid introduction of new alien plants.

5.243 Wildfire

5.2431 Potential Impact of the Proposed Action

Wildfire is a serious threat to the remnant of native biodiversity in the study area and could spread to areas of higher conservation value outside the study area, such as the Waikoloa Dry Forest Preserve 1.1 miles to the north of the study corridor (Waikoloa Dry Forest Initiative, undated). Wildfire negatively affects the beneficial ecosystem-functions of the fountaingrass-dominated vegetation, such as reduction of wind and water erosion. Wildfire reduces the economic value of lands used for pasture and could threaten homes and other structures in the Waikoloa area. No beneficial effects of wildfire, except the reduction of the fuel-load, are known in this region.

Construction, maintenance and operation of the proposed road would provide human access into areas that are now remote. It should be expected that fires would be started from time to time along the road accidentally and, perhaps, intentionally. This probability is greatest in areas where fountaingrass cover is sufficiently continuous to carry fire, approximately above the elevation of 1200 ft. Intensive cattle grazing in these same areas tends to reduce the fuel load and may reduce the frequency of wildfire.

The proposed roadway would, in some cases, be an aid in fighting wildfires ignited at other locations. It would provide access into areas that are now inaccessible to ground travel and the roadway would have the beneficial effect of providing a fuel break that might be sufficient to stop fires from crossing the road.

The analysis in this report cannot assign probabilities or relative probabilities to the potential ignition of wildfires versus the potential to aid in fighting fires. It can only suggest that some of the adverse impact of a new potential ignition source would be offset by the possible aid to fighting fires from other sources. It might be expected that fires would be ignited along the roadway but, in general, fires in the region would be smaller due to the fuel-break and improved access provided.

Ignition of wildfires can be prevented by eliminating sources of ignition and reducing combustible fuel to levels that cannot support fire. Keeping the sources of ignition from the proposed roadway, such as discarded cigarettes, hot automobile exhaust systems and vandals, away from the dry grass along the road is largely a matter of roadway design beyond the scope of this report. Mowing or herbicides may also be used to create grass-free strips beyond the pavement. Costs of these methods may include extra costs of purchasing a wider right-of-way, initial construction costs, repaving, and continuing maintenance costs for mowing or spraying.

It would be prudent to incorporate some fire prevention measures into the design and maintenance of the entire roadway regardless of the alignment selected. It is recommended that basic fire prevention design, such as maintenance of wide, grass-free shoulders be adopted even in barren areas because of the possibility that fountaingrass cover may increase in future years. However, it may not be necessary to exert equal fire-prevention effort at all locations. The project area could be divided into zones of minimum, moderate and maximum wildfire potential and appropriate fire-prevention strategies adapted to each zone (Appendix C).

5.2432 Recommendations

1. Design the entire length of the roadway to be a fuel break as an aid in suppressing fires that originate at other locations.
2. Design the entire length of the roadway to keep sources of ignition, such as discarded cigarettes and hot automobile exhaust systems, away from dry grass or other fuel along the roadway.
3. Implement an aggressive maintenance program to keep the roadway grass-free.
4. Implement a policy of annual field survey of road and fuel conditions and adapt maintenance program as indicated.

5.244 New Introduced Plant Species

5.2441 Potential Impacts

Roads can be avenues for the invasion of introduced plants into new areas. These plants often have adverse impact for biodiversity and general conservation values of the area. They may compete or harm native plants or they may degrade the ecosystem services of the vegetation. The past invasion of this region by fountaingrass serves as an example of the extreme change that can be brought about by introduced species. Seeds of these introduced species may be carried on construction equipment or in fill material. Vehicles traveling the completed road may also carry seeds.

While it might seem that no new introduced plant could degrade the region more than fountaingrass has already done, this is not the case. In recent years, a small, yellow-flowered weed (*Senecio* m*adagascarensis*) has invaded the region. This plant is toxic to cattle and horses, further reducing the value of the fountaingrass infested pastures. It must be considered that it is always possible for a new plant invasion to further reduce the value of the land.

5.2442 Recommendation

State Department of Transportation should make arrangements to have qualified personnel from the Department of Land and Natural Resources (or other qualified personnel) monitor the roadway annually. Individuals and populations of introduced plants new to the region should be eradicated. This annual survey could be done in conjunction with the periodic surveys of fuel conditions recommended for wildfire control.

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APPENDIX A: Vascular Plants of the Study Corridor.

Table A1. Vascular plant species found within the proposed alignments of the proposed extension of Saddle Road from Queen Ka'ahumanu Highway to Mamalahoa Highway during all surveys from 2001 to 2012. VEG ZONE = Vegetation Zone (I = Sparse Fountaingrass with Very Scattered *Kiawe*; II = Fountaingrass with Scattered Native Trees and *Kiawe*; III = Fountaingrass Pasture). D = Dominant, C = Common, F = Frequent, I = Infrequent.

Scientific Name Common Name(s)	Family	Life Form	Origin	Veg Zone I	 II	 III
Calotropis gigantea (L.) W.T. Aiton crown flower	Asclepiadaceae	Shrub	Introduced	I		
Cenchrus ciliaris L buffelgrass	Poaceae	Grass	Introduced	F	F	I
Cenchrus setaceus (Forsk.) Chiov. fountaingrass	Poaceae	Grass	Introduced	D	D	D
Chamaecrista nictitans (L.) Moench partridge pea	Fabaceae	Herb	Introduced		I	
Chamaesyce hirta (L.) Millsp. garden spurge	Euphorbiaceae	Herb	Introduced	I		
Crotalaria juncea L. sunn hemp	Fabaceae	Herb	Introduced		I	
Desmodium sandwicense E. Mey. Spanish clover	Fabaceae	Herb	Introduced	I	I	
Desmodium tortuosum (Sw.) DC Florida beggarweed	Fabaceae	Shrub	Introduced	I		
Diospyros sandwicensis (A.DC) Fosb. *lama*	Ebenaceae	Tree	Endemic		C[1]	
Dodonaea viscosa Jacq. *a'ali'I*	Sapindaceae	Tree	Indigenous		I	
Doryopteris decora Brack. No Common Name	Pteridaceae	Fern	Endemic		I	

Table A1. (Cont.) Vascular plant species found within the proposed alignments of the proposed extension of Saddle Road from Queen Ka'ahumanu Highway to Mamalahoa Highway.

Scientific Name / Common Name(s)	Family	Life Form	Origin	Veg Zone I	Veg Zone II	Veg Zone III
Erythrina sandwicensis / *wiliwili*	Fabaceae	Tree	Endemic	I		
Galinsoga parviflora Cav. / No Common Name	Asteraceae	Herb	Introduced			I
Geranium pusillum N. L. Burm / small cranesbill	Geraniaceae	Herb	Introduced	I		
Indigofera suffruticosa Mill. / indigo	Fabaceae	Shrub	Introduced	I		I
Lepidium virginicum L. / pepperwort	Brassicaceae	Herb	Introduced		I	
Leucaena leucocephala (Lam.) de Wit / *koa haole*	Fabaceae	Shrub	Introduced	I		F
Mollugo cerviana (L.) Ser. / threadstem carpetweed	Molluginaceae	Herb	Introduced		I	
Nicotiana glauca R. C. Graham / tree tobacco	Solanaceae	Shrub	Introduced		I	
Ophioglossum polyphyllum (L.) C. Presl / *pololei*	Ophioglossaceae	Fern	Indigenous	I		
Opuntia ficus-indica (L.) Mill. / *Panini*	Cactaceae	Cactus	Introduced	I		I
Oxalis corniculata L. / yellow wood sorrel	Oxalidaceae	Herb	Polynesian			I
Passiflora suberosa L. / *huehue haole*	Passifloraceae	Liana	Introduced	I		
Portulaca lutea Sol. Ex G.Forster / *'ihi*	Portulacaceae	Herb	Indigenous			I

Table A1. (Cont.) Vascular plant species found within the proposed alignments of the proposed extension of Saddle Road from Queen Ka'ahumanu Highway to Mamalahoa Highway.

Scientific Name / Common Name(s)	Family	Life Form	Origin	Veg Zone I	II	III
Portulaca pilosa L. / *'akulikuli*	Portulacaceae	Herb	Introduced		F	I
Prosopis pallida (Humb. & Bonpl. *ex* Willd.) Kunth[1] / *kiawe*	Fabaceae	Tree	Introduced	C	C	
Rhynchelytrum repens (Willd.) Hubb. / Natal redtop	Poaceae	Grass	Introduced	I		
Senecio madagascarensis Poir. / fireweed	Asteraceae	Herb	Introduced		I	I
Sida fallax Walp. / *'ilima*	Malvaceae	Shrub	Indigenous	I		
Solanum linnaeanum Hepper & P.Jaeger / apple of Sodom	Solanaceae	Shrub	Introduced			I
Sonchus oleraceus L. / *pualele*	Asteraceae	Herb	Introduced			I
Tridax procumbens L. / coat buttons	Asteraceae	Herb	Introduced	I		
Verbesina encelioides (Cav.) Benth.&Hook / crown-beard	Asteraceae	Herb	Introduced			I
Vulpia bromoides (L.)S.F. Gray / brome fescue	Poaceae	Grass	Introduced	I		
Waltheria indica L. / *uhaloa*	Sterculiaceae	Shrub	Indigenous	F		I

[1]Noted in table as "Common" because numerous and conspicuous in study area near the study corridor; present in low numbers in study corridor. See Section 4.22 and Appendix B.

Table A2. Alphabetical List of plant common names and their equivalent botanical names. Hawaiian common names and Latin botanical names printed in italic; English common names printed in Roman face.

COMMON NAME	BOTANICAL NAME
a'ali'i	*Dodonaea viscosa*
uhaloa	*Waltheria indica*
apple of sodom	*Solanum linnaeanum*
brome fescue	*Vulpia bromoides*
buffelgrass	*Cenchrus ciliaris*
coat buttons	*Tridax procumbens*
crown flower	*Calotropis gigantea*
Florida beggarweed	*Desmodium tortuosum*
fountaingrass	*Cenchrus setaceus*
garden spurge	*Chamaesyce hirta*
'ihi	*Portulaca lutea*
'ilima	*Sida fallax*
indigo	Indigofera suffruticosa
'ihi	*Portulaca lutea*
'ilima	*Sida fallax*
indigo	*Indigofera suffruticosa*
kawelu	*Eragrostis variabilis*
kiawe	*Prosopis pallida*
koa haole	*Leucaena leucocephala*
lama	*Diospyros sandwicensis*
Natal redtop	*Rhynchelytrum repens*
panini	*Opuntia ficus-indica*
partridge pea	*Chamaecrista nictitans*
pepperwort	*Lepidium virginicum*
pololei	*Ophioglossum polyphyllum*
pualele	*Sonchus oleraceus*
small cranesbill	*Geranium pusillum*
Spanish clover	*Desmodium sandwicense*
sunn hemp	*Crotalaria juncea*
threadstem carpetweed	*Mollugo cerviana*
tree tobacco	Nicotiana glauca
uhaloa	*Waltheria indica L.*
wiliwili	*Erythrina sandwicensis*
yellow wood sorrel	*Oxalis corniculata*
No common name	*Galinsoga parviflora*

Appendix B: Coordinates of Native Trees Within the Study Corridor.

UTM coordinates and elevation above sea level of all native trees found within the study corridor recorded by hand-held GPS receivers.

Species	UTM Coordinates	Elevation
lama	5 Q 205651 2203106	1040 ft
lama	5 Q 206361 2202568	1055 ft
lama	5 Q 206374 2202567	1060 ft
lama	5 Q 206382 2202572	1060 ft
lama	5 Q 206563 2202388	1118 ft
lama	5 Q 206475 2202046	1130 ft
lama	5 Q 206522 2202492	1117 ft
lama (dead)	5 Q 206187 2202701	1035 ft
lama (dead)	5 Q 206275 2202639	1049 ft
lama (dead)	5 Q 206562 2202389	1120 ft
lama (dead)	5 Q 206413 2202053	1130 ft
lama (dead)	5 Q 206233 2202700	1052 ft
lama (dead)	5 Q 206527 2202485	1120 ft
wiliwili	5 Q 206645 2202255	1140 ft
wiliwili (dead)	5 Q 206717 2201995	1180 ft
wiliwili (dead)	5 Q 206668 2201944	1201 ft

Appendix C: Wildfire Hazard Model

Estimation of wildfire potential (**Fire**) of proposed alternative alignment segments based primarily on fire history, average percent fountaingrass cover (Avg % F'grass), and substrate. No. = Alignment Number; Distance = distance in feet from beginning of alignment. Ratings of fire potential Maximum, moderate and minimum are in relation to the study area only, not other locations within the region.

No.	Distance (ft.)	Approx Elev (ft.)	**Fire**	Avg % F'grass	Substrate	Comments
4	1200 – 2800	60 – 100	**Min**	0	Mauna Loa 'a'a	
4	2800 –5200	100 – 240	**Mod**	30	ML pahoehoe	2001 Survey found
4	5200 –7300	240 – 360	**Mod**	2	Mauna Loa 'a'a	evidence of fire
4	7300 – 8400	360 – 460	**Mod**	60	ML pahoehoe	
4	8400 – 9900	460 –530	**Mod**	1	Mauna Loa 'a'a	
4	9900 –10900	530 – 550	**Mod**	50	ML pahoehoe	
4	10900–12500	550 – 620	**Mod**	2	Mauna Loa 'a'a	
4	12500–14100	620 – 770	**Mod**	60	ML pahoehoe	
4	14100–28500	770 – 1250	**Mod**	60	Mauna Loa 'a'a	Extremely rough and variable; fountaingrass 5-90% cover
5	300 – 2700	50 – 100	**Min**	0	Mauna Loa 'a'a	
5	2700 – 4600	100 – 190	**Mod**	50	ML pahoehoe	
5	4600 – 6400	190 – 240	**Min**	0	Mauna Loa 'a'a	
5	6400 – 8500	240 – 320	**Mod**	50	ML mixed	2001 survey found evidence of fire.
5	8500 – 9600	320 – 380	**Min**	1	Graded lava	Gravel quarry; currently active.
5	9600 – 21000	380 – 750	**Min**	0	Mauna Loa 'a'a	

Appendix C. (Continued) Estimated wildfire potential of proposed alternative alignment segments.

No.	Distance (ft.)	Approx Elev (ft.)	**Fire**	Avg % F'grass	Substrate	Comments
6	1000 – 2600	60 – 70	**Min**	0	Mauna Loa 'a'a	
6	2600 – 5500	70 – 100	**Mod**	20	ML pahoehoe	
6	5500 – 6400	100 – 120	**Min**	0	Mauna Loa 'a'a	
6	6400 – 8400	120 – 150	**Min**	5	Graded pahoehoe	Around gravel quarry.
6	8400 – 21700	150 – 750	**Min**	0	Mauna Loa 'a'a	Along Existing Waikoloa Road.
5/6	21000 – 28600	750 – 1170	**Mod**	5	Mauna Loa 'a'a	Small pahoehoe inclusions.
4/5/6	28600 – 33900	1170 – 1375	**Max**	50	ML mixed	
4/5/6	33900 – 35500	1375 – 1420	**Max**	60	Ancient Mauna Kea and Hualālai lava.	Burned in 1998 fire to fire break at 2070 ft. elevation.
4/5/6	35500 – 46800	1420 – 2070	**Max**	80		
4/5/6	46800 – 56600	2070 – 2500	**Max**	90		Not burned in 1998.

Appendix D: Photographs of Vegetation and Plants of the Study Area

Photo 1. March, 2014. Overview of the area of the makai terminus of all proposed alignments. View is upslope, eastward with Pu'u Anahulu in the background. Kaniku Lava Flow in foreground is nearly devoid of plant life, with very widely scattered fountaingrass and *uhaloa* plants.

Photo 2. March, 2014. Overview of makai portion of Proposed Alignment #6. View is from point of junction with Waikoloa Road towards Waikoloa Resort. *Kiawe* trees on pahoehoe *kipuka* within near-barren Kaniku Lava Flow.

Photo 3. March, 2014. A portion of Proposed Alignment #6 where superimposed on the existing Waikoloa Road. View is upslope. Fountaingrass and other introduced plants line the roadside.

Photo 4. March, 2014. A portion of Proposed Alignment #6 viewed down-slope from junction of Waikoloa Road with West Hawaii Concrete Quarry Road. Fountaingrass conspicuous within disturbed area near junction and along Waikoloa Road.

Photo 5. March, 2014. Overview of Proposed Alignment #5 viewed down-slope from the West Hawaii Concrete Quarry Road, with the Waikoloa Resort in the background. Scattered fountaingrass on the Kaniku Lava Flow visible.

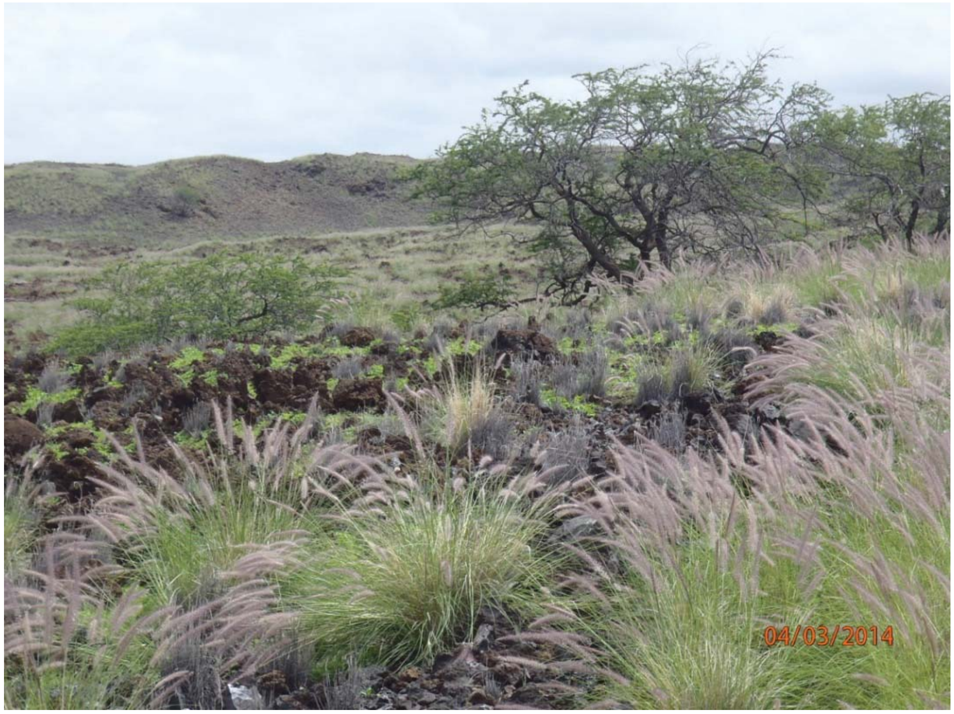

Photo 6. March, 2014. Overview of area of Proposed Alignment #5/6 where it departs from Waikoloa Road, viewed upslope. Kiawe trees, fountaingrass and ephemeral introduced herbs in fore- and mid-ground. Fountaingrass is dominant ground cover on hills in left background.

Photo 7. March, 2014. Overview of area of mauka terminus of Align #4/5/6 with Mamalahoa Highway (in right foreground) with scattered Haole koa shrubs and dense fountaingrass. View is down-slope; Kohala Mountains in left background, shoulder of Pu'u Nohonaohae at extreme right background.

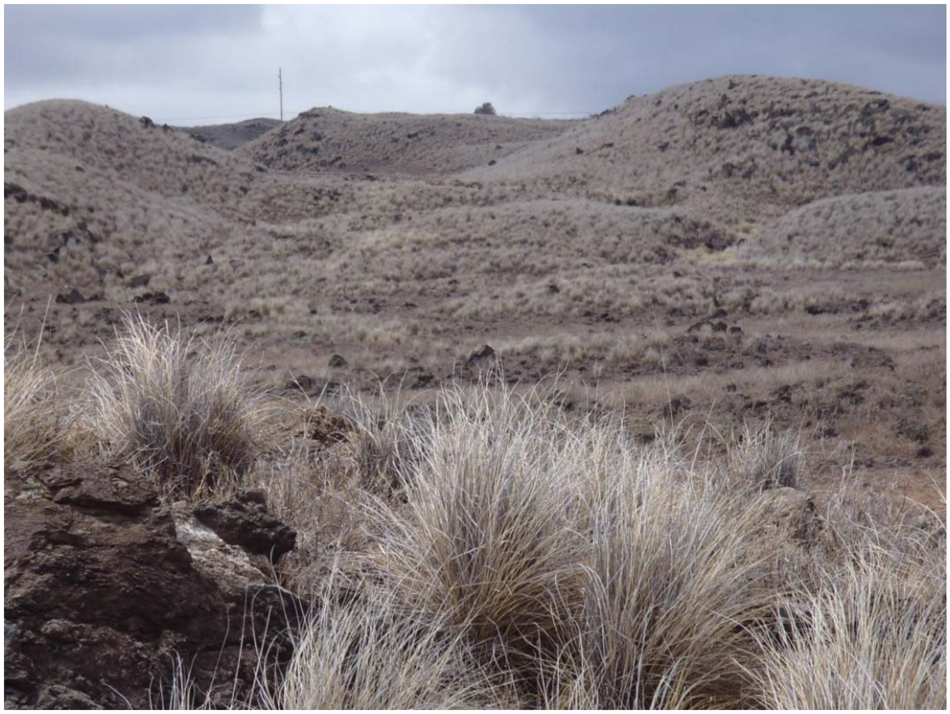

Photo 8. June, 2012. Overview of mauka terminus of Proposed Alignment #4/5/6. View is up-slope; utility pole in background marks route of Mamalahoa Highway. Same area from opposite direction shown in Photo 7, emphasizing the differences between 2012 (a dry year) and 2014 (a wet year).

Photo 9. June, 2012. Close-up of a site within Proposed Alignment #4/5/6 within area shown in Photo 8. Dry buffelgrass in fore- and mid-ground; fountaingrass on low hills in background.

Photo 10. July, 2012. A portion of Proposed Alignment # 4/5/6 near 1900 feet elevation. Typical view of feral goats in buffelgrass on flats with the Kaniku Lava Flow in background.

SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix D Vertebrate Fauna Report

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Faunal Surveys Conducted for the Saddle Road Extension Project, Queen Kaʻahumanu Highway to Māmalahoa Highway, Island of Hawaiʻi, Hawaiʻi

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State of Hawaiʻi Department of Transportation
Highways Division
Project No. DP-HI 200(5)

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Table of Contents

Introduction and Background

The Hawai'i Department of Transportation – Highways Division (DOT-H) is proposing to construct a new highway connecting the western terminus of the Saddle Road (State Route 200), now the Daniel K. Inouye Highway, to the existing Queen Ka'ahumanu Highway (State Route 19), (Figure 1). The purpose of the project is to improve safety, efficiency and operational capacity of traffic travelling between East and West Hawaii. An initial set of 11 alternative alignment segments were reduced to five alternative alignments following initial resource surveys and public meetings. The alignments still under consideration are identified as (Alignments #4, #5, #6, #4/5 and #4/5/6) (Figure 1).

This report describes the methods used and the results of avian and terrestrial mammalian surveys conducted on the subject property as part of the environmental due diligence process associated with the proposed project. The primary purpose of the surveys was to determine if there are any avian or mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, (Department of Land and Natural Resources (DLNR) 1998; U. S. Fish & Wildlife Service (USFWS) 2005a, 2005b, 2014). The original surveys were conducted in 2002 and additional surveys examining *mauka* sections of the alternatives under consideration, not originally envisioned back in 2002, were conducted in 2013. In 2014 an additional survey was conducted of a portion of federally proposed Critical Habitat in Unit 32 (USFWS, 2012).

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

General Site and Project Description

The alignments still under consideration have a common starting point at the eastern (*mauka*) terminus of the project at the intersection of the Daniel K. Inouye Highway and Māmalahoa Highway at an elevation of approximately 750 meters above mean sea level (AMSL), and terminate along the Queen Ka'ahumanu Highway at the intersection of Waikoloa Beach Road at an elevation of ~ 18 meters AMSL

The terrain gently slopes from east to west and is composed of a mix of *pāhoehoe* and *'a'ā* lava flows formed during the Holocene and Pleistocene ages. The site is covered with Mauna Kea flows formed more than 10,000 years ago. This in turn was overlain with Hualālai flows deposited between 5,000 - 10,000 years ago. The bulk of these flows are themselves covered by Mauna Loa flows formed between 3,000 – 5,000 years ago, which extend to the coastline, these in turn are overlain in the upper half of the project area by newer flows formed between 1,500 - 3,000 years ago (Wolfe and Morris 1996; USGS 1993, 1996, 1997).

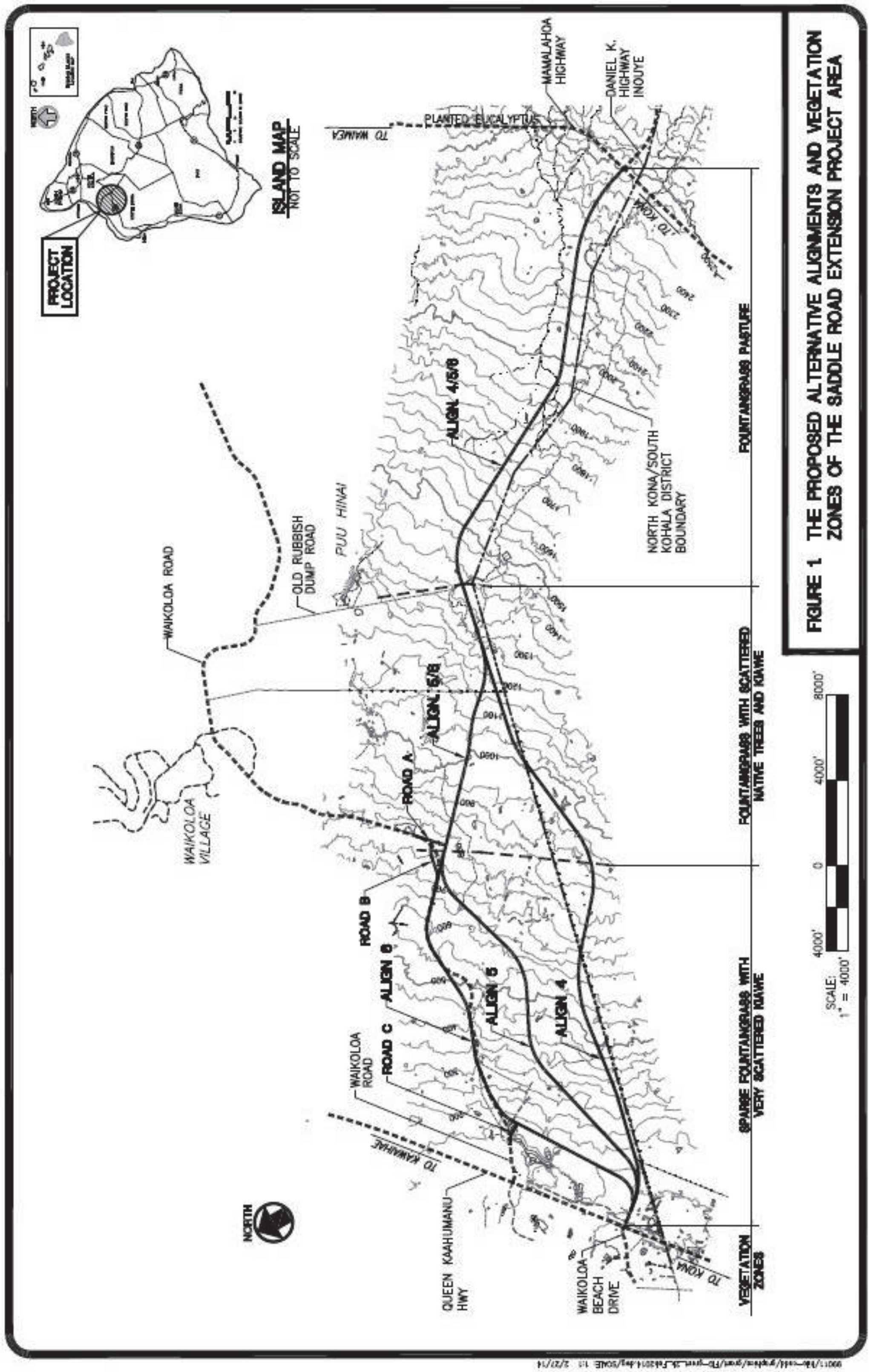

FIGURE 1 THE PROPOSED ALTERNATIVE ALIGNMENTS AND VEGETATION ZONES OF THE SADDLE ROAD EXTENSION PROJECT AREA

PLACE HOLDER – NEED NEW FIGURE

The vegetation present on the upper half of the project area is dominated almost to the exclusion of native species by alien pasture grasses and fountain grass (*Pennisetum setaceum*). At about the 1000-foot level the vegetation becomes extremely sparse with vegetation cover dropping below 25% over the bulk of the remaining project area, this too, is dominated by fountain grass, interspersed with a few tenacious native and indigenous plant species, which somehow have not been killed by browsing ungulates, or wildfires.

Methods

Plant names mostly follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al., 1990, 1999. The avian phylogenetic nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 55th supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011, 2012, 2013, 2014). Mammalian species scientific names follow (Wilson and Reeder, 2005). Place names follow (Pukui et al., 1976).

Avian Survey Methods

Following a site visit, and a rough assay of the different habitats present along the routes of the proposed alignments, three line transects were established within the project area, running from east to west. Each of the line transects was counted twice, once during the dry season and once after the winter rains (Bibby et al. 1993). Field observations were made with the aid of Leitz 10 X 42 binoculars and by listening for vocalizations. Counts were concentrated during the morning hours, the time of day that bird activity is typically at its peak. An additional two hours were spent within the project area on each of four separate nights, and four separate mornings, in an attempt to detect nocturnally flying seabirds and owls overflying the project area. Time not spent counting was used to search the project area for species and habitats that were not detected during count sessions. Additional surveys conducted in 2013 and 2014 investigating revised alignments on the *mauka* portion of the project and looking at the proposed Critical Habitat in Unit 32 followed similar methodologies.

Mammalian Survey Methods

In an effort to detect the presence of endangered Hawaiian hoary bats (*Lasiurus cinereus semotus*), or *'ōpe'ape'a,* as it is known locally. Two stationary remote bat census stations were deployed on each of four nights. Broadband AnaBat II ultrasonic bat detectors coupled to voice activated cassette recorders and remote timing devices were used to detect bat vocalizations. Following techniques developed by Krusic et al. (1996), units were calibrated using a pet ultrasonic flea collar. The tapes were reviewed and the number of bat passes recorded by the devices were counted. In addition, visual scans were made for bats during crepuscular periods on four separate evenings and four separate mornings.

With the exception of the Hawaiian hoary bat, all other terrestrial mammals found on the Island of Hawai'i are alien species. Most are ubiquitous, thus no trapping program was proposed or undertaken to quantify the usage by alien mammalian species of the study site. The survey of mammals other than bats was limited to visual and auditory detection, coupled with observation of scat, tracks and other animal sign. A running tally was kept of all vertebrate mammalian species observed and heard within the project area.

Results

Avian Survey Results

A total of 20 avian species representing 14 separate families were recorded during transect counts (Table 1). Four of the species detected, Nēnē (*Branta sandvicensis*), Hawaiian Stilt (*Himantopus mexicanus knudseni*), Short-eared Owl (*Asio flammeus sandwichensis*) and Pacific-Golden Plover (*Pluvialis fulva*) are native species. Both the Nēnē and Hawaiian Stilt are listed as endangered species under both the federal and State of Hawai'i's endangered species programs. The owl is resident indigenous endemic sub-species, and the plover is an indigenous migratory shorebird species. The remaining 16 species detected, are alien to the Hawaiian Islands, and commonly found throughout the leeward lowland areas on the Island of Hawai'i. (Table 1). Avian diversity and densities recorded were extremely low, though in keeping with the habitats present within the project area.

Table 1 – Avian Species Detected During Transect Counts, SRX Project Site

Common Name	***Scientific Name***	***ST***	***#***
	ANSERIFORMES		
	ANATIDAE - Ducks, Geese & Swans		
	Anserinae - Geese & Swans		
Hawaiian Goose (Nēnē)	*Branta sandvicensis*	**EE**	2
	PHASIANIDAE - Pheasants & Partridges		
	Phasianinae - Pheasants & Allies		
Grey Francolin	Francolinus pondicerianus	A	6
Black Francolin	*Francolinus francolinus*	A	7
Ring-necked Pheasant	*Phasianus colchicus*	A	2
	Meleagridinae - Turkeys		
Wild Turkey	*Meleagris gallopavo*	A	6
	CHARADRIIFORMES		
	RECURVIROSTRIDAE - Stilts & Avocets		
Black-necked Stilt	*Himantopus mexicanus knudseni*	**EE**	2
	CHARADRIIDAE - Lapwings & Plovers		
	Charadriinae - Plovers		
Pacific Golden-Plover	*Pluvialis fulva*	IM	5

	COLUMBIFORMES		
	COLUMBIDAE - Pigeons & Doves		
Rock Pigeon	*Columba livia*	A	6
Zebra Dove	*Geopelia striata*	A	11
	PTEROCLIFORMES		
	PTEROCLIDAE - Sandgrouse		
Chestnut-bellied Sandgrouse	*Pterocles exustus*	A	23
	STRIGIFORMES		
	TYTONIDAE - Barn Owls		
Barn Owl	*Tyto alba*	A	1
	STRIGIDAE - Typical Owls		
Short-eared Owl	*Asio flammeus sandwichensis*	IR	4
	PASSERIFORMES		
	ALAUDIDAE - Larks		
Sky Lark	*Alauda arvensis*	A	32
	MIMIDAE - Mockingbirds & Thrashers		
Northern Mockingbird	*Mimus polyglottos*		2
	STURNIDAE - Starlings		
Common Myna	*Acridotheres tristis*	A	13
	THRAUPIDAE - Tanagers		
Yellow-billed Cardinal	*Paroaria capitata*		5
	FRINGILLIDAE - Fringilline and Carduline Finches & Allies		
	Carduelinae - Carduline Finches and Hawaiian Honeycreepers		
House Finch	*Haemorhous mexicanus*	A	11
	ESTRILDIDAE - Estrildid Finches		
African Silverbill	*Euodice cantans*	A	52
Java Sparrow	*Lonchura oryzivora*	A	9
Scaly-breasted Munia	*Lonchura punctulata*	A	13

Legend Table 1

ST – Status
A – Alien species, introduced to the Hawaiian Islands by humans
EE – Endangered endemic species, native and unique to the Hawaiian Islands
IM – Indigenous migratory species, native but not unique to the Hawaiian Islands
IR – Indigenous resident breeding species
- Largest number of individuals recorded between the four site visits

Mammalian Survey

Ten mammalian species were detected during the course of this survey; all are alien to the Hawaiian Islands (Table 2). Numerous European house mice (*Mus musculus domesticus*) were seen in 2013 and 2014; none were seen during the original faunal surveys conducted in 2002. We encountered one domestic dog (*Canis familiaris*), apparently a lost pet or hunting dog; additionally dog sign was widely distributed about the area, especially along roads. Numerous small Indian mongooses (*Herpestes auropunctatus*) were seen throughout the study site, as were several sets of skeletal remains of this ubiquitous species. Three cats (*Felis catus*) were seen, and cat sign was also widely distributed within the study area. Though we did not see any horse (*Equus caballus*), donkey (*Equus asinus*), or pig (*Sus scrofa*), we did encounter tracks, scat and sign of all three species. Domestic cattle (*Bos taurus*) were encountered in the upper third of the project area, no surprise, given that these lands are still being used for cattle pasturage. Goats *(Capra hircus*) were seen throughout the project area, as were numerous bedding sites, and many ungulate trails, which crisscross the entire area. Six sheep (*Ovis aries*) were seen within the State of Hawai'i hunting area south of the project area, old sheep sign was also encountered within the project area.

Table 2 – Terrestrial Mammalian Species Detected SRX Project Site

Common Name	***Scientific Name***	***ST***	***Detection Type***
	RODENTIA - Gnawers		
	Muridae - Old World Rats & Mice		
European house mouse	*Mus musculus domesticus*	A	V
	CARNIVORA- Flesh Eaters		
Domestic dog	*Canis familiaris*	A	V, Au, Tr, Sc
	Viverridae - Civets & Allies		
Small Indian mongoose	*Herpestes auropunctatus*		V, Tr, Sc
	Felidae- Cats		
House cat	*Felis catus*	A	V
	PERISSODACTYLA - Odd-Toed Ungulates		
	Equidae - Horses, Asses & Zebras		
Domestic horse	*Equus caballus*	A	Sc, Tr, Sg
Donkey	*Equus asinus*	A	Sc, Tr, Sg
	ATRIODACTYLA - Even-Toed Ungulates		
	SUICIDAE - Old World Swine		
Pig	*Sus scrofa*	A	Tr, Sc, Sg

	BOVIDAE- Hollow-horned Ruminants		
Domestic cattle	*Bos taurus*	A	V, Tr, Sc
Feral goat	*Capra hircus*	A	V, Tr, Sc, Sg
Feral sheep	*Ovis aries*	A	Tr, Sc

Legend to Table 2

ST = Status
A = Alien – Introduced to the Hawaiian Islands by humans
V = Visual – Species seen
Au = Audio – Species heard
Tr = Tracks – Species tracks seen

Discussion

Avian Resources

The findings of the avian survey are consistent with the location of the property, and the extremely dry nature of the habitats present within the project area. As previously mentioned a total of 20 avian species representing 14 separate families were detected (Table 1). Four of the species detected, Nēnē, Hawaiian Stilt, Pacific-Golden Plover and Short-eared Owl are native species (Table 1). No other species were detected during time spent within the project area in 2002, 2013 and 2014.

Both the Nēnē and Hawaiian Stilt are listed as endangered species under both the federal and State of Hawaiʻi's endangered species programs. Two Hawaiian Stilts were seen flying north along the existing Queen Kaʻahumanu Highway, just north of the wastewater treatment plant located south of Waikoloa Beach Road. There are no wetlands within the project corridors, thus no habitat suitable for this water obligate species exists within any of the alignments still under consideration. We also encountered two endangered Nēnē, in the pasture approximately 1000 meters down-slope from Māmalahoa Highway. It is likely that the birds were attracted into the area by fresh grass that was growing in the pasture following the winter rains in 2002. There are currently two self-sustaining flocks of Nēnē, in the larger general project area, one concentrated around Puʻuanahulu and the Big Island Country Club, both of which are located ~ 14 kilometers south of the project, and the other on the Waikoloa Village Golf Course located north of the project site. It can be expected that Nēnē numbers in this general area are likely to grow as several hundred Nēnē, have been translocated from Kauai to the Big Island by DOFAW over the past three years, and have been ranging freely across the mid-to low elevation areas in the North and South Kohala Districts (David, 2014).

The Pacific-Golden Plover is an indigenous migratory shorebird species which nests in the high Arctic during the late spring and summer months, returning to Hawaiʻi and the tropical Pacific to spend the fall and winter months each year. They usually leave Hawaiʻi and return to the Arctic in late April or the very early part of May. This species is commonly seen across the state even in urban areas during the fall and winter months.

The Short-eared Owl is a resident indigenous endemic sub-species regularly seen in the North and south Kohala areas, often in relatively large numbers following mice population explosions which cycle with the availability of grass seed for the mice to feed on.

Although not detected during this survey, the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic sub-species of the Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the general project area between April and the end of November each year (Banko 1980, Harrison 1990). These pelagic seabird species were formerly common on the Island of Hawaiʻi (Wilson & Evans 1890-1899). These seabirds reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea (Henshaw 1902), as well as the mid-to-high elevations of Mount Hualālai. It has within recent historic times been reduced to relictual breeding colonies located at high elevations on Mauna Loa and possibly Mount Hualaālai (Banko 1980, Harrison 1990, Cooper & David 1995, Cooper et al. 1995, Simons and Hodges 1998, Banko et al. 2001, Hue et al. 2001). Recent ornithological radar surveys conducted in the Waimea plains area have regularly recorded nocturnally flying seabirds thought to be one or both of these two species (David, 2014, B. Cooper 2014, pers. comm.).

The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983, Simons and Hodges 1998, Ainley *et al.*, 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawaiʻi. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds can collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al*. 1998; Ainley *et al.,* 2001; Hue *et al.,* 2001; Day *et al* 2003). There is no suitable nesting habitat within or close to the project footprint.

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property, its current usage and the remarkably dry conditions we encountered. Although no Hawaiian hoary bats were detected during any of the visits to the site, it is likely that overfly the project site occasionally, as they have been seen in numerous lowland areas in South Kohala, including areas immediately north of the proposed development corridor on a seasonal basis (Jacobs, 1994, David, 2014). The site has little to offer a passing bat, as it lacks the vegetation suitable for roosting, and given its xeric nature, probably does not support significant densities of volent insects that this species prey on. The discovery of a cave containing skeletal bat remains outside of the disturbance corridor presents an enigma, since this species is traditionally considered to be solitary foliage roosting bat rather than a communal cave roosting species (Bogen 1972, Carter et al. 2000, O'Shea and Bogen 2000, Menard 2001).

Although the only live rodent detected were numerous European house mice seen in 2013 and 2014, we also recovered skeletal remains of both black rats (*Rattus rattus*) and European house mice from below two Barn Owl roosts in 2002, indicating use of the area by at least two rodent species. It is also possible that brown rats (*Rattus norvegicus*), and possibly Polynesian rats (*Rattus exulans hawaiiensis*), use resources present within the project area on a seasonal basis.

The other mammalian species detected (Table 2) are either common feral game mammals or domesticated species associated with ranching activities.

Potential Impacts to Protected Species

Seabirds

The principal potential impacts that construction and operation of the Saddle Road Extension poses to protected seabirds are all associated with potential lighting issues. Exterior lighting during the seabird fledgling season poses an increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main areas that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, 2) following build-out, the potential operation of streetlights during the seabird nesting season.

Nēnē

The principal potential impacts that construction and the operation of the Saddle Road Extension poses to Nēnē are predominately associated with the potential for birds to be attracted to the verge of the road and being struck by vehicular traffic as has happened on one section of the Saddle Road. It is impossible to predict where, and if Nēnē might, or might not be attracted to the roadway, it is only possible to raise the concern that this is a potential issue for this species.

Recommendations

- If nighttime construction activity or equipment maintenance is proposed during the construction phases of the project, all associated lights should be shielded, and when large flood/work lights are used, they should be placed on poles that are high enough to allow the lights to be pointed directly at the ground.

- Following build-out, it is recommended that any streetlights or facility security lighting that may be required for public safety reasons be shielded (Reed et al. 1985, Telfer et al. 1987). This minimization measure would serve the dual purpose of minimizing the threat of disorientation and downing of Hawaiian Petrels and Newell's Shearwaters, 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.

Glossary

Alien – Introduced to Hawaiʻi by humans
Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species
Endemic – Native to the Hawaiian Islands and unique to Hawaiʻi
Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally
mauka – Upslope, towards the mountains
makai – Down-slope, towards the ocean
Nocturnal – Night-time, after dark
ʻŌpeʻapeʻa – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)
Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young
Phylogenetic – The evolutionary order that organisms are arranged by
Sign – Biological term referring tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected
Threatened – Listed and protected under the ESA as a threatened species

AMSL – Above mean sea level
DLNR – Hawaiʻi State Department of Land & Natural Resources
DOFAW – Division of Forestry and Wildlife
ESA – Endangered Species Act of 1973, as amended
USFWS – United State Fish & Wildlife Service

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SADDLE ROAD EXTENSION
SOUTH KOHALA, HAWAI‘I

DRAFT
ENVIRONMENTAL IMPACT STATEMENT

Appendix E Historic Properties
E1: Archaeological Report

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AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT FOR THE SADDLE ROAD EXTENSION PROJECT IN WAIKOLOA AND PU‘U ANAHULU AHUPUA‘A, NORTH KONA AND SOUTH KOHALA DISTRICTS, ISLAND OF HAWAI‘I, HAWAI‘I

[Portions of TMK: (3) 6-8-001:005, 027, 006, 067;
and (3) 6-8-002:013, 014, 015;
and (3) 7-1-003:001]

Volume I of II

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ABSTRACT

Fifty archaeological sites were identified during the inventory survey work for the Saddle Road Extension project. Twenty eight of the sites were located within the project Area of Potential Effect (APE). Twenty two sites were located outside of the APE. Most of the sites (n=40) are concentrated in the lower elevations near areas where previous archaeological investigations have documented trails, abrader basins, and pāhoehoe excavations. Similar site types were identified in the current project area, and these diminished with greater distance from the ocean. Caves that were used for a variety of purposes during prehistory were identified in the higher elevations. Sites used during the historical period include an old road and a nineteenth century farmstead. There are no Traditional Cultural Properties within the project area of potential effect.

Approximately 44% of the identified sites are situated beyond the construction zones of the APE. With the exception of one of the sites located beyond the construction zone, mitigative measures for potential impacts to these sites are not necessary. All of the sites that are situated partially or entirely within the construction zones of the APE are evaluated as significant for listing on the National Register of Historic Places. These 28 sites in, or partly in, the construction zone are significant for the data that they contain that can contribute to the understanding of the history and prehistory of the area (Criterion d). Data recovery is recommended for 24 of these sites.

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INTRODUCTION

The Federal Highway Administration (FHWA) and the Hawaiʻi Department of Transportation (HDOT) are working cooperatively to prepare an Environmental Impact Statement (EIS) for the Saddle Road Extension, from the Māmalahoa Highway to the Queen Kaʻahumanu Highway. This project, referred to henceforth as the Saddle Road Extension, is a federal undertaking and consequently subject to the procedures and policies of Section 106 of the National Historic Preservation Act (NHPA). Cultural resources are also considered within the FHWA Section 4f regulations and the state of Hawaiʻi historic preservation review process (H.R.S. Chapter 6E). Scientific Consultant Services, Inc. (SCS) has performed the appropriate studies to inventory and evaluate the historical and cultural resources in compliance with the regulations outlined above. This archaeological inventory survey report includes identification and evaluation of all historical and cultural resources within the Saddle Road Extension project area.

The Saddle Road Extension project study area is primarily within Waikoloa Ahupuaʻa, South Kohala District, Island of Hawaiʻi (Figure 1 and Figure 2). The project area includes portions of TMK parcels (3) 6-7-001:041; 6-8-001:05, 027, 066, and 067; and 6-8-002:012, 013, 014, and 015; (Figure 3 and Table 1). There is a small segment of the project area in Puʻuanahulu Ahupuaʻa, North Kona District [TMK: (3) 7-1-003:001]. The project area is bounded on the west by Queen Kaʻahumanu Highway at approximately 50 feet (15 m) above sea level. The eastern terminus is east of the Māmalahoa Highway (Highway 190) at an elevation of approximately 3,250 feet (990 m) above sea level.

There are three alternative routes under study (labeled respectively Alignments 4, 5, and 6). Alignment 4 and 5 share a common corridor in the central portion of the project area, and is referred to as "Alignment 4-5." The upslope, or eastern, portion of Alignment 4, 5, and 6 are along a shared corridor, referred to as “Alignment 4-5-6." Alignment 4-5-6 and the Queen Kaʻahumanu portion of the project area are essential to the proposed undertaking. Either Alignment 4 or Alignment 5-6 will be constructed. If Alignment 5-6 is constructed, then either Alignment 5 or Alignment 6 will be constructed.

There are also several small connecting “roads” that link some of the Alignments to existing routes: Roads A, B, and C. There is road widening planned for the area *mauka* of the proposed intersection of the Saddle Road Extension with the Queen Kaʻahumanu Highway (referred to as QK).

Figure 1: 250,000 Kilometer Series USGS Topographic Map of North Hawai‘i Island Showing Location of Project Area (ESRI 2013. Source: National Geographic Society).

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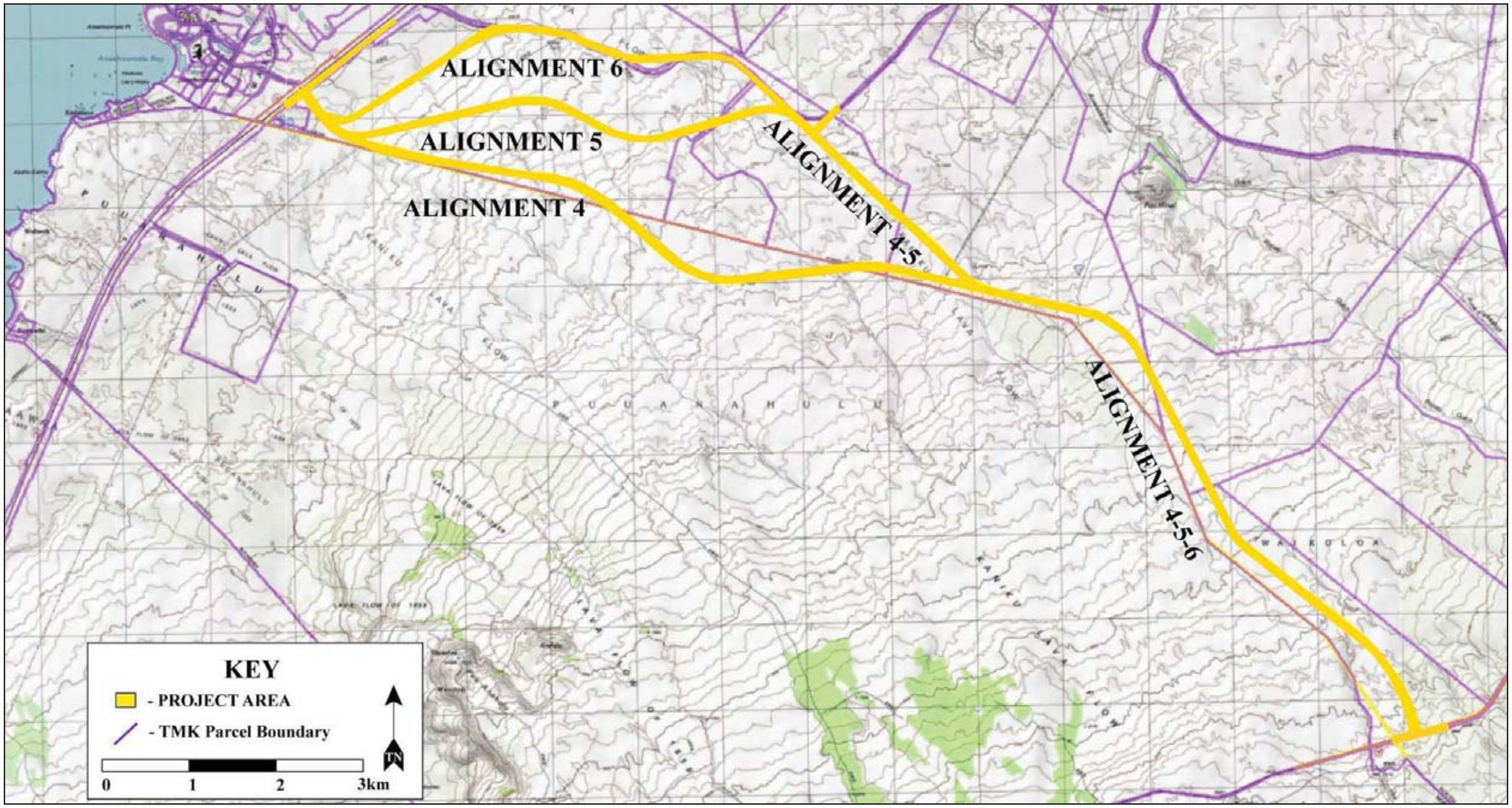

Figure 2: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area (Anaeho'omalu, Pu'u Hīna'i, Pu'u Anahulu, and Ke'āmuku Quads) (ESRI 2013. Sources: National Geographic Society, Hawai'i County Planning Department).

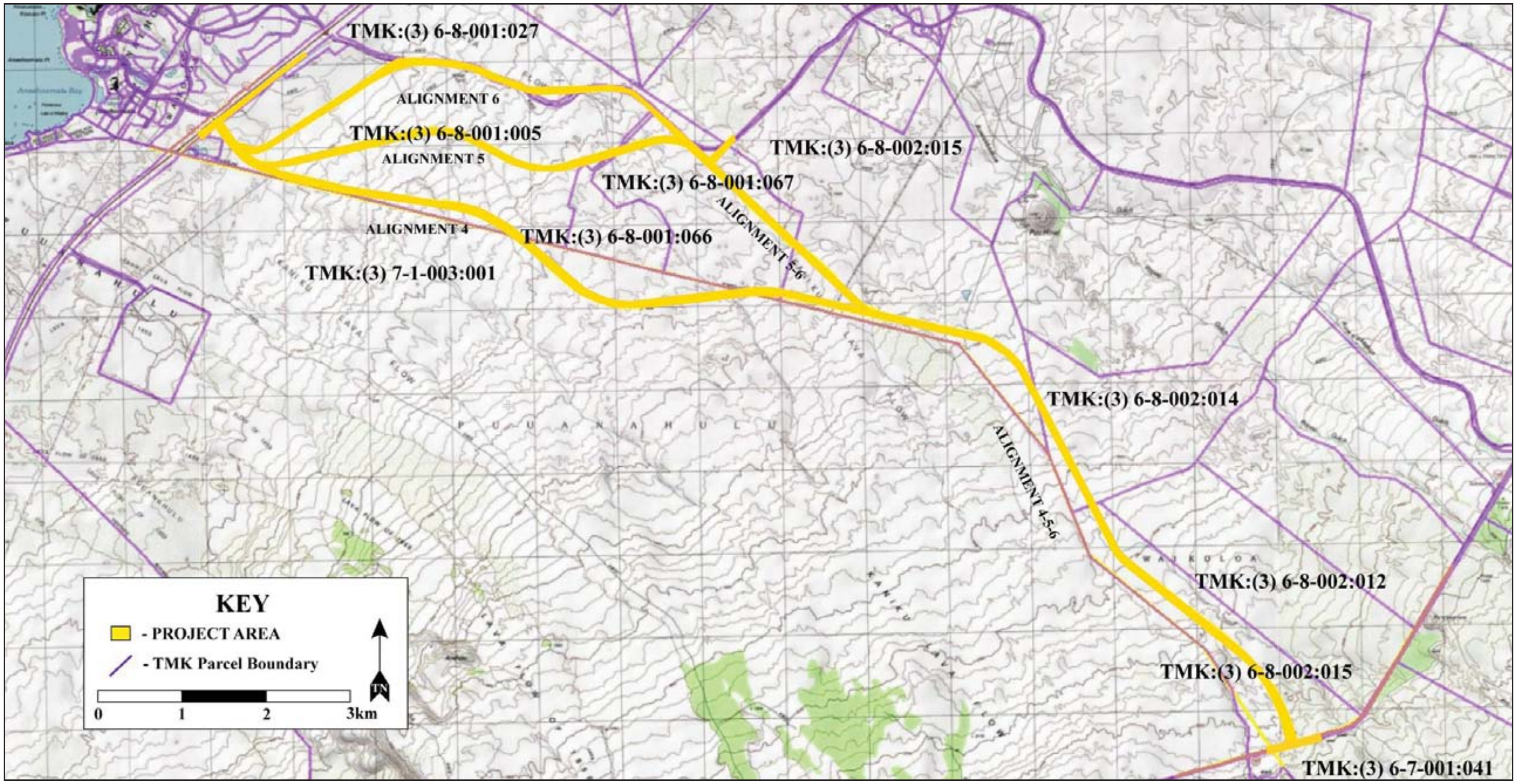

Figure 3: 7.5-Minute Series USGS Topographic Map Showing Location of TMK Parcels and Project Area (Anaehoʻomalu, Puʻu Hīnaʻi, Puʻu Anahulu, and Keʻāmuku Quads) (ESRI 2013. Sources: National Geographic Society, Hawaiʻi County Planning Department).

Table 1: Project Area TMK Parcels and Owners.

TMK PARCEL	OWNER	ALINGMENT
(3) 6-8-001:005	Waikoloa *Mauka*, LLC	Alignment 4, 5, and 6
(3) 6-8-001:027	Waikoloa *Mauka*, LLC	Alignment 6
(3) 6-8-001:066	WQJ 2008 Investment, LLC	Alignment 5
(3) 6-8-001:067	Waikoloa *Mauka*, LLC	Alignment 4, 5, and 6
(3) 6-8-002:012	SRBIC, LLC	Alignment W-3
(3) 6-8-002:013	SRBIC, LLC	Alignment 4-5-6
(3) 6-8-002:014	Waikoloa Village Association	Alignment 4-5-6 & REV
(3) 6-8-002:015	Waikoloa Village Association	Alignment 4-5-6 REV
(3) 7-1-003:001	State of Hawai‘i	Alignment 4

The total length of the combined project area alignments, connector roads, and the portion of Queen Ka‘ahumanu Highway that will be widened is 25.3 miles. The width of the construction corridor varies from 120 to 240 feet, with the majority of the construction corridor less than 150 feet wide. To ensure that all potentially impacted cultural resources were identified, the archaeological inventory survey (AIS) was conducted over a width of 250 feet (the study corridor), an area wider than the construction corridor. The proposed undertaking Area of Potential Effect (APE) is a 250 foot wide corridor stretching 25.3 miles through unimproved cattle pasture and open lava flows. The APE is 784 acres and includes all alternative alignments, connector roads, and the portion of Queen Ka‘ahumanu Highway that will be widened. The AIS project area is the same as the APE.

METHODS

The archaeological inventory survey (AIS) was undertaken in accordance with Hawai‘i Administrative Rules 13§13-284 and 275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports contained in Hawai‘i Administrative Rules 13§13-276. The archaeological inventory survey was also conducted in compliance with the National Historic Preservation Act (NHPA) of 1966, as amended, and as defined in 36 Code of Federal Regulations (CFR) 800. Under Section 106, the federal agency must consult with the State Historic Preservation Officer (SHPO) regarding the potential effect to historic properties identified in the project area. The AIS is provided as a supporting document in the consultation process.

ARCHIVAL RESEARCH

Prior to the commencement of field work, SCS conducted historical and archaeological archival research including a search of historic maps, aerial photos, written records, Land Commission Award (LCA) documents, and State and County Planning and Tax Records documents. Previous archaeological studies were examined, Land Commission Awards and Boundary Commission data was researched, and several knowledgeable area residents were interviewed.

ORAL INTERVIEWS AND CONSULTATION

Interviews and consultation were conducted as part of the archaeological study documented in this report. Interviews were conducted in accordance with the Hawai‘i Section 6E Historic Preservation review process and as part of the federal Section 106 Consultation process.

Section 6E Interviews and Consultation

SCS Archaeologist Leann McGerty contacted 18 individuals in 2001 and 2002 to record information on the cultural practices, land-use, and history of the project area (Appendix A). Formal interviews were conducted with Paul Andrade; Ku‘ulei Keakealani McCarthy; Mark Yamaguchi; and Jiro Yamaguchi. Tape recordings of these interviews are on file at SCS. The interviews generated information on ranch activity, some historical use of the project area and surrounding region, and perceptions of legends and traditional history. When these pertain to the project area they are cited in the report by referencing the interview in this fashion: (Mark Yamaguchi Interview).

Ku‘ulei Keakealani McCarthy has lived in the Pu‘uanahulu area most of her life, and was interviewed on November 28, 2001. Her father, Sonny Keakealani, Jr., was raised in Pu‘uanahulu and was a *paniolo* at Pu‘uwa‘awa‘a Ranch and Parker Ranch. She learned the history of this area from her father and from her uncle Howard Alapa‘i. Paul Andrade, cultural specialist Director for the Outrigger Resort at Mauna Lani, was interviewed on November 29, 2001. Mr. Andrade was born in Honoka‘a in 1962, and the elders in his family worked at Parker Ranch. Jiro Yamaguchi was 77 years old at the time of his interview on April 15, 2002. He was born in Waimea and began working at Parker Ranch at the age of 13. Before World War II, Mr. Yamaguchi was employed at the dairy, mended ranch fences, and worked with mules. After the war, he worked as a full-time cowboy. He learned to speak Hawaiian in order to work with Hawaiian cowboys and to understand the Hawaiian names for prominent natural features on the ranch. Four generations of Jiro’s family have worked at Parker Ranch. Mr. Yamaguchi passed away prior to the submittal of this report. Mark Yamaguchi, Jiro's son, was 43 years old at the time of his interview on April 15, 2002. He was born in Honokaʻa and worked at Parker Ranch for most of his adult life.

Section 106 Consultation

As part of ongoing project area oral interviews and Section 106 Consultation, public notices were published in the West Hawaiʻi Today and Hawaiʻi Tribune-Herald newspapers on August 17, 20, and 21, 2014 (Appendix A). A public notice was also published in the Honolulu Star-Advertiser on September 3, 2014 and in the September 2014 issue of the Office of Hawaiian Affairs (OHA) Ka Wai Ola newspaper.

Section 106 Consultation letters were mailed to Native Hawaiian Organizations (NHO), cultural practitioners, and individuals who have knowledge of the project area lands (see Appendix A). Thirteen individuals and members of eleven organizations were contacted and asked if they have, or knew of anyone who has, information concerning historic properties, archaeological sites, or cultural practices associated with the project area lands (see Appendix A). Individuals contacted included long-standing members of the Puʻu Anahulu, Kohala, and Waimea communities, and former Parker Ranch employees who are familiar with the project area lands.

Organizations invited to consult included the Office of Hawaiian Affairs (OHA), the Hawaiʻi Island Burial Council (HIBC), the Department of Hawaiian Home Lands (DHHL), The Hawaiʻi State Historic Division (SHPD) Burial Sites Specialist, Hui Mālama I Na Kūpuna ʻO Hawaiʻi Nei, the Ala Kahakai National Historic Trail-National Park Service, the Hawaiʻi County Planning Department Cultural Resources Commission, the Waimea Community association, the Waikoloa Community Association, the Paniolo Preservation Society, the Waimea Hawaiian Civic Club, and the Kona Hawaiian Civic Club.

All of the individuals contacted were interested in consulting, and several of the organizations were interested in consulting. The individuals and organizations that responded asked to review the draft AIS report. The draft AIS report is being provided to these individuals and organizations. Additional consultation comments generated through the review of the draft AIS, or received through additional interviews and meetings, will be included in the final draft of the AIS report.

Interview meetings and telephone interviews were conducted with nine individuals, as well as with members of DHHL, HIBC, and OHA. Maps of the project APE were given to those contacted to provide information and context for the interviews. Information was provided regarding the land owners affected by the proposed undertaking and their respective opinions of the project. The rationale for the road construction was discussed, as well as a description of the AIS methods and its general results.

The project area lands have been privately owned for many generations and, as such, cultural practitioners and community members infrequently visit the area. Much of the knowledge concerning past cultural practices has been lost as a result. Most of the knowledge that exists today is held by former Parker Ranch employees who are primarily familiar with the locations of trails, rock mound markers, and ranch era features within the wider region surrounding the project area. There were no past or on-going cultural practices identified, through consultation, within the project area APE or in the region surrounding the project area.

Interviews were conducted with members of the Pu'uanahulu community on September 10, 2014. Those in attendance included Julia Akau, Marnie Humble, Kuulei Keakealani, Merline Kilte, Robert L. Mitchell, and Clarese "Nana" Wilcox. The main points discussed during the meeting are summarized below. It was noted that there are no burials in the project APE. The question was asked as to whether building a new road would increase access to burials in the wider area and how that would be addressed. It was explained that the lead federal agency will assess whether or not there is the potential of an indirect impact to burials created by the new road. If there is, the lead agency will determine how to best mitigate any indirect impacts to them.

Kuulei expressed concern that the project APE will impact the Kanikū lava flow, a storied landscape. Kuulei also mentioned that her father asked if the project APE will impact the old cattle drive trail from Puʻu Waʻawaʻa Ranch to Puakō. She stated that her father Sonny would like to visit the project area to tell what he knows of the trail.

The primary concern for all involved was that every effort be made to avoid historic properties and rare endemic and indigenous plants. It was explained that a flora study and an archaeological study were conducted to help address these issues. The question was asked whether there is a real need for a new road, rather than improving existing roads, and does it justify impacting undeveloped land to build the new road.

A meeting was held on September 2, 2014 with Dr. Billy Bergin, a doctor of veterinarian medicine who worked for Parker Ranch for 25 years, and worked for the state of Hawaiʻi from his office in Waimea. Dr. Bergin did not know of any traditional cultural practices or archaeological sites associated with the project area lands. Dr. Bergin reviewed the draft AIS.

A telephone interview was conducted on September 30, 2014 with Donnie De Silva who worked for Parker Ranch for thirty-seven years and retired in 1995. Donnie worked at numerous Parker Ranch sections including at Puʻu Hīnaʻi where there was a wooden corral. Early in his career, he participated in the cattle drives that brought cattle from Waimea to Kawaihae to be shipped to Oʻahu.

The cattle were driven along the road at night when there wasn't any traffic. The cowboys would arrive in Waimea at midnight where the cattle were corralled. The cowboys would saddle their horses and then eat breakfast. After breakfast, they would drive the cattle to Kawaihae and return to Waimea. This was the main route for taking cattle to the coast for shipment during his early years at Parker Ranch. The practice ceased in the 1960s when the Mauna Kea Hotel was built and night shift workers used the road to commute. From that time on, the cattle were hauled in trucks to Kawaihae.

Donnie explained that there was a cycle, based on seasonal rainfall, for driving cattle on lands between Waimea and the saddle region. The area between the Kamuela Airport to the Keʻāmuku ranch station was the winter paddock. The grass was lush in the winter paddock because of the higher precipitation during the rainy season. As the rainfall diminished after winter, cowboys would drive the cattle up to higher and higher elevations where there was still rainfall and better grass. Finally, cattle would be driven back down to the winter paddock for the next rainy season.

A meeting was held with Shane Palacat-Nelson, the west Hawaiʻi OHA representative, on October 3, 2014 to discuss the Saddle Road Extension project. Shane's family has lived in Kaloko, Honokōhau, and Kona for several generations and he is a traditional cultural practitioner. The primary concern Shane expressed during the meeting was that historic properties are important to cultural practitioners for both their cultural and historical significance. He suggested the an alignment that best avoids the historic properties should be chosen for the proposed project.

Section 106 Consultation was conducted with the Hawaiʻi Island Burial Council (HIBC) members at the October 23, 2014 burial Council meeting held in Hilo, Hawaiʻi. Saddle Road Extension project information was presented by the Saddle Road Task Force (public steering committee), Geometrician Associates (environmental studies), DMT Consultant Engineers (project design engineers), and Scientific Consultant Services, Inc. (archaeological and cultural studies).

Ron Terry (Geometrician Associates) and Lennie Okano-Kendrick (DMT Consultant Engineers) began by stating that the purpose of meeting was to conduct Section 106 Consultation with the Hawaiʻi Island Burial Council (HIBC) as a Native Hawaiian Organization (NHO), even though there were no burials within the area of potential effect (APE). As part of the ongoing Section 106 Consultation, Ron and others planned to present the proposed Saddle Road Extension project details and background, and to ask HIBC members about their concerns and recommendations regarding the proposed project.

Ron introduced members of the Saddle Road Task Force (SRTF) who were in attendance at the HIBC meeting. They were Craig Bo Kahui, Walter Kunitake, and Duane Mukai. Ron and Lennie presented information regarding the proposed project corridors and explained the long history of planning and environmental studies to date. Ron asked if any of the Hawaiʻi Island Burial Council (HIBC) members had questions.

HIBC member Mary Maxine Kahaulelio asked how many properties the project corridors crossed and how large the owners' parcels were. She stated that these people own thousands of acres of land. She asked about burials and archaeological sites within the project area. Ron Terry stated that there were four property owners. Ron also said that the proposed road corridors were selected to avoid archaeological sites, burials, and endangered species. He said that Glenn Escott (Scientific Consultant Services, Inc.) would present a summary of the archaeological study next.

Maxine asked about the presence of unexploded ordnance (UXO) within the project area and the presence of goats and cattle. Ron stated that there is a potential that UXO is located within the project area. He spoke about the ongoing UXO clearance efforts in the area and about coordinating UXO support for construction of the proposed road. He also said that there would be fencing along the highway to keep animals off of the road.

Maxine asked about the start date for construction. Ron stated that the scheduled construction start date was in 2018. He spoke about the engineering and condition of the old Saddle Road and the high incidence of accidents, injuries, and deaths associated with it. Ron noted the improved design of the new Saddle Road and the fact that there are now far fewer accidents per vehicles travelling on the new highway. Even though traffic on the new corridor has tripled, there have only been three reported deaths over the past 10 years.

HIBC Member Fred Cachola spoke about the dangerous conditions of the old Saddle Road. He said that he wished the road was going to go closer to Waimea rather than Kona. He spoke about the likelihood of burials and artifacts in lava tubes in the area of the project area lands. He requested that cultural monitors be present during the construction of the proposed road. He suggested that there is a qualitative difference between cultural monitors and that some are more acceptable then others. He recommended that Native Hawaiian Organizations (NHOs) and the Hawaiian community be consulted in the selection and hiring of cultural monitors.

Ron spoke about the selection of the proposed road corridors and explained that there were many corridor options that were evaluated. There was a wide area of study beyond the area within the existing proposed corridors.

HIBC Chair Edwin Miranda asked which of the proposed alignments will be chosen for the actual road construction. Lennie described the various alignments and explained that Alignment 4-5-6 would be used as the *mauka* portion of the road and that either Alignment 4, 5, or 6 would be chosen as the *makai* portion of the road.

Ed asked, if a snag is hit during the construction of one of the alignments, such as the presence of an inadvertent or previously undocumented cultural site, will the budget include sufficient money to revise the alignment or choose an alternate route. He won't agree to the removal or relocation of a significant site to complete the proposed road.

Ed asked about soil erosion and drainage studies for the project. Ron answered that the appropriate studies were conducted and will be reported in the EIS.

Ed spoke about the importance of native plant species to the aesthetic of burial sites. He hoped that endangered species would be preserved in place. He asked who conducted the botanical study. Ron stated that Geometrician Associates conducted the botanical study.

Ed asked about the social aspects of the proposed project. Ron spoke about the past and ongoing consultation with community associations and individuals. Specifically, Ron spoke about consultation conducted with the Waikoloa Village Home Owners Association. The association expressed various suggestions along different lines regarding the project.

Ed suggested that there should be a plan to control or eradicate fireweed in the proposed road corridor. He spoke about the spread of fireweed along the newly realigned Saddle Road. He believes that the fireweed will continue to spread downhill along the new Saddle Road and the proposed Saddle Road corridor. The fireweed has a negative effect on horses and cattle.

Ed asked again about drainage for the project area. He asked if a 100-year flood study was conducted for the proposed project. Lennie answered in detail. Ron added that the best management practices are being implemented.

Fred mentioned that Alignment 4 crosses or touches the North Kona-South Kohala *moku* (district) boundary in three places. He expressed that these are traditional boundaries that are culturally and historically important to Hawaiians. In addition, there was likely pre-contact era activity along the boundary, including the construction of rock mounds to mark the boundary. There might also be other archaeological features, such as trails and burials, along the *moku* boundary. He asked that we consult the Advisory Council on Historic Preservation (ACHP) publications regarding the treatment of traditional cultural boundaries and trails.

Fred suggested that, since the *moku* boundary is culturally important, there is the potential to educate the public about this boundary. He suggested there be signage to mark the boundary.

Ed Miranda asked if there were any endangered plants in the project area. Ron stated that years ago, there was a *wiliwili* tree and an *uhiuhi* tree near the project area, but since then both trees have died. Ron stated there are no *wiliwili* trees or *uhiuhi* trees in the corridor. Ed expressed that he would like to see *uhiuhi* trees planted in the area.

Maxine returned to the question of how many land owners' properties would be crossed by the proposed road. The road will create access to their property increasing the potential for them to develop their properties.

Maxine stated that, only conducting Section 106 Consultation with area civic clubs is not enough since many clubs don't have members that are familiar with the project lands or traditional cultural practices. The project has the potential to open up undeveloped lands to new development. She stated that there is already a lot of traffic on Saddle Road. She stated that there are too many trucks and tourists coming into remote areas of the island, like at Puʻu Huluhulu. She feels that development is "moving us out of our own island." She stated that these large land owners, rich outsiders, in the area of the proposed Saddle Road Extension bought up the properties without anyone knowing. She stated the properties are big and these owners are buying up the land of the Hawaiian people. She asked who these people are and how they were able to purchase these properties. She stated that the Section 106 process is supposed to protect Hawaiian cultural lands, not sneak in projects. She wants to ensure that the Section 106 process is being properly applied.

Maxine also discussed the potential for animals to be killed on the road. She also requested that HIBC member Kalena Blakemore be informed if any lava tubes are identified during the construction of the new road, since Kalena has experience with caves.

Fred restated that the Section 106 process should be conducted in accordance with Advisory Council of Historic Preservation (ACHP) guidelines.

Maxine discussed previous construction projects conducted in the distant past where burials were dug up and moved. She also stated that, in some cases, the burials were paved over with roads.

Fred stated that the project has the potential to take 736 acres of what he considers to be a cultural landscape, and that the cultural landscape will be gone forever. He requested that Hawaiians be allowed to collect information and artifacts from sites within the project area prior to the start of construction. He stated that he felt Section 106 mitigation should include scholarships for Native Hawaiian archaeology students to collect the information and artifacts.

HIBC member Keikiʻaloha "Keiki" Kekipi spoke to thank the Saddle Road Extension team for all the work they have conducted collecting important cultural information for everyone, including future generations. Maxine stated that she didn't feel the same as Keiki. Ed stated that the HIBC was not there to offend anyone, but was there to defend cultural properties and practices.

Glenn Escott, Senior Archaeologist for Scientific Consultant Services, Inc (SCS) presented information regarding the history of the project area archaeological investigations, cultural informant interviews, and Section 106 Consultation. He gave a summary description of site types documented in the project area. He stated that there were no burials identified within the project area, but there are known burials in lava tubes in the broader area. Glenn asked if any of the Hawaiʻi Island burial council (HIBC) members had questions.

Fred spoke again about the cultural importance of the traditional North Kona - South Kohala *moku* boundary. He again expressed that the project will follow state and federal regulations in assessing its importance.

Fred spoke about the fact that Hawaiians and non-Hawaiians have different views concerning what constitutes an archaeological site. He feels that, in the past, archaeological studies on have documented isolated individual sites and have overlooked the larger cultural landscape with which they are associated. He asked what the spiritual impact will be to the Hawaiian people as a result of losing this landscape to the proposed project.

Maxine spoke about the fact that Hawaiians arrived on the island first. This is their island. They used different regions within the landscape for different purposes. There was a place to eat, a place to live, a place to give birth, and there are important places in between these areas as well. She thinks it is likely that the project lands between the coast and the mountains were important to Hawaiians. She is afraid that sites will be destroyed, especially burials.

Maxine stated that the people who are developing the island ("you folks") are motivated by power and profit. She continued, "You folks don't have any respect. You folks don't do a good job of finding and protecting sites. You damage sites. You guys are putting a highway over our burials. The military is bombing the island. What more do you guys want? We stopped the Queen Kaʻahumanu Highway. We stopped it!"

She went on to say that the last phase of the realigned Saddle Road should not be called the Daniel K. Inouye Highway. It should be named after a Hawaiian. She stated the highway is named after Senator Inouye because he gave lots of money to the military. She continued, "You guys come over here and destroy the island!"

HIBC member James Kimo Lee spoke to defend Senator Inouye, citing the programs Senator Inouye supported that have benefited the Hawaiian community. Maxine stated that she did not agree.

HIBC member Nalei Kahakalau spoke to say that he feels most archaeological studies conducted in Hawaiʻi are good. He asked if there were any burials. Glenn stated there are no burials in the project area. He asked if Glenn could say with certainty that there were no burials in the project area. Glenn stated that he could say with certainty that there are no marked burials in the project area. In Hawaiʻi there is always the possibility that there might be unmarked burials that cannot be detected without subsurface excavation. Nalei asked that any inadvertent burial discoveries be considered as previously documented burials.

Nalei stated that his primary concerns regarding the proposed project are the moku boundaries, the need to have cultural monitors, providing scholarships for native Hawaiian students to collect information on project area sites, in-place preservation of any burials, and large preservation buffers at those burial sites.

Fred asked how many trails were in the project area. Glenn stated that there is a trail network within the *makai* portion of the project area, along Queen Kaʻahumanu Highway. Fred asked that the trails be marked where the proposed road crosses them. He suggested that the road surface color might be different from the rest of the road there, or perhaps signs could be placed explaining the trails. He recommended that the trail crossing be considered a significant pedestrian crossing.

The Director of the Saddle Road Task Force, Walter Kunitake closed the meeting by explaining that HIBC members' input, as well as all of the community input they have received, is very important to the task force for steering the direction of the project. He thanked the members for their concern and help. He said that the task force would do its best to implement HIBC recommendations throughout the course of the project.

FIELD SURVEY

The centerline and outer edges of the study corridors were staked at 300 foot intervals. Archaeological survey was conducted in October and November, 2001, November 2003, and March 2012. Suzan Keris, B.A., Adam Johnson, B.A., Bert Meigs, B.A. were the field archaeologists conducting the study. Glenn Escott, M.A. was the Field Director for the project.

The ground surface within the 784 acre APE survey was primarily exposed lava, exposed lava with sparse grass, grazed grass pastureland, and some areas of knee-high grass. Ground visibility was excellent to good in most areas.

Survey transects were walked parallel to the length of the study corridors. Each morning, archaeologists surveyed along one half of the survey corridor and in the afternoon surveyed along the other half of the corridor, returning to their starting point. In this way, four archaeologists walked four transects along one half of the study corridor and four transects along the other half of the study corridor on their return. During the pedestrian survey, archaeologists were spaced at 36 foot (11 m) intervals across the study corridors. The staked outer edges of all corridors were walked as survey transects allowing for the thorough inspection of the proposed road alignments and the ground surface outside of the study corridor. Several sites were identified and recorded some distance outside of the APE by this method.

In areas where undulating ground surface or tall grass made ground visibility poor, archaeologists marked their position along their survey transect and surveyed areas of poor ground visibility between the transect lines. A point was made to intensively survey areas of tall grass, ground surface depressions, hill tops, and ridge lines by walking between survey transects and over these types of topographic features. After all areas of poor ground visibility were surveyed in this way, the archaeologists returned to their transect lines and continued surveying. Additional resurvey of some portions of the alignments was made when walking the survey corridor from the few access points to unsurveyed study areas and to record sites. Approximately 1,280 man-hours were expended in the field portion of the project. Thomas Wolforth, M.S. was the Principal Investigator for the project initially, followed by Glenn Escott, M.A.

Sites and features identified in the field were plotted by means of Global Position System (GPS) and mapped, described, measured, drawn, and photographed. Sites were plotted on a project area map using Universal Transverse Mercator (UTM) units (Zone 5 North) and WSGS84 datum. Trails and other linear features were mapped to their termini often well beyond the boundaries of the project area.

There are two types of sites that do not lend themselves to mapping documentation: pāhoehoe excavations, and "ridge" quarries. Both sites are places where people struck the natural bedrock, presumably with stone hammerstones, to crack, break, and remove pieces of the natural rock. Consequently, these sites are manifest by the deconstruction of the natural setting, rather than the addition of materials to construct a feature of some kind. In addition, there are no, or very few, artifacts at the site. The raw material was taken away to be modified elsewhere, so that the only "artifacts" at the site are the broken rocks. Pāhoehoe excavations have been identified in previous archaeological investigations in the area. Ridge quarries are newly defined in this report. Whereas pāhoehoe excavations are quarry areas usually on relatively level terrain, "ridge" quarries are broken areas on vertical upthrusts of lava. Unlike pāhoehoe excavations where there are holes left in the quarried locations, the quarried material from ridges is often taken from the top or flanks of the relatively thin upthrust lava (often less than 2 feet thick).

Detailed mapping of pāhoehoe excavations and ridge quarries merely provides a depiction of the natural landscape. The data contained within these types of sites is not in their particular formation or configuration. Rather, it is in their location on the natural and cultural landscape. This report records the kind of lava that the quarries are created in, records their location in the overall landscape, and discusses how they were integrated into the larger land use patterns of the area. Maps are provided for all and photographs are provided for a sample of both types of quarries.

CAVE SURVEY

One concern of the resource investigation team was identifying every cave that existed below the APE. It was recognized that, by limiting the surface survey to the 250 foot wide study corridors, tubes passing below the APE could be missed. Openings to such tubes could be well beyond the APE and out of visual range of the surveying team.

Cave exploration was conducted in stages to ensure that all tubes within the APE were identified and investigated. Potential cave locations were identified by the United States Geological Survey (USGS) based on topographical data suggestive of cave openings and associated cave tube locations in and near the project study area. These were plotted on a project map. Subsequently, project team members conducted a helicopter reconnaissance of the study area. Several large cave openings were observed and plotted on USGS topographic maps. The data recovered from these two methods resulted in an awareness of the quantity and kind of caves in the landscape.

Surface survey was conducted beyond the APE in all places identified as having a potential for having cave openings, and in places where cave openings were observed in the helicopter reconnaissance. During the surface survey it became apparent that there is a positive correlation between the presence of *wiliwili* trees (*Erythrina sandwicensis*) and cave openings (Latin flora names: Starr Environmental 2013). All *wiliwili* trees within approximately 200 meters of the outer edge of the APE were inspected during surface survey.

Once a cave opening was identified, cave inspection proceeded in stages. Openings were sketch mapped and GPS coordinates were recorded with hand-held instruments. All tubes associated with each opening were explored, and sketch mapped. This data was plotted on project study maps and examined to determine whether the tubes passed beneath the study area. If it was clear that the cave did not pass beneath the study area, no further investigations were conducted. A map of tubes recorded outside of the project area is provided in Appendix B. This level of assessment is sufficient to ensure that particular tubes do not pass below the project area, but is not adequate to conclude that no cultural remains exist within those tubes. Consequently, the absence of documented cultural material within certain tubes should not be construed as a declaration that none exist, or that the cave was never used by people in the past.

If it was determined during the first investigation of the cave that it passed below, or very close to, the APE, further investigation of the tube was conducted to achieve two things: inspect the cave more thoroughly for evidence of cultural use, and map the cave in more detail and with a higher level of accuracy.

Lava tube caves are natural formations created as a byproduct of lava flowing across the landscape. Lava tubes with openings to the ground surface were used by Native Hawaiians in a variety of ways. Evidence of pre-Contact to early post-Contact era cave use is often characterized by manmade features, such as rock mounds, terraces, enclosures, modified openings, petroglyphs, and the presence of tools and subsistence debris.

Evidence for illuminating cave interiors include burnt *kukui* nut shells, stone lamps, partially burnt pieces of wood and plant material, and charcoal on the cave floor. Although large caves may have been fully traversed and explored by people in the past, it is extremely rare that an entire cave was modified with stone features. The particular distribution of stone features and material remains provides data pertaining to how the cave was used. The assignment of site boundaries of cultural activities within caves takes this into account.

A cave is a natural geological feature and is not necessarily an archaeological site. An archaeological site is the concentration of features and/or cultural material within the natural setting. This perspective on site designation for cultural phenomenon is in accord with principles of site definition in use for sites on the ground surface. Although people traversed, explored, used, farmed, collected resources, and conducted other activities all over the ground surface, that does not mean that the entire ground surface is an archaeological site. Using this perspective of site definition, there can be multiple sites within caves.

For instance, a long cave may have a refuge site near the constricted entrance to the cave, and a burial site hundreds of meters further into the cave. There may also be scattered flecks of charcoal or pieces of burnt wood distributed on the cave floor between the refuge and burial areas. The evidence of burned items is an indication that people moved across this subterranean landscape, but these are not culturally modified areas, and are consequently not considered archaeological sites in this report. Each cave system was assigned a name. There were no names assigned to small, culturally sterile lava blisters.

SUBSURFACE TESTING

Subsurface testing was conducted at two sites (Sites 24465 and 24470). These were the only two sites that contained enough sediment to conduct subsurface testing. Most of the sites in the project area were abrader basins, caves lacking soil deposits, and trails on exposed lava. Subsurface testing included shovel probes (SP) and test-units (TU).

Shovel probes (SP) were excavated at sites and individual features to quickly sample them by collecting small amounts of data from many locations. The results of shovel probes were used in four ways:

- To observe how material remains (and consequently, activity areas) were distributed over large areas,
- To locate subsurface deposits and subsurface features,
- To quickly determine the base of feature architecture, and

- To situate subsequent controlled excavations at places identified in the shovel probes as containing high quantities, or certain types of, material remains.

Shovel probes locations were non-random and were placed in areas across a site where artifacts and subsurface features were most likely to occur, or were excavated along feature architecture to investigate the base of architecture depth. Shovel probes were approximately 0.4 by 0.4 m to 0.5 by 0.5 m in plan view, were excavated by natural stratigraphic layers, and terminated on bedrock or, less often, culturally sterile dark yellowish brown fine silt.

The shovel probe excavation summaries in this report document the number of layers and the depth at base of excavation for all shovel probes. Soil colors were recorded using Munsell color charts, and soil composition was recorded with the aid of the U.S. Department of Agriculture Soil Survey Manual. The collected matrix was screened through 1/8 inch hardware mesh. In most cases, material remains were collected separately for each natural layer encountered in the probe, unless otherwise stated in the shovel probe excavation summary. All materials were analyzed as outlined below.

Test-Units (TU) were 1.0 by 1.0 m plan view, were excavated by natural stratigraphic layers, and terminated on bedrock or, less often, culturally sterile dark yellowish brown fine silt. The collected matrix was screened through 1/8 inch hardware mesh. The excavation unit summaries in this report document the number of layers and the depth at base of excavation for all test-units. Soil colors were recorded using Munsell color charts, and soil composition was recorded with the aid of the U.S. Department of Agriculture Soil Survey Manual.

Profiles were drawn for all excavation units. Collected matrix was screened through 1/8 inch hardware mesh. In most cases, material remains were collected separately for each natural layer, for each 10 cm level, and for each subsurface feature encountered in the TU excavation, unless otherwise stated in the excavation summary. All materials were analyzed as outlined below.

LABORATORY ANALYSIS

Inventory of midden and artifacts collected from the excavations were analyzed by layer and 10 cm level of provenience within each excavation unit. Meaning, artifact counts from each excavated layer were tabulated individually to allow for a comparison of artifact types and densities between each layer. This type of analysis is well suited to show changes in human activities and food sources over time.

Faunal remains were identified to species and genus where possible, or to class or order when they were nondiagnostic of species. The data of midden identified were tabulated for each layer. Volcanic glass and basalt debitage was counted and described in terms of core, primary, secondary, interior, exterior, or non-diagnostic flakes. For all other artifacts, dimensions, weight, count, and diagnostic characteristics were recorded. The characteristics and types of bottle glass and plateware recovered were recorded and used to date the items where possible.

Radiocarbon samples were collected as a single piece of provenienced charcoal removed from the sediment within the unit by means of a trowel. The sample was placed in an aluminum foil packet and sent to the SCS lab in Honolulu. The sample was not touched by hand, and was sent to Beta Analytic, Inc. in Miami, Florida for radio carbon dating. Measured radiocarbon age dates in years before present (ybp) and 2-Sigma calibrated date ranges returned by Beta Analytic, Inc. were calibrated to 2-Sigma percentage probability date ranges using the Oxcal radiocarbon calibration computer program. The Beta Analytic, Inc. raw data and tabulated 2-Sigma date range probabilities are included in Appendix C.

ENVIRONMENTAL SETTING

The project area traverses a large area from the arid coastal region to the semi-arid upper *pili* lands of leeward Hawai‘i. *Pili* lands is a traditional Hawaiian land classification that refers to the dry grassy plains in the low to mid-elevations of Hawai‘i Island where *pili* (*Heteropogon contortus*), a grass traditionally used for thatching, normally grows. Though *pili* grass no longer grows in the project area, the area is still classified as *pili* lands.

The project area is situated between 60 and 2,500 feet (18 and 762 meters) above mean sea level (amsl). The coastal and near coastal portions of the project area are covered by exposed pāhoehoe and ‘a‘ā lava flows. There is almost no vegetation in this region due to lack of rainfall and lack of soil. Further inland, as elevation and rainfall begin to increase, so does the vegetation. The lava flows in the center of the project area are primarily exposed ‘a‘ā lava. The upper portions of the project area have more soil. These are soils developed in ash from nearby cinder cones, as well as from Mauna Kea. Some of the soil is colluvial and alluvial sediments washed down from the slopes of Mauna Kea during deglaciation

15,000 to 14,000 years ago (Blard et al. 2006). The upper project area is primarily open grass and shrublands.

Lava flows associated with Mauna Kea, Mauna Loa, and Hualālai volcanoes cover the project area (Wolfe and Morris 1996). The various composition and ages of the flows create several distinctly different substrates (Figure 4). The upper elevations of the project area are mostly Mauna Kea flows dating to the Pleistocene (from 14,000 to 250,000 years ago) (Wolfe and Morris 1996:14). Pu‘u Hīna‘i is a Mauna Kea cinder cone dating to between 14,000 to 65,000 years ago. A Hualālai flow dating to between 5,000 and 10,000 years ago is also situated in the upper elevations. Soils on these flows are shallow sandy loams on rolling terrain and ridges (Pu‘u Pa and Waikoloa Series soils), and sand and sandy loam colluviums on the level flats (Kamakoa Series soils) (Sato et al. 1973: 24, 50, and 53).

Mauna Loa flows cover the lower two thirds of the study area. Older Mauna Loa flows, dating to 5,000 to 10,000 years ago are present in *kīpuka* of younger flows dating to 1,500 to 5,000 years ago. The older flows are light brown smooth and ropey pāhoehoe. The younger flows are dark grey with some brown ‘a‘ā (Figure 5). Wolfe and Morris (1996) lump this series of younger dark grey ‘a‘ā flows together into one flow unit (Wolfe and Morris 1996:11).

Multiple flows can be distinguished by elevation changes and ‘a‘ā composition during surface survey. This suite of dark grey ‘a‘ā flows that dominate the lower elevations of the project area are referred to collectively as the Kanikū Flow. There are no soils on the flows below 1,800 feet (550 m) amsl.

Average annual rainfall increases with elevation in Waikoloa and varies from year to year. Mean annual rainfall ranges from approximately 10 inches in the lower elevations (western end) of the project area is over 20 inches in the eastern project area (DLNR 1986). There are no permanent streams in or immediately adjacent to the project area.

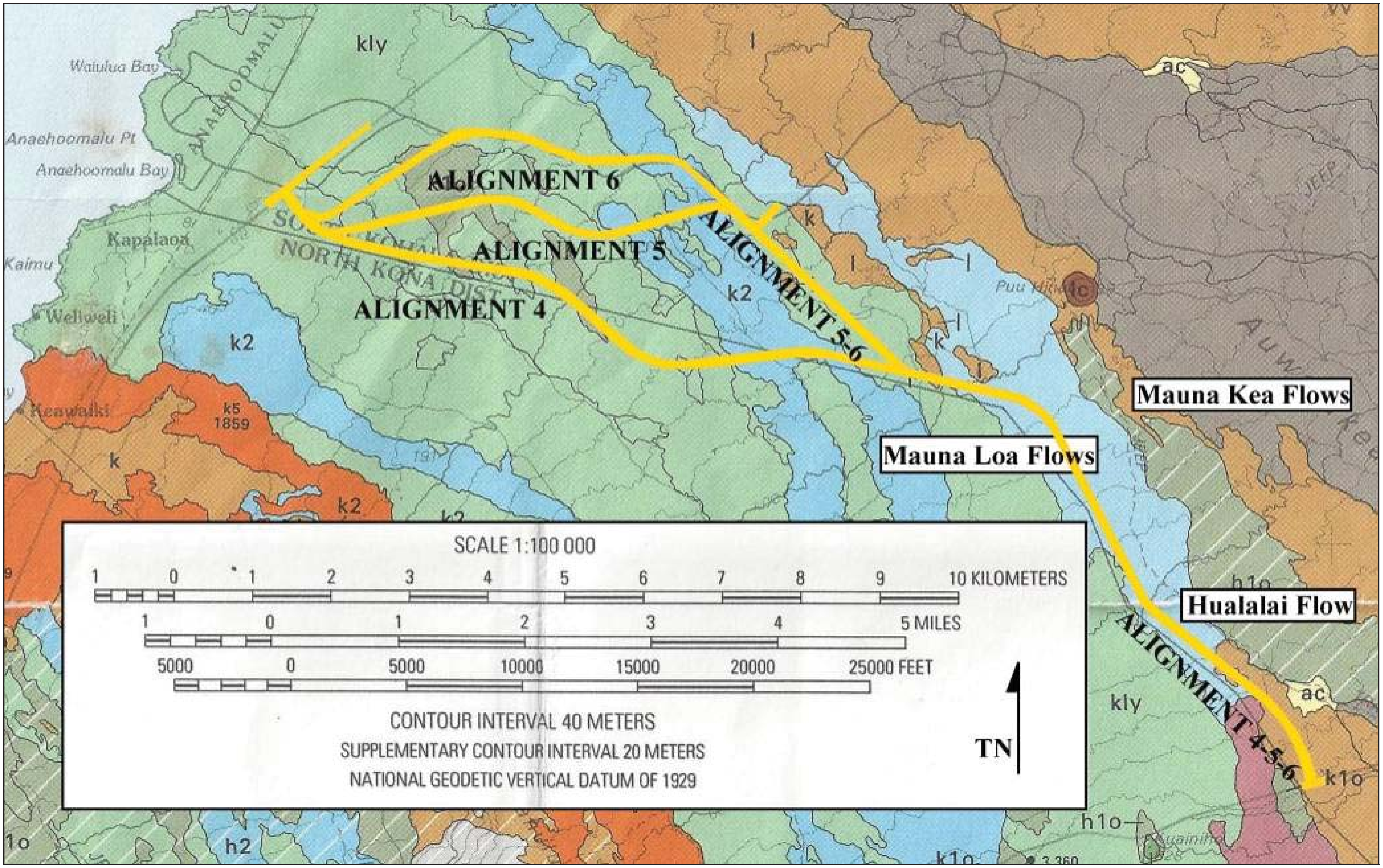

Figure 4: 7.5-Minute Series USGS Topographic Map Showing Location of Lava Flows and Project Area (Wolfe and Morris 1996).

A notable aspect of the regional physical setting is the occasionally strong winds.

> (T)he tradewind is exceedingly strong, bringing with it a mist toward sunset. It rushes furiously down between the mountains which bound the valley of Waimea and become very dangerous to shipping in the bay. It is called by the natives *mumuku* and is foretold by them by an illuminated streak that is seen far inland. This is believed to be caused by a reflection of the twilight on the mist that always accompanies the *mumuku*... [Wilkes 1845(4):217].

Currently, there is a very low diversity of vegetation currently within the project area (Gerrish 2003). Fountaingrass (alien: *Cenchrus setaceus*) dominates the floral landscape, and is present throughout the project area. *Kiawe* (alien: *Prosopis pallida*), *lama* (native: *Diospyros* sp.), and *wiliwili* (native: *Erythrina sandwicensis*) trees are widely distributed and numerous enough to be conspicuous in the lower elevations. *A‘ali‘i* (native: *Dodonaea viscosa*), *‘akia* (native: *Wikstroemia pulcherrima*), eucalyptus (alien: *Eucalyptus* sp.) and olive (alien: *Olea europaea*) are common in the higher elevations.

The area provides habitat for several native and Hawaiian-introduced animal species including *kōlea*, or Golden Plover (*Pluvialis fulva*), and *pua‘a*, or pig (*Sus scrofa*). Several species of quail, pheasant (*Callipepla californica*), partridge (*Phasianidae alectoris*), turkey (*Meleagris gallopavo*), goat (*Capra* sp.), and donkey (*Equus asinus*) introduced during the Historic-era are also present in small numbers. The only animals inhabiting the project area are goats and birds.

Figure 5: Photograph of the Kanikū Flow in the Foreground and an Older Mauna Loa Flow in the Background.

CULTURAL AND HISTORICAL BACKGROUND

EARLY SETTLEMENT AND EXPANSION

Many archaeologists believe that Hawaiʻi Island was first settled after A.D 1,000 by people sailing from the Marquesas (Athens et al. 2014; Dye 2011; Kahn et al. 2014; Kirch 2011; Kirch and McCoy 2007; McCoy 2005 and 2007; Mulrooney et al. 2011; Reith et al. 2011; Wilmhurst et al. 2011a and 2011b). An article published in the Journal of Archaeological Science reviewing radiocarbon dates recovered at archaeological sites on the Island of Hawaiʻi suggests that, by relying on only carbon samples from short-lived plant remains, the most reliable dates point to initial Polynesian colonization of Hawaiʻi Island occurring between AD 1220 and 1261 (Rieth et al. 2011:2747).

Early settlers established settlements on the windward shores in likely places such as Waipiʻo, Waimanu, and Hilo Bay. The windward, or *koʻolau* shores receive abundant rainfall and have numerous streams such as the Wailuku, Waiolama, ʻAlenaio, and Wailoa that facilitated agricultural and fishpond production (Maly 1996:3). The windward shores also provide rich benthic and pelagic marine resources.

Early accounts of settlements along the windward shores describe the area as divided into several distinct environmental regions (Ellis 1963:291-292). At Hilo Bay, from the coast to a distance of five or six miles inland, scattered subsistence agriculture was evident, followed by a region of tall fern and bracken, flanked at higher elevations by a forest region between 10 and 20 miles wide, beyond which was an expanse of grass and lava (*Ibid*:403). The American Missionary C.S. Stewart wrote, "the first four miles of the country is open and uneven, and beautifully sprinkled with clumps, groves, and single trees of the bread-fruit, *pandanus*, and candle tree" (Stewart 1970:361-363). The majority of inhabitants (in 1825) lived within this coastal region. Taro, plantains, bananas, coconuts, sweet potatoes, and breadfruit were grown individually or in small garden plots. Fish, pig, dog, and birds were also raised and captured for consumption. Wood, such as *ʻōhiʻa* and *koa* for house construction, canoe building, and fires was obtained from the upland agricultural zone (McEldowney 1979:18-19), and from the dense forests above (Ellis 1963:236).

The dry leeward shores of Hawaiʻi Island presented a very different environment requiring a modified set of subsistence strategies. Archaeologists and historians are uncertain about the exact motives that lead to the establishment and spread of settlements on the leeward side of Hawaiʻi, but radiocarbon dates from early studies that did not select for short-lived plant remains suggest the process was underway around A.D. 1000 (Cordy 2000:130). There have been no studies conducted in the broader region of the project area using short-lived plant remains. Coastal sites in South Kohala District, *makai* of Waikoloa, at Kalāhuipuaʻa and ʻAnaehoʻomalu, and inland sites in the *ahupuaʻa* of Waimea (Figure 6 and Map Insert) have been dated to the A.D. 800s to 900s (Cordy 2000:130, Kirch 1979: 198). It may well be that these dates are from long-lived tree species and reflect the age of the trees rather than the time they were used by early Polynesians. Other early radiocarbon dates might reflect the fact they were obtained from marine shell samples, which do not reflect accurate dates of occupation or use.

The early coastal settlements are located on or adjacent to the dry rocky shoreline and consist of temporary habitation caves containing midden, fishing tools, and fish remains; and two possibly permanent habitation sites (Barrera 1971, Jensen 1989a, 1989b, 1990a, and 1990b). Later, permanent habitations were established and developed into small villages associated with fishpond production. Cordy suggests people who lived at inland Waimea occasionally frequented the Kalāhuipuaʻa and ʻAnaehoʻomalu area for its anchialine pond and marine resources (Cordy 2000:131). The implication is that inland settlements and agriculture may have developed first, perhaps spreading from nearby, upland Waimanu and Waipiʻo for the following reasons:

> Cool Waimea with flowing streams, located just over the mountain from Waipiʻo and Waimanu, may have been among the first such leeward lands settled—although it lies 8-10 miles from the sea. This expectation could account for the early dates of use along the shore in ʻAnaehoʻomalu and Kalāhuipuaʻa—the coastal extensions of the lands which begin in Waimea. If the fields were in Waimea, then occasional exploitation of marine resources and the costal anchialine ponds certainly must have occurred. The sediment in Keanapou fishpond in Kalāhuipuaʻa shows it was converted to a fishpond ca. A.D. 1000-1200, if not earlier. Eight caves, as short-term habitation shelters, belong to this period at ʻAnaehoʻomalu. These caves were located adjacent to the large ʻAnaehoʻomalu fishpond or in its near vicinity. They may reflect visits to the shore by upland dwellers to gather marine resources. Also, at least one possible permanent dwelling site at Kanikū Point—a set of 4 structures (1 platform and 3 enclosures)—may date to this time. This permanent habitation site may be associated with a few settlers on the shore who had to exchange marine foodstuffs for agricultural products with those living upland. We have but one early date

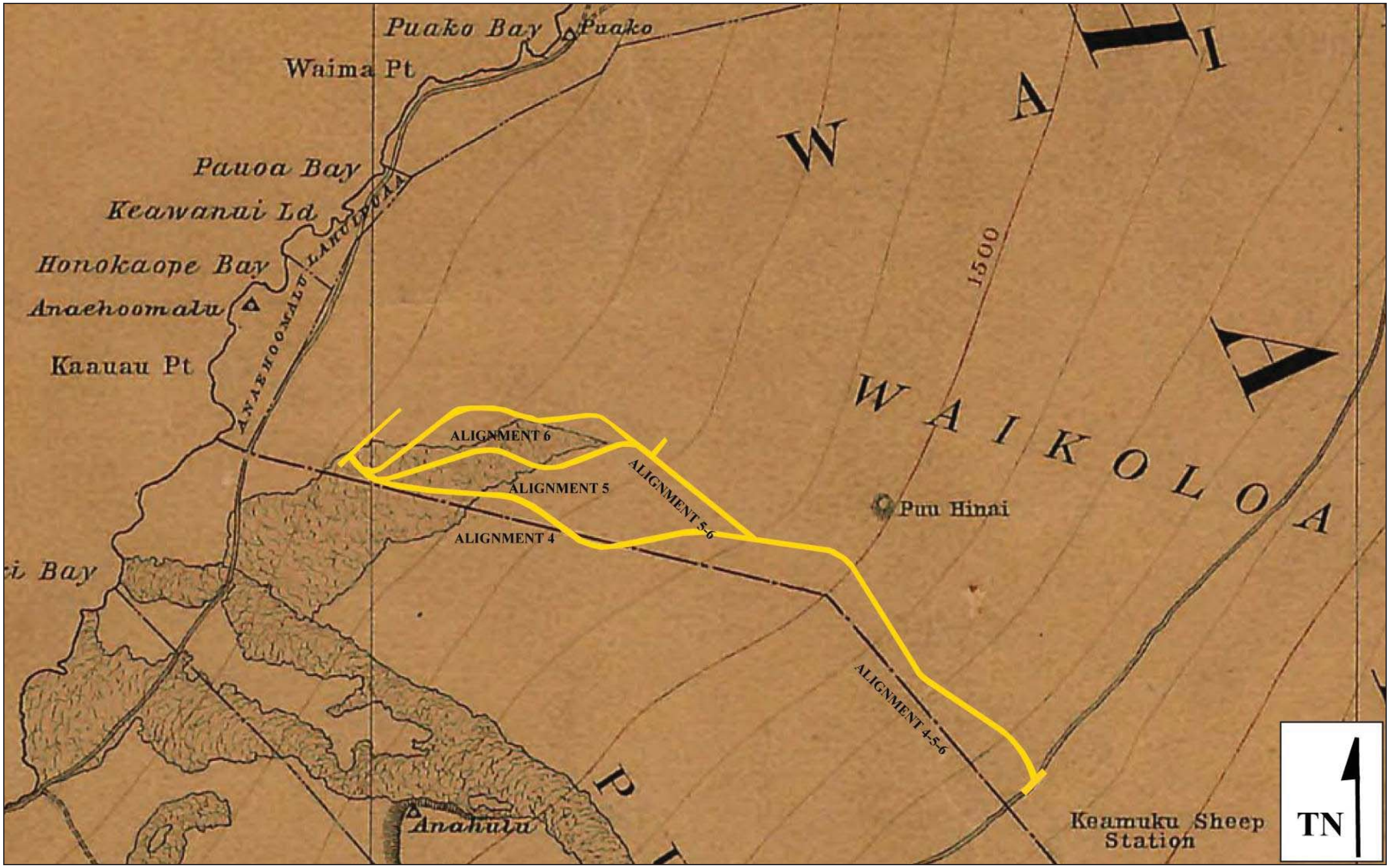

Figure 6: Traditional Land Designations in Historical Description and Location of Project Area Shaded Yellow (Donn 1901).

> from upland Waimea (along an irrigation canal and still being evaluated). Our archaeological investigations have focused on the drier down slope and central portions of Waimea's agricultural system, which were probably built later. The initial colonists may have settled roughly where Waimea town is today, along the flowing streams at the base of the then forest-covered hills. Archaeological excavation has yet to occur in these areas and hopefully will before large-scale bulldozing of the soils, which probably would destroy any early sites remaining (Cordy 2000:131-132).

It is likely that people living permanently along the dry shoreline shared extended family relations with people inland, allowing for an exchange system that distributed marine resources to inland agriculturalists and brought inland agricultural products to people at the coastal settlements (Clark and Kirch 1983:14, Handy and Handy 1991:314-316, Maly and Maly 2002:2).

The fertile plain of Waimea, which receives 40 to 80 inches of rainfall annually and is watered by streams from the Kohala Mountains (the Waikoloa, Waiʻaka, and Keanuʻiʻomanō streams), was planted in taro (*Colocasia esculenta*) and sweet potato (*Ipomoea batatas*). Sweet potato was the dominant crop at elevations that received from 30 to 60 inches (Cordy 2000:135). At lower elevations in South Kohala District, especially along the coast, rainfall is less than thirty inches and soils are shallow or nonexistent. Some agriculture might have been possible along the Waiʻulaʻula Stream in ʻŌuli, as it likely ran year-round prior to deforestation. It is also likely that mulching with rocks or cut plant materials allowed for a limited amount of root crop and arboreal agriculture in pockets of soil along the coast.

In Waimea and Kohala, new settlements and agricultural field systems continued to spread and intensify during the A.D. 1200s to 1400s (Cordy 2000:312). Permanent communities were developing at Lapakahi and along the coastal region from ʻUpolu Point to Kawaihae (*Ibid*: 140). Temporary residences and an agricultural field system were also established in the upland *kula* region of the wider Waimea area (Figure 7) (Moffat and Fitzpatrick 1995:70-71, Maly and Maly 2002:4). As communities grew and agriculture intensified during this period, polities began to form, along with competition between polities. Large polities influencing communities within modern district-size boundaries emerged in the 1300s (Cordy 2000:142). Cordy notes that just north of the project area "two different settlement and political zones seem to have developed prior to the 1200s and to have lasted until late in prehistory—one focused on Waimea and Kawaihae in the south, and the other in north Kohala up to ʻUpolu Point" (*Ibid*:385, footnote 15).

By the late 1700s extensive permanent field systems were well established in North Kohala, Waimea, and the eastern portions of Lālāmilo and ʻŌuli (Clark and Kirch 1983:27, 293-313, and 527-528; Cordy 2000:308-317; Haun et al. 2004:ii and 71). The Lālāmilo swale land fields, described in Cark and Kirch (1983), Cordy (2000), and Haun et al. 2004) were part of the Waimea Field System (see Figure 7) and were the nearest agricultural field system to the current project area. The field system is roughly seven miles north of the current project area and is beyond the area shown in Figure 7.

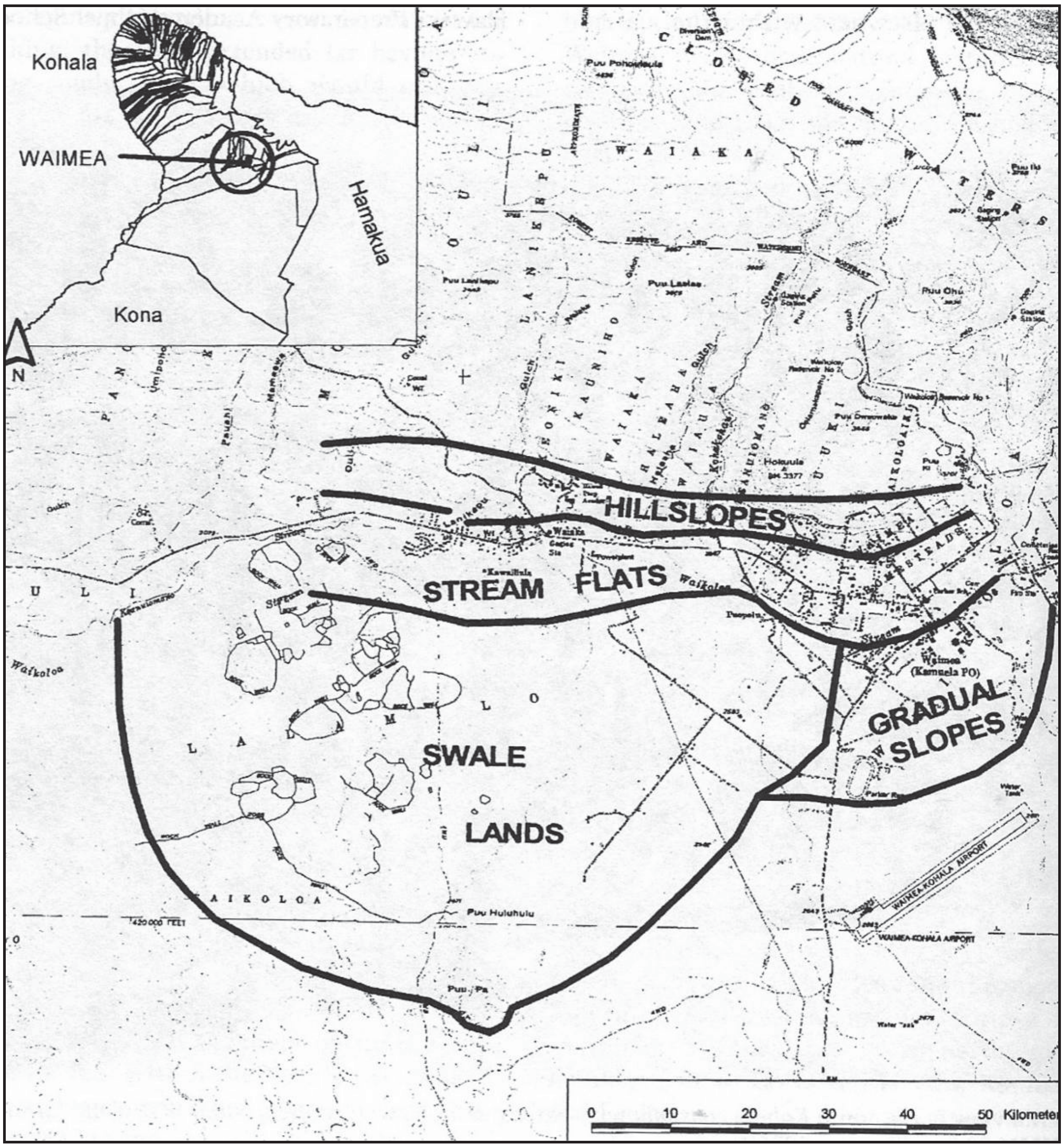

Figure 7: The Swale Lands of the Waimea Field System (Cordy 2000:314).

Cordy describes the fields as,

> . . . rectilinear fields with terrace facings or low-ridged walls . . . fed by six major canals (one an extension out of the airport area) and a vast number of interlinking branches of these canals. The walled fields diminished to the south about half way to Puʻu Huluhulu and Puʻu Pā, where rainfall and soil quality drop—although the swales were still fed by canals (Cordy 2000: 310).

Banana (*Musa acuminata*), sweet potato, sugar cane (*Saccharum officinarum*), and dry land taro were cultivated in the fields by farmers who built C-shaped and L-shaped enclosures for temporary use and lived some distance away from the fields (Cordy 2000:310-311).

TRADITIONAL LAND DIVISIONS OF SOUTH KOHALA, WAIMEA AND WAIKOLOA

The traditional land divisions of Hawaiʻi, established during the 16th, century, recognized Kohala as one of the six districts (*moku-a-loko*) of the island. Waimea was a sub-district (*ʻokana* or *kalana*) of Kohala, and Waikoloa was an *ʻili* of Waimea. ʻŌuli, Waiʻaka, Lālāmilo, Puakō, Kalāhuipuaʻa, ʻAnaehoʻomalu, Kanakanaka, Alaʻōhia, Paulama, Puʻukalani, and Puʻukapu were also *ʻili* of Waimea. Other accounts state that Waimea was an *ahupuaʻa* that had the status of *moku* (Lyons 1903:28). Today, it is widely held that Kawaihae 1, Kawaihae 2, ʻŌuli, Lālāmilo, Waimea, Kalāhuipuaʻa, Waikoloa, and ʻAnaehoʻomalu are *ahupuaʻa* within west and south portions of South Kohala District. The project area is in Waikoloa Ahupuaʻa, South Kohala District.

TRADITIONAL ACCOUNTS OF EARLY WAIKOLOA AND SURROUNDING LANDS

Traditional accounts (*moʻolelo ʻāina*) of legendary places (*wahi pana*) in Waikoloa and Waimea include legends and historical narratives documented in historic times by native Hawaiians and 19th century authors. The accounts refer to events that took place from the 13th century to the arrival of European explorers. There is no mention in any of the accounts regarding specifical lands within the project area, but they do refer more broadly to lands of Waikoloa, Waimea, Lālāmilo, and the coastal region from ʻAnaehoʻomalu to Puakō. Accounts include legends of supernatural entities, descriptions of places they traveled to in this region, and also legends that tell the stories of deities and persons whose actions and namesakes are the origins of prominent natural features and places on the landscape. There are also historical narratives that describe battles between warring *aliʻi* and describe land traversed by warriors, and the place names where battles were fought.

Legends, Place Names, and Descriptions of the Land

The legend of Kanikū and Kanimoe, two *mo‘o* (water-spirits with lizard bodies) who often took the form of beautiful women, relates to the conspicuous lava flow that dominates the landscape of the lower project area. Kanikū and Kanimoe lived in the large coastal fishpond of Waināāli‘i in Pu‘uanahulu Ahupua‘a. The pond is said to have been one and a half miles wide and over two miles long. Kanikū and Kanimoe were turned to stone when a lava flow covered the pond. Their bodies remain lying side by side in the lava flow, now known as the Kanikū Flow (Keakealani McCarthy Interview). Kanimoe means “prostrate sound”, and Kanikū means “upright sound” (Pukui et al. 1974:85)

The Heart Stirring Legend of Ka-Miki, published in the Hawaiian language newspaper *Ka Hoku o Hawaii* and translated by Maly and Maly contains an extensive description of customs, lands, and places near the project area, as well as many places on the Island of Hawai‘i. The story was published serially between 1914 and 1917 under the title "Kaao Hooniua Puuwai No Ka-Miki" (no diacriticals in original title). The legend is set in the 13th century, but also reflects more recent influences (Maly and Maly 2002: 17). Underlined quotes in this report are from Maly’s original and are his emphasis.

The District of Kohala is described in the legend as divided into smaller units that included:

> Large Kohala, little Kohala, inner Kohala, outer Kohala, Kohala of the ‘Āpa‘apa‘a wind, of Pili and Kalāhikiola, the two traveling hills. Indeed! They are the combined districts of this proud land brushed by the ‘Āpa‘apa‘a wind, maturing like love fondly in the bosom of love (*Ka Hoku o Hawaii*, March 22, 1917, translated in Maly and Maly 2002: 18).

Maly defines outer Kohala (Kohala *waho)* as the lands from Kawaihae to Waikoloa, and ‘Anaeho‘omalu. The Hawaiian language names for the smaller districts are as follows: large Kohala is Kohala *nui*, little Kohala is Kohala *iki*, inner Kohala is Kohala *loko*, outer Kohala is Kohala *waho*, Pili and Kalāhikiola are as written, and the two traveling hills are *Na-pu‘u-haele-lua*.

Dr. Bergin describes the traditional boundaries of Kohala as divided into two major divisions. Kohala *Iloko* is the name of the windward lands east of ʻUpolu Point (Bergin 2004:15). Leeward Kohala is the second major division and is further divided into four zones that possess four distinctive types of terrain. Kohala *i waho* is the traditional name of the lands from ʻUpolu Point to Kahuā, north of Kawaihae. *ʻĀina* Kawaihae refers to the coastal area at present day Kawaihae. *Wai one* are the coastal plains south of Kawaihae to ʻAnaehoʻomalu. The k*ula* area refers to the Waimea plains area roughly ten miles inland.

Waikoloa without a *kahakō* means "duck water" (Pukui et al. 1974:223), perhaps a reference to lands that attracted wetland ducks. In many references it is written with a *kahakō* and means "northwest wind," perhaps a reference to the strong wind that blows through the area. If the *kahakō* was over the last "o" it might be translated as "the long, sweet water." This might be a reference to the lack of water and its refreshing flavor when finally reached (Andrade Interview).

The Heart Stirring Legend of Ka-Miki also relates the origins of several place names in the area of South Kohala.

> The region of Lālāmilo was named for the young chief Lālāmilo, grandson of Kanakanaka, an expert lawaiʻa hī-ʻahi (deep sea tuna lure fisherman) and Pilia-moʻo, a powerful priestess and ʻōlohe. Kanakanaka and Pilia-moʻo were the parents of Nē'ula (a fishing goddess), and she married Puʻu-hīnaʻi a chief of the inlands, and they in turn were the parents of Lālāmilo. Kanakanaka's sister was the wind goddess, Waikoloa, for whom the lands are now named.
>
> Lālāmilo gained fame as an expert ʻōlohe and fisherman. And through his wife Puakō, he came to possess the supernatural leho (cowry octopus lure) which had been an ʻōnohi (cherished) possession of Haʻaluea, a goddess with an octopus form... How this octopus lure came to rest on the reefs fronting this land remains a mystery. . .
>
> Puakō was the daughter of Waʻawaʻa (kāne) and Anahulu (wahine), and the sister of: ʻAnaehoʻomalu (wahine); Pūʻālaʻa (kāne); and Maui-loa (kāne). Puakō's great desire was to eat heʻe (octopus), and Pūʻālaʻa was kept continually busy acquiring heʻe for Puakō, and getting paʻouʻou fish for ʻAnaehoʻomalu. When he could no

> longer provide sufficient numbers of fish for his sisters they left Puna and set out in search of suitable husbands who could provide for their needs.
>
> Because of their great love for ‘Anaeho‘omalu and Puakō, Anahulu, Wa‘awa‘a, their relatives and attendants also moved to the Kona - Kohala region and dwelt at sites which now bear their names; only Pū‘āla‘a remained in Puna. This is how Pu‘u-Huluhulu, Pu‘u-Iki, and Mauiloa came to be named; and Pu‘u Anahulu (Ten day hill [ceremonial period]) was named for Anahulu, the chiefess wife of Wa‘awa‘a (Pu‘u Wa‘awa‘a).
>
> Arriving at Kapalaoa in the Kekaha lands of Kona, ‘Anaeho‘omalu married Nāipuakalaulani, son of the chiefess Kuaīwa of Kapalaoa. Puakō went on to Waimea where she met with natives of that area, and was introduced to the chiefess Nē‘ula, mother of Lālāmilo. When Nē‘ula learned that Puakō greatly coveted he‘e, she told Puakō that her son was the foremost lawai‘a ‘ōkilo he‘e (octopus fisherman) of the region. And because Puakō was so beautiful, Nē‘ula introduced her to Lālāmilo. Lālāmilo saw Puakō, and compared her to the foremost "he‘e" which he could catch (*Ka Hoku o Hawaii*, July 5 and 19, 1917, translated in Maly and Maly 2002: 22-23).

The origin of the large ‘Auwaiakeakua gulch situated east/west between Ke‘āmuku and Waiki‘i was told to Maly by former residents of Waiki‘i Village. ‘Auwaiakeakua (Water channel of the gods) was built by *menehune* who abandoned the construction in fear of the coming dawn (Maly and Maly 2002: 27).

Historical Narratives, the *Ali‘i*, and Warfare in the Region

Historical narratives set near the project area describe battles between warring *ali‘i*, land traversed by warriors, and the place names where battles were fought. There are three accounts of historical events that took place near the project area between the 14th and 18th centuries. The events are documented by Fornander (1996), Kalākaua (1990), Kamakau (1961), and Malo (1951), and are treated in detail by Maly and Maly (2002).

The first event is the 14th century battle between Kamiole, a Ka‘ū chief and Kalapana, the son of Kanipahu the sixth *mō‘ī* of the Pili line. Kamiole and his warriors, reinforced by warriors from Kona, Hilo, and Puna had previously defeated Kanipahu at Kohala. Kalapana, with the aid of chiefs from Kohala and Hāmākua met Kamiole at ‘Anaeho‘omalu and defeated him.

The second historical event that took place near the project area is the battle between Lonoikamakahiki (ruler, A.D. 1640-1660) and rebel chiefs (most notably his elder brother Kanaloa-kuaʻana) encamped along the shore at ʻAnaehoʻomalu. Lonoikamakahiki and his Kona warriors were joined by forces from Kaʻū at the border of Kohala and Kona, on inland ʻAnaehoʻomalu.

> The next day Lono marched down and met the rebels at the place called Wai[a]lea, not far from Wainanalii, where in those days a watercourse appears to have been flowing. Lono won the battle, and the rebel chiefs fled northward with their forces. At Kaunooa, between Puako and Kawaihae, they made another stand, but were again routed by Lono, and retreated to Nakikiaianihau, where they fell in with reinforcements from Kohala and Hamakua. Two other engagements were fought at Puupa and Puukohola, near the Heiau of that name, in both of which Lono was victorious (Fornander 1996:120-121).

A third battle was fought north of project area during the reign of Lonoikamakahiki. The king of Maui (Kamalālāwalu), desiring to take over the Island of Hawaiʻi, sent spies to discover the best place from which to launch an attack (Kamakau 1961:56). They returned after investigating the shores of Hawaiʻi and reported that Kohala would be easy to capture as the inhabitants lived only on the coast and were few in number (*ibid.*). They further thought that,

> if Kohala was conquered, Kona, Ka-ʻu, and Puna would be easily taken, and they felt that Hilo and Hamakua would lend no assistance. This was true, for the chiefs of these districts were cousins of the chiefs of Maui (Kamakau 1961: 57).

Kamalālāwalu and his forces captured Puakō, and mislead by two old men of Kawaihae, marched to the dry grassy plain of Waimea (Waikoloa), and the hills of Hōkūʻula and Puʻu ʻOaʻoaka to await the warriors of Hawaiʻi. The warriors of Hawaiʻi took several routes to Waikoloa and stationed themselves around the forces of Maui. Fornander records:

> During the night and including the following morning the Kona men arrived and were assigned to occupy a position from Puupa to Haleapala. The Kau and Puna warriors were stationed from Holoholoku to Waikoloa. Those of Hilo and Hamakua were located from Mahiki to Puukanikanihia, while those of Kohala guarded from Momoualoa to Waihaka (Fornander 1917, 4(2):344-345).

Kamakau recorded:

> After Kama-lala-walu's warriors reached the grassy plain, they looked seaward on the left and beheld the men of Kona advancing toward them. The lava bed of Kaniku and all the land up to Hu'ehu'e was covered with the men of Kona. Those of Ka'u and Puna were coming down from Mauna Kea, and those of Waimea and Kohala were on the level plain of Waimea. The men covered the whole of the grassy plain of Waimea like locusts. Kamalalawalu with his warriors dared to fight. The battlefield of Puʻuʻoaʻoaka was outside of the grassy plain of Waimea, but the men of Hawaii were afraid of being taken captive by Kama, so they led (Kamalalawalu's forces) to the waterless plain lest Maui's warriors find water and hard, waterworn pebbles (Kamakau: 1961:58).

The two armies only skirmished in the beginning, soon turning to full battle, and a final route of the forces of Maui (Kamakau 1961). Almost all of the chiefs and warriors of Maui were slain either on the field of battle or at the Kawaihae shoreline.

The altar (*Ke Ahu a Lono*) at the coastal boundary between Kona and Kohala is often described as an alter for "the warrior leaders and warriors of Lonoikamakahiki, built at the time he went to battle with Kamalālāwalu" (*Ka Hoku o Hawaii* Jan. 31-Feb. 14, 1924, translated by Maly and Maly (2002: 15). A second account ascribes *Ke Ahu a Lono* to the restoration of friendship between Lonoikamakahiki and Kapaihiahilina. Lonoikamakahiki built the *ahu* for offerings made to consecrate their reconciliation. The *Ahu a Lono* was also the place where offerings were gathered during the *Makahiki* (Andrade interview).

Kamehameha also built (or rebuilt) Puʻukoholā *heiau*, possibly completed by 1791, *mauka* of Mailekini *heiau* above Kawaihae (Kamakau 1961:154-155, Cordy 2000:338). It has been suggested the *heiau* construction undertaken by Kamehameha was a reconstruction of a previously built *heiau* that was re-consecrated to his god Kūkāʻilimoku (Kinney 1913: 43 and Kamakau 1961: 154). Kamehameha and his chiefs resided in Kawaihae during the construction and after, from 1792 to 1796 (Maly and Maly 2002: 16). Lonoikamakahiki, Alapaʻinui, Keaweʻāpala, and numerous lesser chiefs often visited and stayed at Kawaihae, Puakō, and Waimea (Kamakau 1961: 182-183).

Historical narratives of the Waikoloa area underline its geographical location as a nexus of travel between often contending political centers (Figure 8). Trails from Kona to Kohala crossed the lava flats inland of ‘Anaeho‘omalu and Puakō.

Trails stretched from the coast to Waimea. Other trails ran from Kona, south and then east of Hualālai, and down to Waimea or the coast. Trails from Hilo crossed the saddle Mauna Kea and Mauna Loa, and then led downhill to Lālāmilo, where travelers could take trails either east or west. Trails were also used between the Waipi‘o-Hāmākua region and Waimea. The trails connected Kawaihae, Waimea, and leeward Kohala to other centers of royal power and figured prominently in interregional conflict. Kawaihae was also a center of political power and the fishponds at ‘Anaeho‘omalu and Kalāhuipua‘a were constructed, and were likely *‘ili kūpono*, from around the 12th century onward (Cordy 2000:131; Andrade interview). An *‘ili kūpono* was a land division within an *ahupua‘a* whose inhabitants paid taxes directly to the king, rather than to the *konokiki*, as in the case of those living in an *‘ili ‘āina* division of an *ahupua‘a* .

KOHALA, WAIMEA, AND WAIKOLOA IN HISTORIC-ERA TRAVEL ACCOUNTS

By the late 1700s the Waimea area supported an estimated population of approximately 10,000 (Wellmon 1969:4) while North and South Kohala likely had a population of roughly 23,000 (Cordy 2000: 49, Bergin 2004:21). The settlement pattern for leeward Kohala consisted of permanent habitation between one and two miles inland with seasonal temporary habitation along the coast (Cordy 2000:47). During the planting and harvesting seasons, coastal Kohala was sparsely populated. Captain Cook’s journals from his arrival in 1779, describes coastal Kohala as unpopulated, with very few houses or agricultural fields (Beaglehole 1967:525). However, when the growing season was over, while fishing, aquaculture, salt production, and abrader production were carried out along the coast from Kawaihae to ‘Anaeho‘omalu, the population would swell (Barrera 1971:105-113, Cordy 2000:46-47, Kirch 1979:179-197, Vancouver 1984:798-804).

The majority of agricultural production was carried out in the foothills of the Kohala mountains and from Lālāmilo to the Waipi‘o Valley, especially along the Waikoloa, Wai‘aka, and Keanu‘i‘omanō Streams. Large areas of the foothills of southern Waikoloa were covered in *pili* grass (*Heteropogon contortus*) traditionally used for thatching. *Māmane* (*Sophora chrysophylla*), *naio* (*Myoporum sandwicense*), *wauke* or paper mulberry (*Broussonetia papyrifera*), *‘iliahi* or sandalwood (*Santalum paniculatum*), and *‘ōhi‘a* (*Metrosideros polymorpha*) grew on the plains of Waimea and at upper elevations in the foothills of Mauna Kea and Mauna Loa. Traditional resource extraction from the area included *kapa* cloth made from *wauke*, m*āmane* limbs cut for adze handles, and birds trapped for their meat and feathers (Wilkes 1845: 217-218).

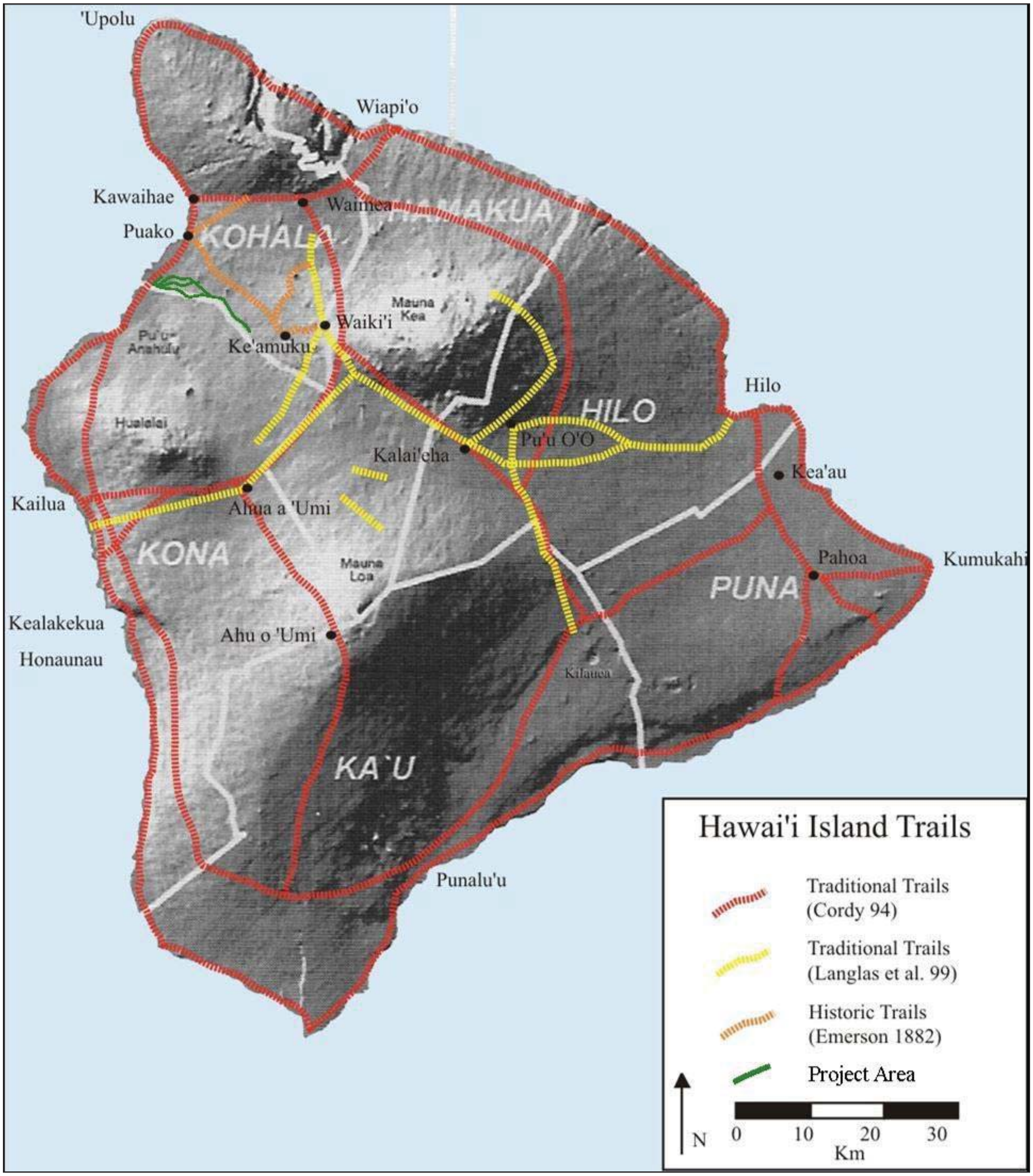

Figure 8: Hawai‘i Island Map Showing Location of Trails and Project Area (Adapted from Cordy 1994).

The arrival of Europeans and the Hawaiian people's introduction to world markets drastically altered the distribution of population centers, agriculture, and cultural practices in Hawai‘i. In the Waimea-Waikoloa region, maritime trade and ranching slowly replaced traditional fishing, fish pond aquaculture and farming practices as chief economic activities.

Sandalwood harvesting for China's markets commenced in 1808 and reached a peak in the 1820s. Kamehameha held a monopoly on the collection and sale of sandalwood to foreign trading vessels. Sandalwood trees were rapidly harvested from the Waimea-Waikoloa area and an island-wide *kapu* was placed on the cutting of sandalwood in 1830. The royal government next looked to ranching as a steady source of income. Sheep and cattle ranching provided wool, fresh meat, salted beef, tallow, and hides for local markets on Hawai‘i and O‘ahu, and for provisioning merchant and whaling vessels.

Ranching has its roots in the first cattle and sheep brought to the island in 1793 by Vancouver. Five cows, one bull, two ewes, and a ram were released to prosper in the region of Waimea, Mauna Kea, Mauna Loa, and Hualālai (Vancouver 1984:812). Kamehameha placed a ten-year *kapu* on the killing of cattle so that they would have time to multiply (Ellis 1963: 291). Vancouver wrote:

> In this valley is a great tract of luxuriant, natural pasture, whither all the cattle and sheep imported by me were to be driven, there to roam unrestrained, to "increase and multiply" far from the sight of strangers, and consequently less likely to tempt the inhabitants to violate the sacred promise they had made; the observance of the which, for the time stipulated in their interdiction, cannot fail to render the extirpation of these animals a task not easily to be accomplished (Vancouver 1967 vol.3:64).

Vancouver returned in 1794 with more cattle, sheep, goats, geese, and various plants and seeds. Two American captains, William Shaler and Richard Cleveland presented two horses to John Young in 1803. Cleveland later returned with more than 200 horses brought from California. Donkeys, mules and oxen were also imported for transportation and hauling.

By 1813 to 1815, cows began overrunning agricultural fields and became a danger to travelers and residents (Ellis 1963: 291, Wilkes 1845: 204). A wall, called *Kauliokamoa* for the King's k*onohiki*, was constructed between 1813 and 1819 (Barrère 1983:30) to keep cattle in Waikoloa and off of agricultural land to the east (Lālāmilo and Waimea). The wall extended from roughly the northern border of Waikoloa to near Puʻu Huluhulu and separated the less fertile annual grasslands from the perennial grasslands (Boundary Commission Book for Hawaiʻi Vol. A, 6, 10).

John Parker was granted permission to hunt wild bullock for the crown in 1822. Wild cattle were captured in bullock pits seven to eight feet long by four feet wide covered with branches and a thin layer of dirt (Wilkes 1845: 204). They were also hunted with guns and were lassoed in later years, after the arrival of *vaqueros*, "Spaniards [Central and South Americans] with horses from California" (Wilkes 1845: 203). Ellis also described the nature of the herds and bullock hunting.

> Although there are immense herds of them, they do not attempt to tame any; and the only advantage they derive is by employing persons, principally foreigners, to shoot them, salt the meat in the mountains, and bring it down to the shore for the purpose of provisioning the native vessels. But this is attended with great labour and expense. They first carry all the salt to the mountains. When they have killed the animals, the flesh is cut off their bones, salted immediately, and afterwards put into small barrels, which are brought on men's shoulders ten or fifteen miles to the sea-shore (Ellis 1963: 291).

In 1830 Governor Kuakini moved to Waimea to oversee and improve government cattle. He ordered the construction of corrals and the widening and improvement of twelve miles of the Waimea to Kawaihae trail. Liholiho visited the same year to witness strides made in the nascent cattle ranching industry. It was hoped that the exportation of tallow, hides, and salted beef would supplant the defunct sandalwood trade as a major source of income. In 1835, William French opened a store in Waimea and began several ventures related to ranching, including tallow making, tanning, and saddle making (Bergin 2004: 156). Cowhide was tanned using the astringent bark of local trees (Wilkes 1845: 218). Other craftsmen included carpenters and a blacksmith.

The majority of French's trade involved supplying whaling ships and the local market with beef. A description of French's operation in 1840 describes their capture and shipment.

> Our principal object in taking the walk was to witness the marking of a lot of cattle that had been driven down from the mountains not long since. Great numbers of wild bullocks are caught in the mountains every year by the hunters:

> The lasso, the principal instrument in their capture is made of braided thong upon one end of which is a ring forming a slip noose which is thrown with astonishing precision around any part of the animal. Even while at a full gallop in pursuit, the hunter grasps his lasso and giving it two or three twirls around his head with his right hand, throws it unerringly and entangles his victim by the horns or limbs. . . For their capture a mode frequently resorted to by the hunters was to dig deep pits and cover them with underbrush and dirt. . . . The bullocks to be marked were driven into a pen towards which we directed our steps. They were noble animals and had been tamed by tying them singly with tame cattle for a time. . . . There were not far from 40 bullocks marked on this occasion intended for the Clementine in her trip down to Honolulu. They are then put into pasture to be fattened for the supply of ships visiting Honolulu in the fall season.
>
> This brig Clementine had upon its deck about 40 head of bullocks arranged closely together with their heads turned inwards. They were tied down by the horns to a strong framework of spars so that there was no danger of their getting loose (Olmstead, quoted in Bergin 2004: 156).

By 1840 bullock hunting had drastically reduced the numbers of wild cattle, driving them to higher and higher elevations of Mauna Loa and Mauna Kea (Wellmon 1969:54). A five-year *kapu* was placed on cattle hunting and lead to further efforts to tame, brand, and fence in herds on privately owned land (Wilkes 1845: 200). The decline of whaling and the *kapu* placed on killing cattle created economic hardship and population decline in the Waimea area. Wilkes reported that during this time there were still three or four stores operated by foreigners at Waimea (Wilkes 1845: 218). In 1880 George Bowser's "Directory and Tourists Guide" reported that,

> Waimea itself, although of immemorial age, and once populous, is now only a scattered village, with but two stores and a boarding and lodging house and coffee saloon (Bowser 1880:540).

Grazing, the opening of new pastureland, and fires were denuding the forested plains of Waimea and pushing the tree line to higher and higher elevations (Doyle 1953: 47-48). Over time, cattle operations ceased hunting wild herds and began establishing privately owned, fenced-pasture ranches in an effort to consolidate land ownership and to improve breeding stock. This trend helped to prevent widespread degradation of the lands of Waimea and Waikoloa.

THE MĀHELE (1845-1850)

Article IV of the Board of Commissioners to Quiet Land Titles was passed in December 1845 and began the legal process of private land ownership. Through the Māhele of 1847-48 and the Kuleana Act of 1850, land was made available for private ownership. The Māhele established a board of five commissioners to oversee land claims and to issue patents and leases for valid claims. Many scholars believe that Kauikeaouli (Kamehameha III) was forced to establish laws in order to protect Hawaiian sovereignty and crown lands from foreigners who had already begun claiming ownership of land they were granted permission to use for homes and business interests (Daws 1968:111; Kameʻeleihiwa 1992: 169-70, 176; Kelly 1983: 45; Kuykendall 1938(1): 145 footnote 47, 152, 165-6, 170;). Among other things, the foreigners were demanding private ownership of land to secure their island investments (Kameʻeleihiwa 1992: 178; Kuykendall 1938(1): 138, 145, 178, 184, 202, 206, 271).

As legal statutes defining the Māhele continued to evolve (up to 1850), the lands of the kingdom of Hawaiʻi were divided among the king (crown lands), the *aliʻi* and *konohiki*, and the government. Once lands were thus divided and private ownership was instituted, the *makaʻāinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living as stipulated in the Kuleana Act (1850). These claims, however, could not include any previously cultivated or presently fallow land, *okipuʻu*, stream fisheries, or many other resources traditionally necessary for survival (Kameʻeleihiwa 1992:295; Kelly 1983:45-76; Kirch and Sahlins 1992 vol.1:3, 135-137, and vol.2:2). The right of claimants to land was based on the written testimony of at least two witnesses who could corroborate the claimant's long-standing occupation and use of the parcel(s) in question. The claimant might have been awarded a patent for the property, subsequently called Land Commission Awards (LCAs) (Chinen 1961:16).

At least 26 claims (Table 2) were made for *kuleana* plots in Waikoloa (Maly and Maly 2002: 66). The project area is located within the boundaries of LCA 8521-B awarded to G.D Huʻeu.

Table 2: Claims and Land Commission Awards in Waikoloa.

Applicant	LCA	Register	Testimony	Award Book
James Fay (Kimo Fe)	Helu 589	NR 2:281	*n/a*	*n/a*
James Hall (Kimo Holo)	Helu 672	FR 2:103	FT 5:67 & NT 4:48	MA 3:100
Edmund Bright (Braita)	Helu 986	FR 2:125	FT 5:67 & NT 4:43	MA 3:91
Kipikane (w.)	Helu 1117	*n/a*	NT 4:45 & FT 5:66	*n/a*
James Fay	Helu 2258	FR 2:147	NT 5:65-66	MA 3:52
Nahoena	Helu 3195	NR 8:50	NT 4:8	*n/a*
Makalahae	Helu 3684	NR 8:44	NT 4:33	MA 5:48-49
Waiahole	Helu 3738	NR 8:46	NT 4:34-35	MA 5:48-49
Auwae	Helu 3762	NR 8:47	NT 4:35-36	MA 5:46
Ohiaku	Helu 3783	NR 8:47-48	NT 4:39-40	MA 5:47
Opunui (w.)	Helu 3786	NR 8:48	NT 4:38	MA 4:287
I.A. Palea	Helu 3828	NR 8:380	NT 4:31-32	MA 5:46
Pauhala	Helu 3844	NR 8:51	NT 4:10	MA 5:51
J. Seaboy (Seabury)	Helu 4024	NR 8:55-56	NT 4:44	MA 5:49-50
James Hall	Helu 4036	FR 1:3	*n/a*	*n/a*
Wm. Beadle	Helu 4038	FR 3:2	FT 5:67 & NT 4:42	MA 3:9
Kaahukoo	Helu 4126	NR 8:64	NT 4:12	*n/a*
Kaumu	Helu 4129	NR 8:64	NT 4:37	MA 5:51
Keaulama	Helu 4184	NR 8:53-54	NT 4:36	
Kua	Helu 4215	NR 8:59-60	NT 4:24	MA 5:47
Kaulua	Helu 4231	NR 8:58	NT 4:25-26	MA 5:48
Manuwa	Helu 4505	NR 8:66	NT 4:20	MA 5:50
G.D. Hueu	Helu 8068	NR 8:70-71	NT 4:18-19	
Kipikane (w.)	Helu 8505	FR 3:19	FT 5:67 & NT 4:45	MA 3:55
G.D. Hueu	Helu 8521 B	NR 3:709	*n/a*	*n/a*
Laahiwa	Helu 9972	NR 8:169	*n/a*	*n/a*

THE LANDS OF G.D. HUʻEU (GEORGE DAVIS)

George Davis Huʻeu (George Davis) inherited and owned a large portion of the good grazing lands of Waikoloa. Kamehameha I had given the land to G.D. Huʻeu's father, Isaac Davis, as an *ʻili kūpono* for services rendered during the conquest of the Hawaiian Islands. Local chiefs claimed some portions of his land when he died intestate in 1810 (Macrae 1972: 44). It became necessary for Isaac Davis' friend John Young to ask the crown for stewardship of the property for Davis' children's sake. When the Davis children came of age, Young requested that,

> the King, Kaahumanu [Kinaʻu], Adams [Kuakini] and Rooke and all the Chiefs will let Isaac Davis' children keep their father's lands that King Kamehameha gave to him as a reward for assisting the King in his wars in conquering the islands of Hawaii, Maui, Molokai, and Oahu, and which I hope in God our young king will fulfill the wishes of his honored father (Collins 1951: 12-13).

Isaac Davis' land (Royal Patent Grant 5671) was granted to George Davis Huʻeu as an unsurveyed LCA (8521B) in 1865.

The lack of longtime residents to testify to the traditional boundaries, the nature of the existing survey maps, and various contradictory land claims created further problems concerning G.D. Huʻeu's land award. Early survey maps of the area depicted traditional boundaries in locations that are very different from those codified only five to ten years later.

The Wiltse map of 1860 Waimea places the boundary between North Kona and South Kohala Districts further north and east than its later accepted location (Figure 9).

The *mauka* boundary of Waimea, and so Waikoloa, are described in an 1866 letter from three Commissioners of Crown Lands based on the Wiltse map. The description of the boundary relating specifically to the area of Davis' land and shown on the Wiltse map is as follows:

> Thence to Pumahoelua. Thence to a large rock marked "H." Thence to Kuikahekili; then to Namahana on the line of Kona. Thence along the gulch called Poopoo, bordering the land called Puuanahulu to an ohia tree marked "H." Thence to Puuiwaiwa. Thence to a point of rocks maked "H." Thence along the line of Puuanahulu to Kahooalapiko, then to Puuhinei (Maly and Maly 2002: 82).

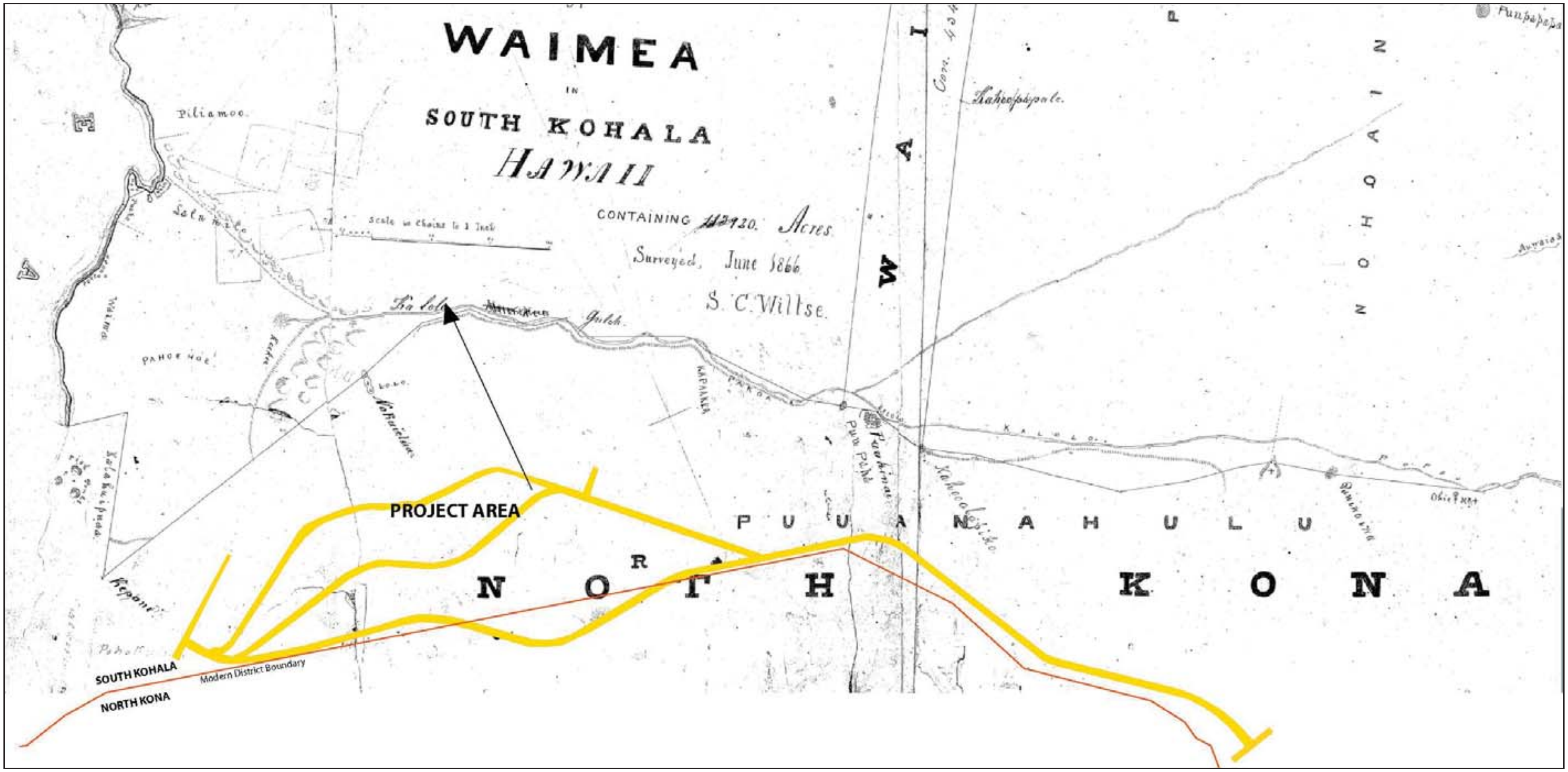

Figure 9: Portion of Map of Waimea Showing Early South Kohala - North Kona Boundary (Wiltse 1866).

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The remainder of the boundary between North Kona and South Kohala is much further north than the later, officially agreed upon boundary.

The extent of Davis' property was contested by the Crown in court in 1866, and was finally surveyed and mapped in 1867. Counsel for Davis contended the land granted by Kamehameha included the plains near the seacoast. Representatives of the Crown contended the grant consisted of the hill country only and no land on the Waikoloa plain. A.F. Judd recorded the court proceedings as follows:

> Conspicuous land marks, geographical points are the boundaries of districts and large lands; so Waikoloa has Puaapilau; Keahualono, Puukapele, and Puuhuluhulu, all hills, and not a low place on the plain and the meeting of two gulches in the plain, as alleged by the Crown, to the boundaries of Waikoloa. Puukapele and Keahualono are hills visible each from the other, and the two points establishing the base of the triangle (Handwritten notes of A.F. Judd November 28, 1866, Bergin collection).

The court proceedings ruled that the upland hills of Waikoloa were Davis' land and the coastal plains remained possessions of the Crown.

G.D. Hu‘eu's property contained:

> . . .a house lot in the ili of Waikoloa, the cattle corral in the ili of Nohoaina, the goat corral in the ili land of Paulama, and the house site there. There are four sections.
>
> The first section is the house site in the ili of Waikoloa, it has been enclosed and there are two houses within; one house for the school teacher, Kauahi, he has only a house there; the other one is for Hueu.
>
> To the uplands and outer area (waho) is the land of Uilama Pakele (William Beckley); the kula (plain or open) lands on the lower (*makai*) side are also his; and on the Kohala side is the Alanui hele (path) and the corral of Parker folks and William [Beadle]. It is his old land, gotten from his father, Aikake (Isaac). From KI [Kamehameha I]. Gotten by Aikake from Koapapaa. No one has objected.

> Parcel two is in the ili land of Nohaaina, a cattle corral. Uilama Pakele's land is *mauka*, and on all sides.
>
> [Parcel three] The goat corral in ili land of Paulama. Uilama Pakele is the only one who bounds it on all sides.
>
> Parcel 4. Keoni's house lot is to the upland side; the outer (waho) and shoreward (*makai*) sides are Uilama Pakele's land; towards Kohala is Leleiohoku's cattle corral. Hueu's interest is from Uilama. No one has objected.
>
> William Beckley, sworn and stated: I know this, and his interest is from me. I gave him these sections in 1845-1846. (Native Testimony Volume 4:18-19, translated in Maly and Maly 2002: 68-69).

William Beckley was an agent of the Crown entrusted with the management of cattle on Crown lands. Hu‘eu's property eventually became lands of the Ke‘āmuku Sheep and Cattle Station. The project area is located within the southwest portion of the Hu‘eu LCA. There are no other Land Commission Awards near the project area APE.

RANCHING

The origin of organized sheep ranching in the Waimea region is credited to William French, who first arrived in Hawaii in 1819 as a representative of an American shipping venture involved in the sandalwood trade (Wellmon 1969: 49). By 1826 he was grazing sheep and cattle between Waimea and Kawaihae and by 1844 was exporting wool (Wellmon 1969: 57). French owned the Līhu‘e Livestock Farm and a home in Waimea (the historic Spencer House) (Bergin 2004: 156). French also established a store at Pu‘u Loa, and tallow works, a tannery, and blacksmith and carpentry shops (Bergin 2004: 156) in Waimea. French's ranching operation was taken over by Francis Spencer and partners after French's death in the mid-1850s (Bergin 2004: 157).

Francis Mcfarland Spencer (Born in England 1818, died 1897) arrived in Kawaihae in 1839 with his wife and two young children. For a time he ran the stagecoach from Kawaihae to Waimea (Figure 10), from Waimea to Kukuihaele, Honokaʻa, and Paʻauilo (John Spencer interview, recorded by A. Wakayama 1983). Oxen, horses (Percherons), and mules were the primary draught animals for the stagecoach at that time. Spencer used his income to purchase land, and by the 1854 was operating a store and a sheep and cattle farm in Līhuʻe.

Spencer's copartners in the Līhuʻe sheep farm were James Louzada and Henry Cornell (Maly and Maly 2002: 135). James Louzada was one of three "Spaniards" that were hired between 1830 and 1832 to hunt bullock on the island of Hawaiʻi. Spencer and Louzada imported six Saxon-merino crossed sheep in 1858 to improve their stock (Bergin 2004: 229). Spencer also operated a sheep farm at Puʻu Loa (his primary residence), which combined with his other ranching interests, was called F. Spencer and Company.

F. Spencer and Company entered into a partnership in 1861 with the newly formed Waimea Grazing and Agricultural Company (WGAC), owned and operated by Robert Cheshire Janion and his partner William H. Green (Maly and Maly 2002: 134). The WGAC, like all ranching operations in the area, was involved in bullock hunting and the production of salted beef and hides as well as sheep and cattle ranching. The new joint business venture, consolidated under the name of the Waimea Grazing and Agricultural Company, became the largest ranching operation of its time.

In 1865 Francis Spencer bought out the ranch operation of three Hawaiian ranchers who held a lease (General Lease No. 106) on the entire *ahupuaʻa* of Puʻu Anahulu adjacent to and west of Keʻāmuku (Maly and Maly 2002: 137). On July 2, 1868 G.D. Huʻeu leased his land in Waikoloa to William L. Green on behalf of the WGAC for $600 per year (Maly and Maly 2002: 139). The 20-year lease included all of the land awarded to G.D. Huʻeu under LCA Number 8521 B Parcel 1, except properties previously sold to William Claude Jones in October 1866 (Maly and Maly 2002: 137-139). The Huʻeu family was allowed to continue grazing their 1,000 cattle, 100 horses, and 1,000 sheep on the land under the terms of the lease.

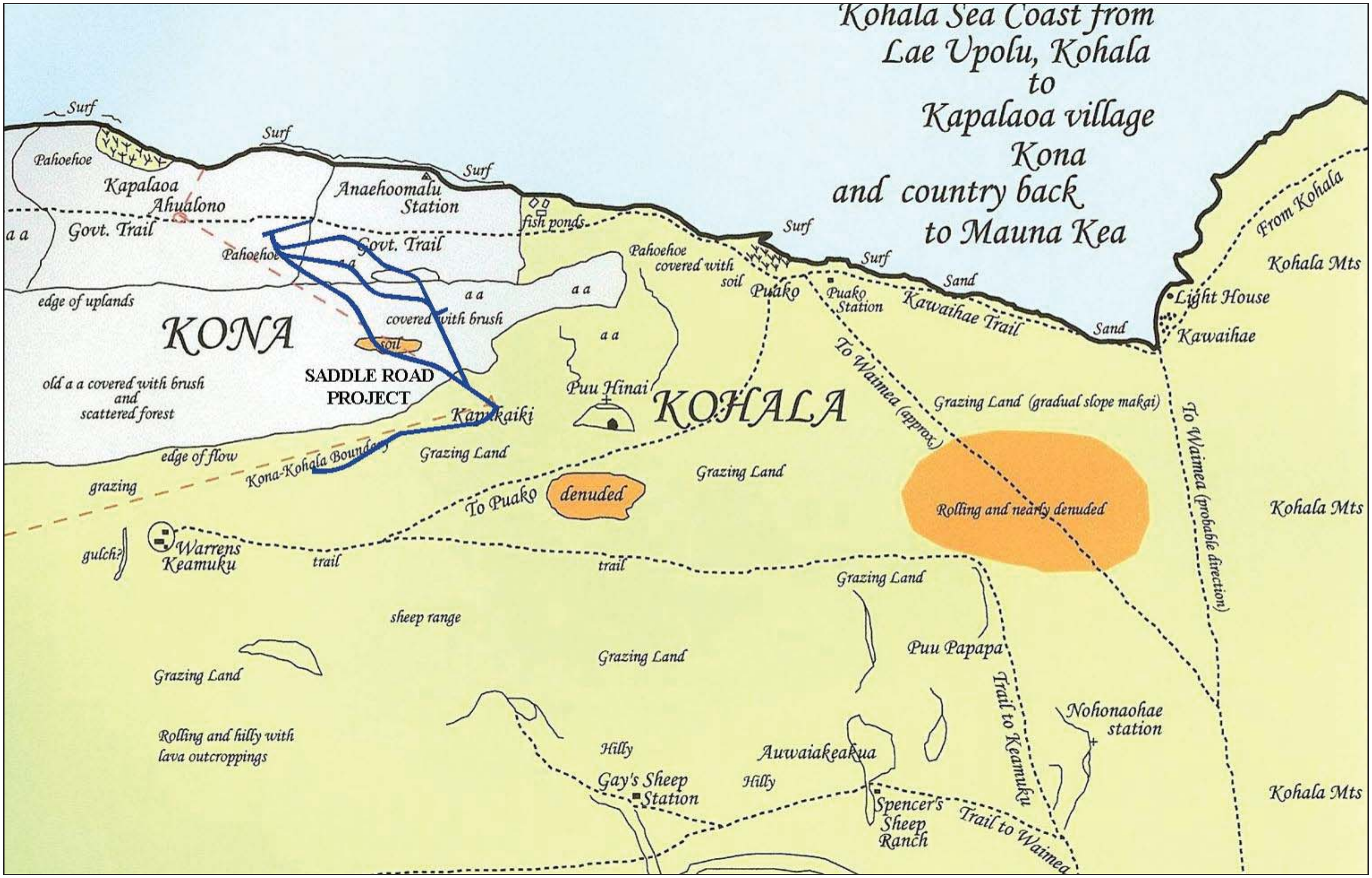

Figure 10: Colorized and Annotated Version of Emerson's Sketch Map of South Kohala (1882) Showing Travel Routes and Approximate Location of the Saddle Road Project Area (Adapted from Emerson 1882).

The WGAC, in turn, leased the land to Francis Spencer, who leased the grazing rights to the WGAC. The lease, combined with previously owned/leased land (seven properties altogether) gave Francis Spencer and the WGAC the right to hunt wild (unbranded) cattle and sheep, and to graze their cattle, sheep, horses, and mules over a vast area of land from Hilo to Hāmākua, to South Kohala, and to Kona (Maly and Maly 2002: 137). William L. Green estimated that in 1870 100 “bush cattle” hides (also called “mountain hides”) per year could be taken from Keʻāmuku with a maximum return of 9.5 cents a hide (Maly and Maly 2002: 143).

At some point between the end of 1871 and the beginning of 1876, the WGAC went out of business due to drought (Wellmon 1969:136). Francis Spencer formed the Puʻuloa Sheep and Stock Company out of his sheep stations in Waimea, Waikoloa, and Puʻu Anahulu (Maly and Maly 2002: 144). In October of 1876 he sold (mortgaged) his interest in the Puʻuloa Sheep Ranch to George W. Macfarlane (Maly and Maly 2002: 145). Macfarlane sold a fourth of the interest to W. L. Green.

A.W. Carter purchased the Puʻuloa Sheep and Stock Company interests for $20,000 (Brennan 1972: 136) in January 1904 on behalf of Parker Ranch. During the 20th century, Parker Ranch became the largest sheep and cattle ranch in the northwest quarter of the Island of Hawaiʻi. Parker Ranch offices were centered in Waimea with ranch station offices in the surrounding areas of Waikoloa, Hāmākua, Humuʻula, and elsewhere.

Much of the inland portions of the project area was used for cattle ranching by Parker Ranch. They were either used as grazing and loafing areas, or were crossed over while driving cattle down to the coast for transport to Oʻahu and other ports overseas. Rally Greenwell remembered teams of cowboys riding up to a mile into the lava flows surrounding the grazing areas to pull up fountain grass so that it wouldn't colonize the pastures (Greenwell interview).

During the time that Francis Spencer operated his ranch at Keʻāmuku, some farming was conducted in the foothills of Waikoloa. An early map from the period shows an area labeled "*Aina Mahi*," or farmland (ʻĀina Mahi) located south east of Puʻu Hīnaʻi (Figure 11 and Figure 12). The land is in an area of relatively good alluvial and colluvial soil, and it might have received more rainfall in the past. There are small seasonal gulches that cross the area from southeast to northwest. It is possible that the area was used in pre-Contact times as well as in the early Historic era. Henry Auwae remembered that a number of Portuguese were ranching sheep and goats and growing corn, pumpkin, and sweet potato in the Keʻāmuku area (Langlas et al. 1999:46).

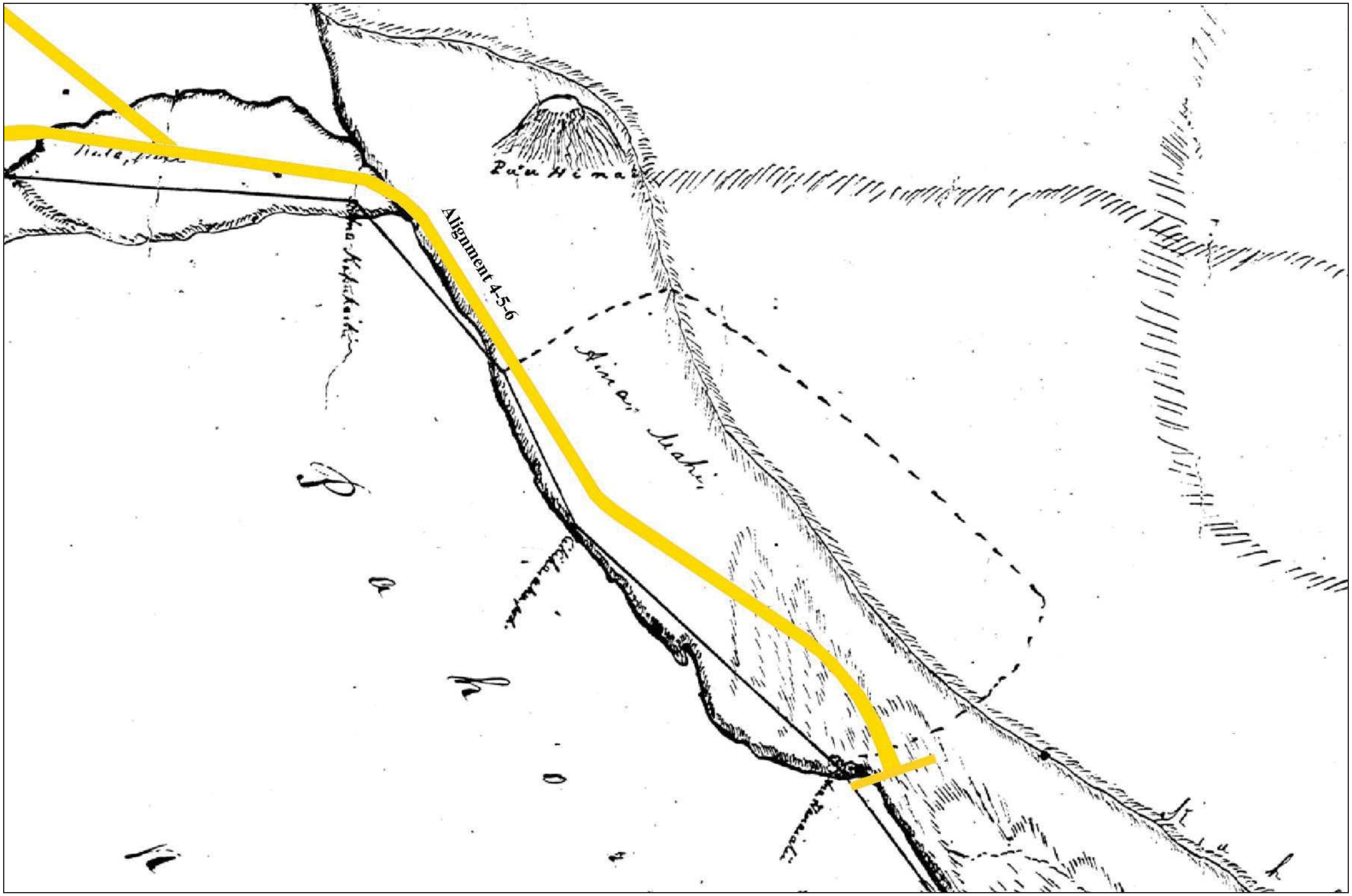

Figure 11: Portion of Map of Waikoloa Showing ʻĀina Mahi Southeast of Puʻu Hīnaʻi and Project Area Alignment 4-5-6 (Kaelemakule, N.D.).

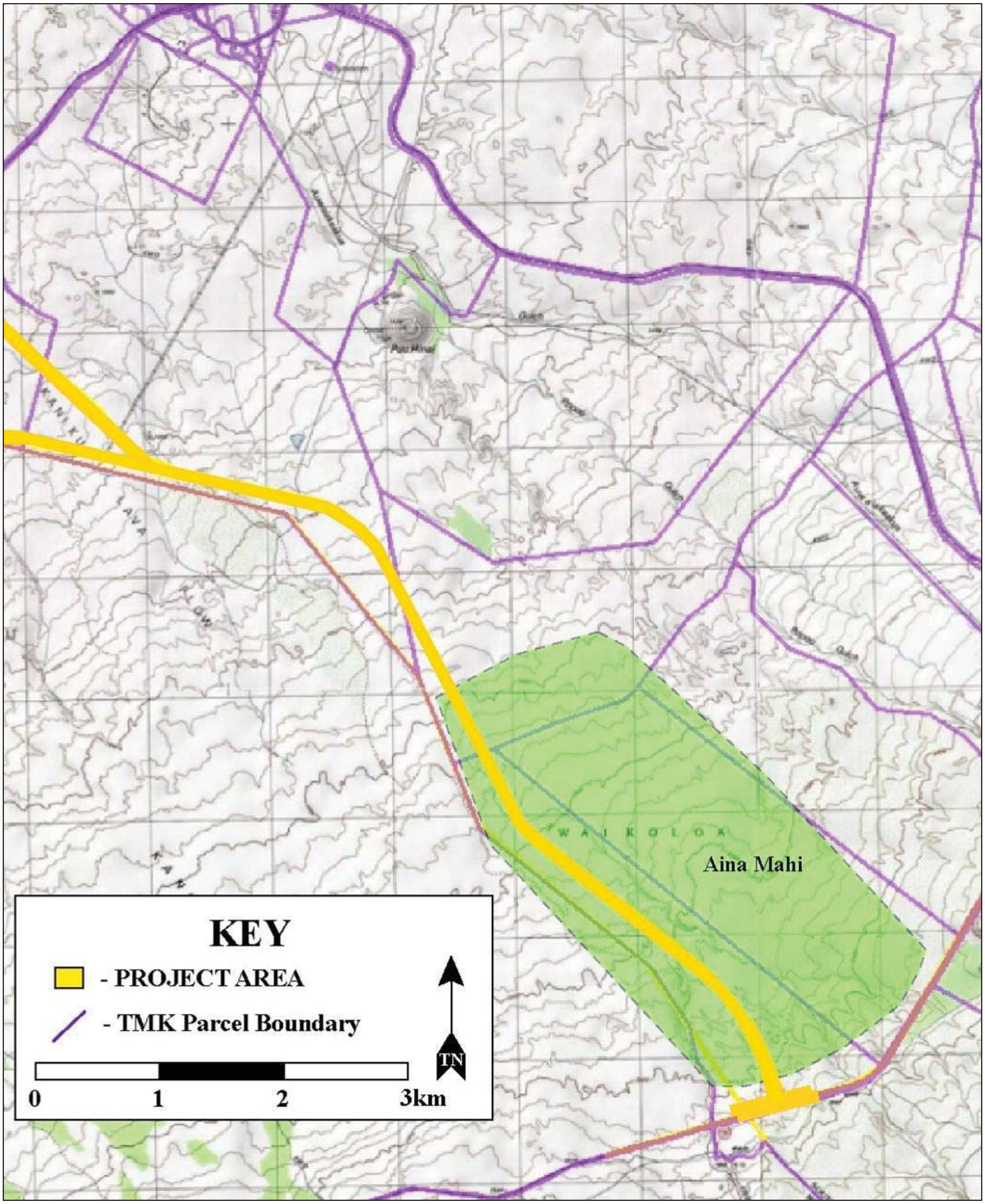

Figure 12: 7.5-Minute Series USGS Topographic Map Showing Location of "Aina Mahi" and Project Area (Puʻu Hīnaʻi, Puʻu Anahulu, and Keʻāmuku Quads) (ESRI 2013. Sources: National Geographic Society, Hawaiʻi County Planning Department).

MILITARY TRAINING

In December of 1943, approximately 123,000 acres (200 square miles) in the Waimea-Waikoloa area of Hawaiʻi were leased by the U.S. War Department for use as a troop training area. The military utilized portions of this property for troop maneuvers and weapons practice, while other areas served as artillery, aerial bombing and naval gun fire ranges. Troop exercises were conducted using 30 caliber rifles, 50 caliber machine guns, hand grenades, bazookas, flame throwers, and mortars.

Larger ordnance and explosive (OE) or unexploded ordnance (UXO) items used included 37 millimeter (mm), 75 mm, 105 mm, and 155 mm high explosive (HE) shells, 4.2 inch mortar rounds, and barrage rockets. From 1943 through 1945 nearly the entire Waikoloa Maneuver Area was in constant use, as the Marine infantry reviewed every phase of training from individual fighting to combat team exercises. Intensive live-fire training was conducted in grassy areas, cane fields, and around the cinder hills of Puʻu Pā and Puʻu Holoholokū.

A military cantonment was also established just outside Waimea town. Initially called Camp Waimea, it was later rechristened Camp Tarawa in honor of the first successful amphibious land invasion of the Pacific War. Camp Tarawa was the largest Marine training facility in the Pacific, covering an area of approximately 467 acres. It consisted of a small city of canvas tents, Quonset huts and wood framed structures all connected by a network of dirt and cinder roads. Between 1943 and 1945 as many as 50,000 men passed through Camp Tarawa on their way to the Pacific Theater. These included members of the 2nd and 5th Marine Divisions, the 31st Naval Construction Battalion, the 471st Army Amphibian Truck Company, the 726th Signal Aircraft Warning Company, the 11th Amphibian Tractor Battalion, the 5th Joint Assault Signal Company, and the 6th Marine War Dog Platoon (Nees and Williams 2000:13-14).

In September of 1946, the property comprising the Former Waikoloa Maneuver Area, with the exception of the 9,141-acre Lālāmilo Firing Range, was returned to its original land owners. The Lālāmilo Firing Range was retained as a camp site and training area by the U.S. Marines until 1953, through a permit granted by the Territory of Hawaiʻi. The permit was cancelled in December 1953, and the Territory of Hawaiʻi began using the land for cattle grazing. The State of Hawaiʻi has had ownership of the 9,141-acre Lālāmilo property since 1959.

PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

PREVIOUS ARCHAEOLOGICAL STUDIES IN WAIKOLOA AHUPUAʻA

Previous archaeological investigations in Waikoloa Ahupuaʻa are concentrated in three regions: the coastal region, the mid-elevation lava fields, and the upland *pili* lands at the east end of the current project area. The majority of studies have focused on the coastal and near coastal region. The mid-elevation lava field studies have been focused around the area of Waikoloa Village. The previous archaeological studies conducted in the upland region at the east end of the project area were conducted at the former Parker Ranch Keʻāmuku Station property. The following discussion of previous archaeological studies and distribution of archaeological site types incorporates all three regions. Table 3 and Figures 13 through 16 outline previous archaeological work conducted in the vicinity of the project area.

Archaeological remains within inland caves suggest that the initial occupation of the Waikoloa area may have occurred as early as A.D. 780 (Jensen 1989b). The presence of small modified lava blisters near the coast with tools and food debris indicates that by A.D. 900 (Kirch 1975, 1979) people were coming to the area to extract marine resources. More permanent and continuous use of the coast is reflected in the construction of fish ponds and larger habitation structures by A.D. 1200 (Welch 1989b).

Natural lava tubes were modified to afford refuge during times of warfare, and for places to work and inter the dead (Barrera 1971; Donham 1986; Reeve et al. 2008b; Robins et al. 2003; Schilz and Shun 1992).

A number of small caves were used intermittently as temporary habitation areas while traveling through the barren lava of Waikoloa, or while bird hunting and quarrying (Moore et al. 2002; Robins et al. 2003). Small caves in this region often have few if any archaeological remains in them (Burgett et al. 1998; Jensen 1989a; Wolforth and Wilson 2007). Somewhat larger caves appear to have been occupied early during prehistory, and intermittently for many centuries thereafter (Jensen 1991; Kirch 1979).

Table 3: Previous Archaeological Studies in the Waikoloa Area.

Reference	Investigation	Location	Results
Reinecke 1930	Reconnaissance	Regional	Identified sites along the coast
Barrera 1971	Reconnaissance	ʻAnaehoʻomalu	Complexes over 500 acres
Ching 1971	Reconnaissance	Kailua to Kawaihae	Roughly 1000 sites along highway

Reference	Investigation	Location	Results
Bevacaqua 1972	Reconnaissance	‘Anaeho‘omalu	Variety of sites
Kirch 1979	Data Recovery	Kalāhuipua‘a	Marine exploitation
Cox 1983	Reconnaissance	Kawaihae to PTA	No Sites Identified
Welch 1984	Reconnaissance	Puakō petroglyphs	Petroglyphs
Walker and Rosendahl 1986	Inventory Survey	‘Anaeho‘omalu	Heiau and associated features
Donham 1987	Data Recovery	Waikoloa	Variety of pre-Contact era sites
Cordy 1987	Synthesis	Waikoloa	Ahualono interpretation
Bonk 1988	Inventory Survey	Waikoloa	No sites located
Jensen and Donham 1988	Data Recovery	Waikoloa	Quarry sites
Jensen 1988	Inventory Survey	Waikoloa	Abrader basins and habitation
Welch 1989b	Inventory Survey	Pauoa Bay	Fishpond
Jensen 1989a	Inventory Survey	Pauoa Bay	Temporary habitation, caves, abrader basins, trails
Jensen 1989b	Inventory Survey	Pauoa Bay	Caves, abrader basins, trails
Jensen 1989c	Inventory Survey	Pauoa Bay	18 sites: caves, habitation, petroglyphs, basins
Jensen 1990c	Inventory Survey	Pu‘u Hīna‘i	A single wall site (T-1)
Hammatt et al. 1998	Data Recovery	Waikoloa	Data recovery at eleven coastal sites
Jensen 1991	Data Recovery	Pauoa Bay	Habitation cave dating to as early as 960 A.D.
Jensen and Burgett 1991a	Inventory Survey	Waikoloa	Four pre-Contact rock alignments
Jensen and Burgett 1991b	Inventory Survey	Waikoloa	Nineteen pre-Contact platforms (possible burials), terraces, and a trail
Hurst and Sinoto 1991	Inventory Survey	Waikoloa	No sites located
Schilz and Shun 1992	Inventory Survey	Puakō	Pre-Contact and historic sites
Landrum *et al*. 1992	Inventory Survey	Mauna Lani	Many abrader quarries
Landrum 1993	Inventory Survey	‘Anaeho‘omalu	Variety of sites
Lass 1995	Test Excavations	‘Anaeho‘omalu	Habitation
Halpern and Rosendahl 1996	Inventory Survey	Mauna Lani	Ponds and petroglyphs
Drolet and Clark	Inventory Survey	Mauna Lani	Temporary habitation

Reference	Investigation	Location	Results
1997			
Burgett et al. 1998	Inventory Survey	Mauna Lani	Abrader manufacture features
Rosendahl 2000a	Inventory Survey	Waikoloa	Historic and pre-Contact features
Rosendahl 2000b	Reconnaissance	Waikoloa	No sites
Jensen 2000	Data Recovery	Waikoloa	Cave excavation: temporary habitation
Moore et al. 2002	Inventory Survey	Waikoloa	Ten pre-Contact temporary habitation sites
Robins et al. 2003	Reconnaissance Survey	Waikoloa	Forty-five pre-Contact sites
O'Hare et al. 2003	Data Recovery	Waikoloa	Pāhoehoe excavations
Haun 2004	Inventory Survey	Waikoloa	Abrader basins
Dashiell and Sinoto 2005	Archaeological Assessment	Waikoloa	No sites located
Reeve and Cleghorn 2006	Monitoring	Waikoloa	3 sites: temporary shelters and rock mounds
Hammatt and Shideler 2007	Inventory Survey	Waikoloa	Post-Contact era reservoir
Wolforth and Wilson 2007	Inventory Survey	Waikoloa	Abrader basins, trails, lava ball quarries
Wolforth and Huber 2007	Inventory Survey	Waikoloa	Temporary habitation, caves, abrader basins, trails
Reeve et al. 2008	Monitoring	Waikoloa	
Corbin 2008	Inventory Survey	Waikoloa	Eight rock cairn markers
Corbin 2008	Inventory Survey	Waikoloa	Eight rock cairn markers
Escott and Keris 2009	Inventory Survey	Waikoloa	Post-Contact era survey markers
Haun and Henry 2010a	Archaeological Assessment	Waikoloa	No Sites
Haun and Henry 2010b	Archaeological Assessment	Waikoloa	No Sites
Escott and Patolo 2011a Draft	Archaeological Monitoring	Waikoloa Area 6	No sites located
Escott and Patolo 2011b Draft	Archaeological Monitoring	Waikoloa Areas 1, 2, 3, 4, and 5	Sixty-five sites, mostly modern, traditional ag. sites
Wilkinson et al. 2014	Archaeological Assessment	Waikoloa	No Sites

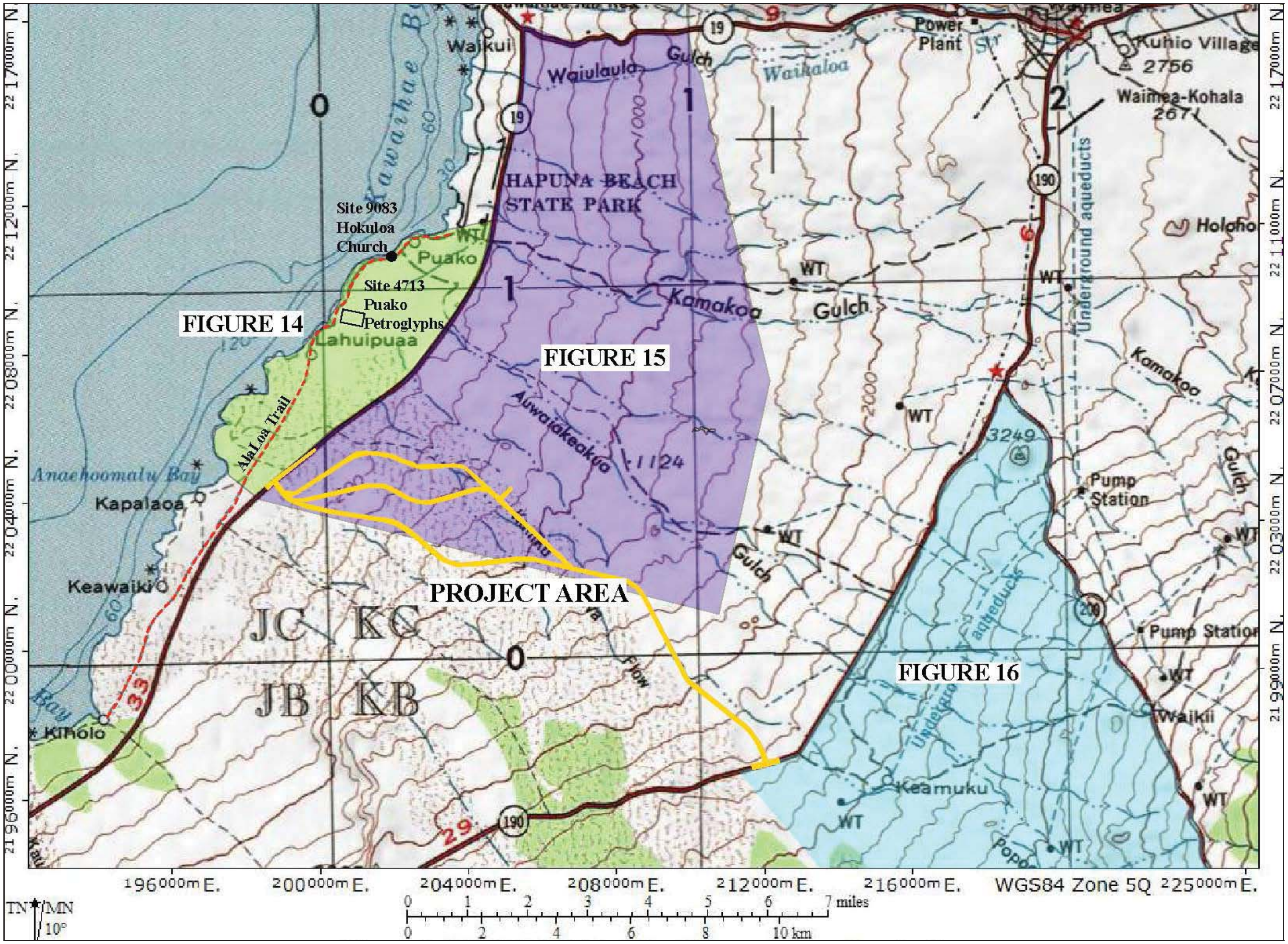

Figure 13: 250,000 Kilometer Series USGS Topographic Map Showing Location of Project Area (Shaded Yellow), Historic Register Sites, and Previous Archaeological Studies Shown in Figures 14, 15, and 16 (National Geographic Topo! 2003. Source: National Geographic Society).

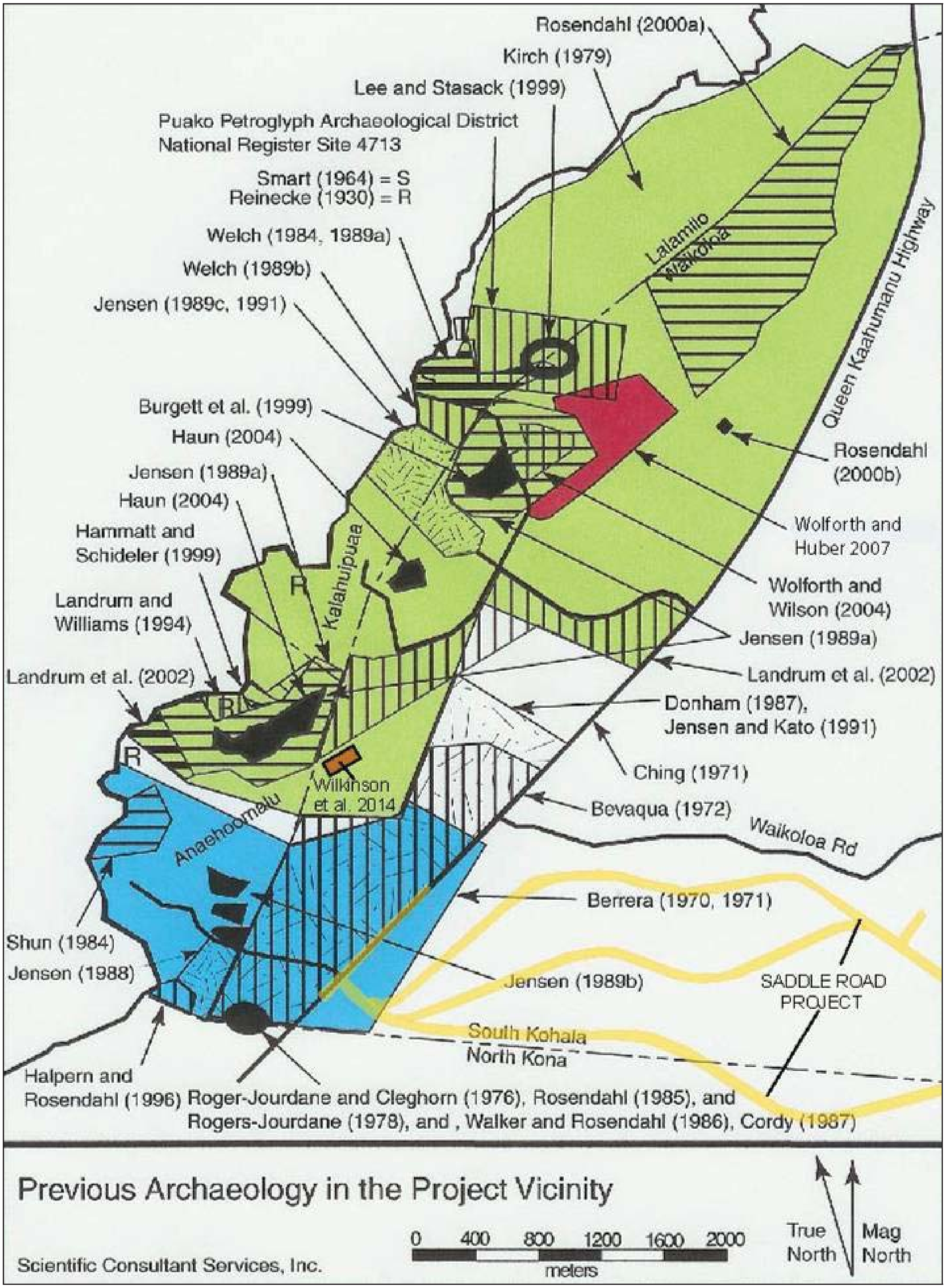

Figure 14: Previous Archaeological Studies at ʻAnaehoʻomalu, Kalāhuipuaʻa, Lālāmilo, and Lower Waikoloa Lands.

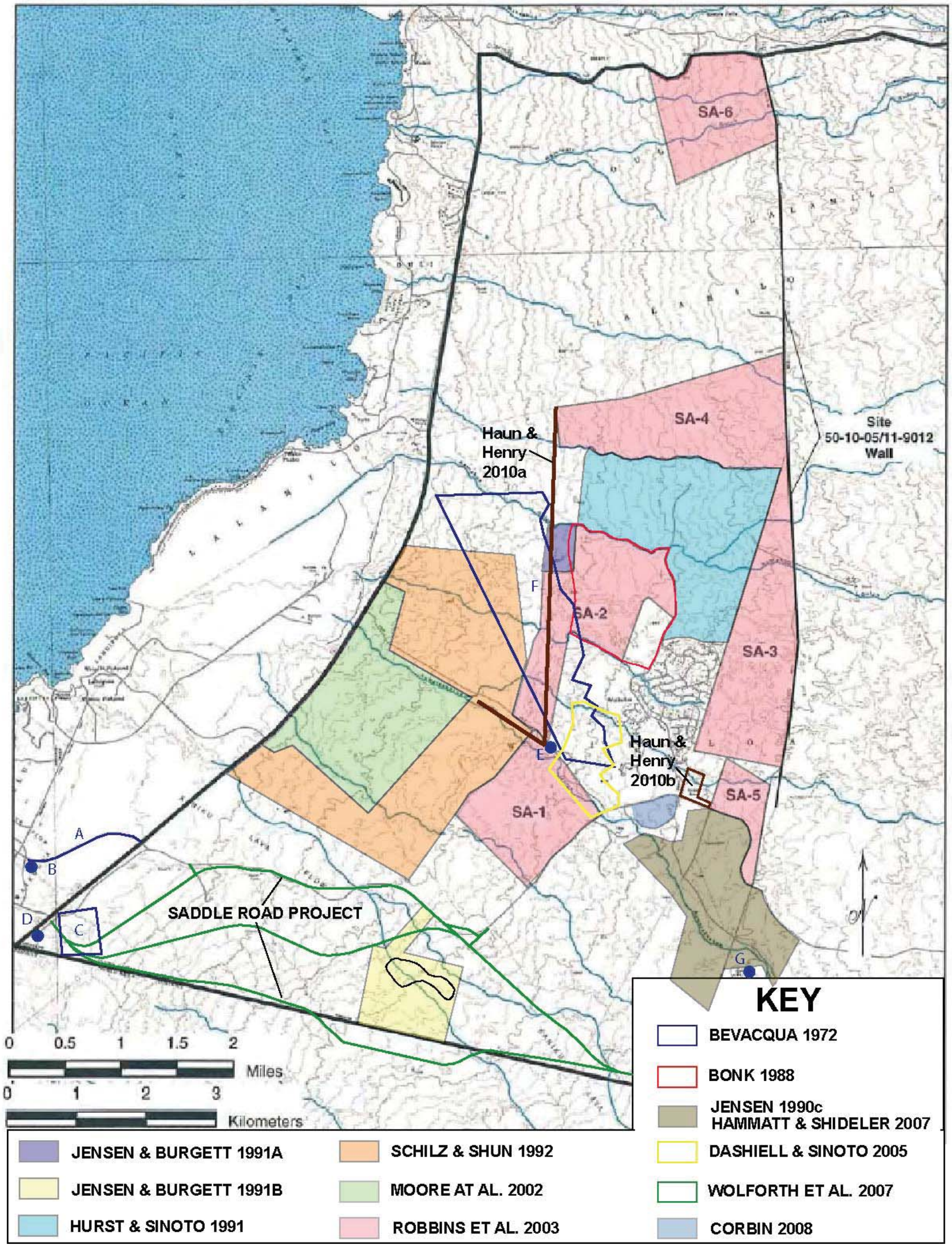

Figure 15: 7.5-Minute Series USGS Topographic Map Showing Location of Previous Archaeological Studies in Waikoloa Village Area (Adapted from Robins et al. 2003).

A series of paved platforms situated approximately 4.8 kilometers inland from ʻAnaehoʻomalu have been interpreted as burial features (Jensen and Burgett 1991b). Although no subsurface testing was conducted at the platforms, their size, shape, and well constructed and paved architecture makes the burial interpretation a likely one. The rationale for multiple burial platforms located so far from habitation areas and other utilized areas, and their scattered, seemingly random placement on the rough lava is unknown at this time. An isolated blister burial was recorded in the barren lava fields northwest of the paved platforms mentioned above (Moore et al. 2002).

Many of the archaeological investigations in the barren lava of inland Waikoloa have recorded quarry and manufacture areas for abraders (Ching 1971; Jensen and Donham 1988; Kirch 1979). These are evident in small pits in the lava, often with pieces of bedrock moved from the inside to the rim of the pit. There are also grooves and shallow lines in the bedrock that appear to have been created by rubbing pieces of rock against the bedrock, most likely to shape the quarried rock. Some of the outcrops contain rough, scoriaceous lava that is particularly well-suited as raw material for abrading tools.

The most common archaeological features recorded in the central barren lava regions of Waikoloa are military training positions, hunting blinds, rock mounds interpreted as survey markers and boundary markers, intermittently used temporary habitation rock shelters, and trails (Corbin 2008; Robins et al. 2003). Site density in this region is very low.

The greatest concentration of population settlement within and near to Waikoloa was at Lālāmilo and Waimea (Hommon 1982; Kirch 1975). The fertile Mauna Kea soils there were enhanced for cultivation with water from the Kohala Mountains via a network of channels to create what is known as the Lālāmilo Field System (Clark and Kirch 1983). Based on several sources of data, it appears that the field system was created during the late 12th century (Clark and Kirch 1983; Wolforth 1999). Permanent population has continued in Waimea to date, while the field system was abandoned after transformation for alien cultivated species in the mid-1800s.

There is evidence that a type of floodwater farming occurred within the barren zone that was dependent on intermittent seasonal flows of surface water (Rosendahl 1972). Several small agricultural features were identified within the narrow Kamakoa Gulch (Jensen and Burgett 1991a), and similar features identified near the base of Puʻu Hīnaʻi (Bevacqua 1972). These areas are not far from the "Aina Mahi" just upslope from Puʻu Hīnaʻi.

Based on the size and configuration of Waikoloa Ahupuaʻa, it is likely that people within Waikoloa had direct access to the cultivated fields of Waimea and the marine, grass, and scoriaceous lava resources at lower elevations and along the coast. At the very least, it is expected that these resources were moved and exchanged between the coast and population concentration at Waimea.

Phase I (Robins et al. 2003) and Phase II (Robins et al. 2007) archaeological studies were conducted across the Māmalahoa Highway from the current project area (Figure 16). The studies were conducted at the former Parker Ranch, Keʻāmuku Cattle Station by Garcia and Associates (GANDA). SCS conducted a Phase II study (Escott 2006; Johnson and Escott 2009 draft) on the primary work and living facilities at the center of the station. GANDA's study documented 68 sites comprised of 265 features (Table 4). Fifty two (76%) of the sites contained post-Contact features associated with ranching, habitation, and boundary markers.

Four sites (6%) contained possible pre-Contact or early post-Contact era features, including a burial cave, a temporary habitation enclosure, a petroglyph, and a pictograph. Two (3%) sites had both pre and post-Contact features. The period associations of ten (15%) sites were unclear and could not be determined. The majority of features were rock mounds and cairns associated with ranching era land clearing, boundary demarcation, and the quarrying of rock for construction material (most likely for construction of the Kona-Waimea Belt Road). A number of terraces, enclosures, C-shaped enclosures, two rock shelters, and an L-shaped enclosure were associated with temporary habitation and agriculture.

Several walls were associated with ranching and agriculture. Sites were concentrated along the existing Māmalahoa Highway, in the vicinity of the Keʻāmuku Sheep and Cattle Station, along the southwestern edge of the Keʻāmuku Station Parcel, and to a lesser extent at northern tip of the Keʻāmuku Station Parcel and at two upland paddock areas (Figure 17).

Phase II archaeological investigations at the Keʻāmuku Station work and living facilities (Escott 2006; Johnson and Escott 2009 draft) suggest the station was first established during the mid-19th century as an early sheep ranching enterprise with bullock hunting and the earliest attempts to domesticate wild cattle taking place there as well.

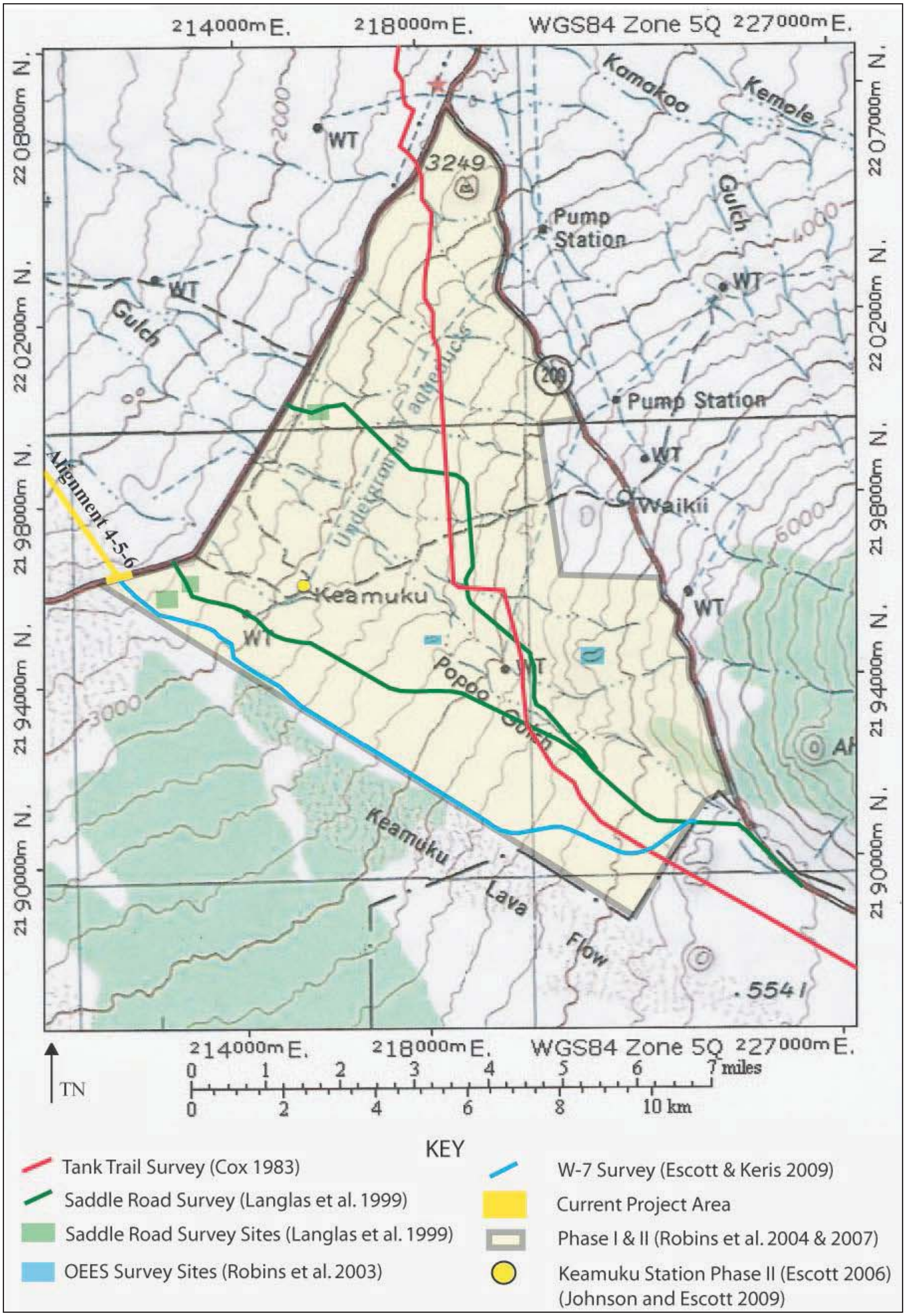

Figure 16: 7.5-Minute Series USGS Topographic Map Showing Previous Archaeological Studies in the Project Area Uplands (Adapted from Robins et al. 2007).

Table 4: Keʻāmuku Station Property Phase I Sites (GANDA 2003: 39-42).

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
20854	1-5	C-shape Complex	Habitation	Post-Contact
20855	1	Kona-Waimea Belt Road	Government road	Post-1916
21132	1-5	Mound complex	Construction Material	Post-Contact
22929	1-12	Terrace-Enclosure Complex	Habitation	Undetermined
22933	1	Rockshelter	Habitation	Undetermined
23467	1	Enclosure	Military	Post-Contact
23468	1-2	Mound Complex	Boundary Marker	Post-Contact
23472	1-2	Cairn complex	Boundary Markers	Post-Contact
23473	1-2	Mound complex	Markers	Post-Contact
23489	1	Mound	Land Clearing	Post-Contact
23490	1-2	Enclosure Complex	Temporary Habitation	Pre-Contact
23491	1	Mound	Boundary Marker	Post-Contact
23492	1	Wall section	Boundary Remnant	Post-Contact
23493	1	Mound	Land clearing	Post-Contact
23494	1	Cairn	Marker	Post-Contact
23495	1-5	Complex	Agriculture	Post-Contact
23496	1	Platform	Water tank foundation	Post-Contact
23498	1	Cairn	Marker	Post-Contact
23499	1-8	Complex	Cattle Watering/Agriculture	Post-Contact
23500	1-2	Parallel walls	Possible cattle chute	Post-Contact
23501	1	Petroglyph	Rock art	Pre-Contact
23502	1	Cairn	Possible Marker	Undetermined
23503	1	Cairn	Possible Marker	Undetermined
23504	1	Cairn	Possible Marker	Undetermined
23505	1-2	Enclosure/Platform Complex	Habitation	Post-Contact
23506	1	Wall	Possible cattle chute	Post-Contact
23508	1	Terrace	Erosion Control	Post-Contact
23509	1-24	Mound Complex	Construction Material	Post-Contact
23510	1	Mound	Survey Marker	Post-Contact
23511	1	Enclosure	Temporary habitation	Pre-Contact/Post-Contact

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
23512	1-3	Enclosure/Mound Complex	Possible Habitation	Post-Contact
23513	1	Cairn	Boundary Marker	Post-Contact
23514	1	Cairn	Boundary Marker	Post-Contact
23515	1	Firing Position	Military Training	Post-Contact
23516	1	Ranch Road	Transportation	Post-Contact
23517	4	Cremation Remains	Burial	Modern
23518	1	Retaining Wall	Ranch Road	Post-Contact
23519	1-4	Complex	Habitation/ Animal Pen?	Post-Contact
23520	1-3	Mound Complex	Construction Material	Post-Contact
23521	1-7	Mound Complex	Construction Material	Post-Contact
23522	1-6	Mound complex	Construction Material	Post-Contact
23523	1-2	Terrace, Mound	Possible Habitation	Pre-Contact/Post-Contact
23524	1	Cairn	Marker	Post-Contact
23525	1-2	Mound	Survey Markers	Post-Contact
23526	1	Enclosure Remnant	Habitation	Post-Contact
23527	1	Pictograph	Rock art	Pre-Contact
23528	1	Cairn	Boundary Marker	Undetermined
23529	1	Mound	Boundary Marker	Post-Contact
23530	1	Cairn	Boundary Marker	Post-Contact
23531	1	Cairn	Boundary Marker	Post-Contact
23532	1	Cairn	Boundary Marker	Post-Contact
23533	1	Cairn	Boundary Marker	Post-Contact
23534	1	Mound	Boundary Marker	Post-Contact
23536	1	Mound	Boundary Marker	Post-Contact
23537	1	Mound	Boundary Marker	Post-Contact
23538	1	Mound	Land Clearing	Post-Contact
23539	1-100	Keʻāmuku Ranch Station	Sheep-cattle station: permanent habitation; animal pens	Post-Contact
23540	1	Retaining Wall	Road	Post-Contact
23541	1-3	Enclosure Complex	Animal Pens	Post-Contact
23542	1	C-Shaped Enclosure	Temporary Habitation/Hunting?	Post-Contact
23543	1-83	Mound Complex	Construction Material	Post-Contact
23576	1-5	Concrete Pads	Foundation	Post-Contact

Site No.	Feature No.	Site/Feature Type	Probable Function	Age
23579	1-33	Complex	Temporary Habitation; Agriculture; Boundary	Post-Contact
23580	1	Enclosure	Temporary Habitation	Post-Contact
23588	1	Faced Mound	Marker/Possible Shrine	Undetermined
23591	1	Lava Tube	Burial	Pre-Contact
23592	1	Mound	Possible Marker	Undetermined
23593	1-2	Mound Complex	Markers	Undetermined
23594	1	Mound	Marker	Undetermined
23597	1	Mound	Land Clearing	Post-Contact
23599	1-3	Mound Complex	Construction Material	Post-Contact
23600	1	Mound Complex	Land Clearing	Post-Contact
23620	1-3	Mound Complex	Land Clearing	Post-Contact

Sites highlighted blue are documented in Escott 2006 and Johnson and Escott 2009.

Living quarters, processing facilities, walls, and corrals were constructed during this period. Early ranch layout, building construction techniques, material culture, and dietary regime suggest a synthesis of Hawaiian, Japanese, and Western cultures.

HAWAIʻI REGISTER AND NATIONAL REGISTER HISTORIC SITES

Three sites near the project area are listed on the Hawaiʻi Register of Historic Places (HRHP) and the National Register of Historic Places (NRHP) (see Figure 13). The closest site, the Ala Loa Trail is located 885 meters (0.55 miles) northwest of the Queen Kaʻahumanu Highway portion of the project area, roughly where the trail crosses Waikoloa Beach Drive. The Puakō Petroglyph Field and Hokuloa Church are located approximately 4.5 km (2.8 miles) and 6.0 km (3.7 miles) northwest of Alignment 6, respectively. All three sites are listed on the HRHP and Hokuloa Church is also listed on the NRHP.

ARCHAEOLOGICAL EXPECTATIONS

Based on pre-Contact era to Historic era accounts, as well as previous archaeological studies, it is expected that many of the archaeological features in the upland (eastern) portion of the project lands will likely be associated with post-Contact era ranching. This is likely because the upland (eastern) portion of the project area has been used for cattle ranching. Additionally, the upland project area is not near places of known traditional Hawaiian habitation or agriculture.

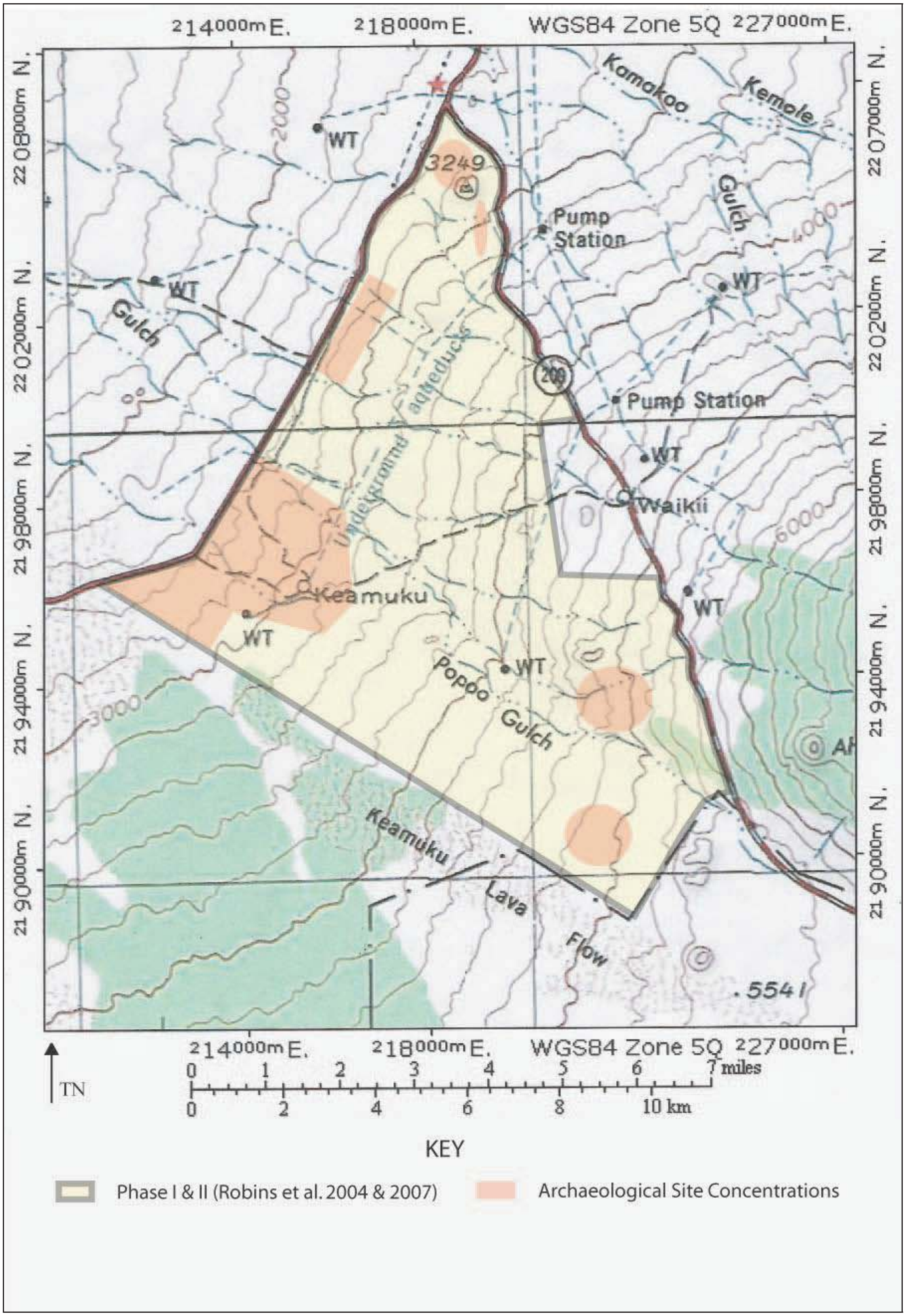

Figure 17: 7.5-Minute Series USGS Topographic Map Showing Archaeological Site Concentrations at Keʻāmuku Station (Adapted from Robins et al. 2007).

The area was used infrequently during pre-Contact times for travel, bird hunting, and plant gathering.

In addition, use of the area for over one hundred years for ranching and, for a short time, military training has likely lead to the destruction of many archaeological features that existed within the project area. In the 1930s Parker Ranch began an eradication program to remove a *pānini* (prickly pear cactus) infestation on its Waikoloa ranch property. During the first three decades of the program, mass chain-dragging and bulldozing was employed throughout large areas in this region. Any existing archaeological features were likely impacted by the program.

Likewise, military troops often dismantled or destroyed archaeological features while training in the area. For these reasons, it is expected that primarily post-contact ranching features will be documented in the upland portion of the project area.

Post-Contact era ranch features including dirt ranch roads, fence lines, stacked-rock paddock walls, stacked-rock animal pens, water pipes, and troughs, as well as military training and defensive positions, are likely to be present. Parker Ranch did not maintain facilities on the project area parcels, and therefore, no habitation or work structures are expected. A small amount of modern refuse is expected.

Pre-Contact era and early post-Contact era traditional Hawaiian archaeological sites are more likely to exist in the coastal portion of the project area. These features would be associated with travel through the area and resource extraction. Traditional Hawaiian features might include trails, rock mound markers, pāhoehoe excavations, temporary shelters, and petroglyphs.

Trails might be marked by rock mounds where they cross open pāhoehoe or soil surfaces. Some leveling or infilling, and curbing might be encountered along trail segments. Temporary shelters might include rock enclosures, small c-shaped enclosures, modified lava tubes, and low rock alignments. Isolated artifact scatters containing midden, basalt flakes, and volcanic-glass flakes are also possible.

RESULTS OF FIELDWORK

Fifty (50) archaeological sites were recorded during the inventory survey process (Table 5, Figures 18, 19, 20, and 21). Twenty eight of the sites were recorded within the project APE. The remaining twenty two sites are located outside of the boundaries of the APE and will not be impacted by project construction activities.

The vast majority (n=40) of all sites recorded during the inventory survey study were located in the near coastal region at the western end of the project area (Figure 19). Five of the sites were located within the central portion of the project area along the North Kona and South Kohala boundary (Figure 20). Four of these sites are rock mounds that likely mark the boundary or are property survey markers. Another concentration of sites (n=7) was identified in the upland "Aina Mahi" area near the eastern end of the project area (Figure 21). Approximately one third of the sites are located entirely within the APE, another third are partially within, and another third are outside of the APE.

The site descriptions below are grouped into three geographical categories: sites recorded in the near coastal portion of the project area, near the Queen Kaʻahumanu Highway; sites recorded in the central portion of the project area, along the South Kohala and North Kona District boundary; and sites recorded in the inland portion of the project area, near the Māmalahoa Highway. The central and upland sites are generally smaller, less complex, and used for shorter durations. The near coastal sites were likely visited more often because they were closer to habitation areas clustered along the coast.

Table 5: Inventory of Archaeological Sites.

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24466	1	4-5-6	Out	*Ahu* with post	Historical survey marker
24467	3	4-5-6	In	Group of *ahu*	Pre-Contact to Early post-Contact era trail markers
24468	4	4	Partially in	Ridge quarry and 3 *ahu*	Pre-Contact to Early post-Contact era resource extraction, trail markers
24469	3	6	Out	*Ahu* and graffiti	Possibly Pre-Contact era to Historic era markers
24470	24	5	Partially in	Modified cave	Pre-Contact to Early post-Contact era refuge cave
24471	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24472	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era c resource extraction
24473	8	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24474	6	4	In	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24475	3	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24476	1	5	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24477	2	5	In	Pāhoehoe excavations	Pre-Contact to Early post-Contact era resource extraction
24478	1	5	Partially in	*Ahu* in cave	Prehistoric marker
24479	1	4	Partially in	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24482	4	6	Out	Pāhoehoe excavation, alignments	Pre-Contact to Early post-Contact era resource extraction and shelter
24483	1	6	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24484	1	6	Out	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24485	8	4	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24486	1	4	Out	Materials stored in cave	Pre-Contact to Early post-Contact era tool manufacture cache
24487	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24488	1	6	Out	Petroglyph	Prehistoric image
24489	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24490	1	5	Out	*Ahu* at skylight at refuge cave	Pre-Contact to Early post-Contact era marker
24491	3	4	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24492	1	4	In	Pāhoehoe excavation	Prehistoric resource extraction
24494	1	4-5-6	In	*Ahu*	Pre-Contact to Early post-Contact era marker
24495	1	5	In	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24496	2	4-5-6	Out	Fire and material collection	Prehistoric shelter
24497	3	4-5-6	Out	2 *ahu* in Beta 3 opening	Pre-Contact to Early post-Contact era shelter
24498	3	6	Out	3 *ahu* with trail Site	Prehistoric markers

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
				24499	
24499	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24502	1	4-5-6	Out	Quarry in cave	Pre-Contact to Early post-Contact era quarry
24503	1	6	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24504	3	4	Out	3 *ahu* in a line	Pre-Contact to Early post-Contact era transportation
24505	1	4	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24506	1	4	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24507	1	4	Out	Trail	Pre-Contact to Early post-Contact era transportation
24508	1	4	In	Trail	Pre-Contact to Early post-Contact era transportation
24509	27	4	Out	Abrader basin, 1 Pāhoehoe ex	Pre-Contact to Early post-Contact era tool manufacture
24510	1	4	In	Trail	Pre-Contact to Early post-Contact era transportation
24511	11	4	In	Abrader basins	Pre-Contact to Early post-Contact era tool manufacture
24512	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24513	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24514	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24515	5	6	Partially in	5 *ahu* in a line	Pre-Contact to Early post-Contact era transportation
24516	2	6	Out	*Ahu* and alignment	Pre-Contact to Early post-Contact era marker
24517	1	4-5-6	In	*Ahu*	Pre-Contact to Early post-Contact era marker
24518	1	4-5-6	In	*Ahu*	Pre-Contact to Early post-Contact era marker
24521	2	QK	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24522	2	QK	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction

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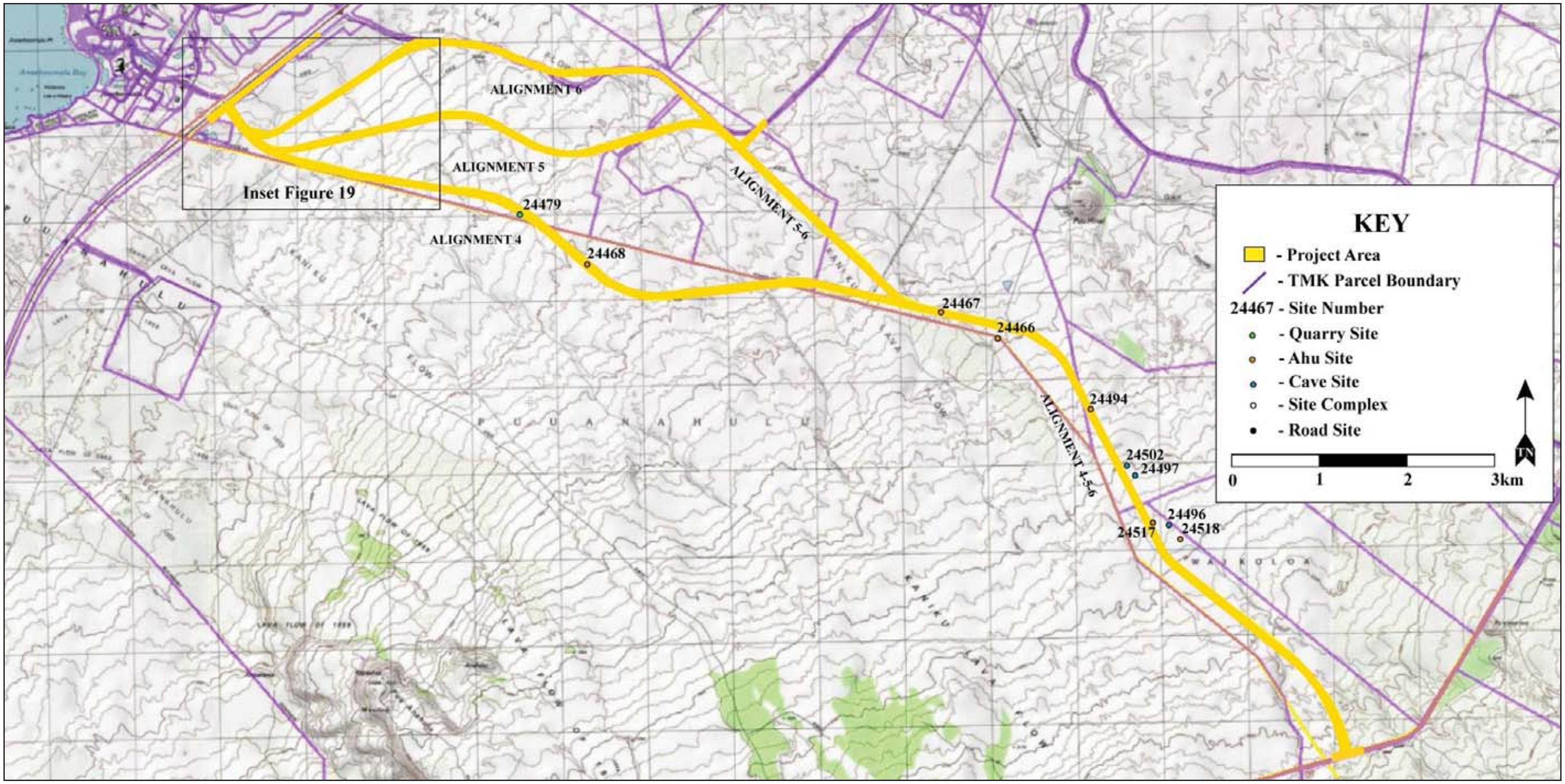

Figure 18: 7.5-Minute Series USGS Topographic Map Showing Location of Project Area Archaeological Sites (Anaehoʻomalu, Puʻu Hīnaʻi, Puʻu Anahulu, and Keʻāmuku USGS Quads) (ESRI 2013. Sources: National Geographic Society, Hawaiʻi County Planning Department).

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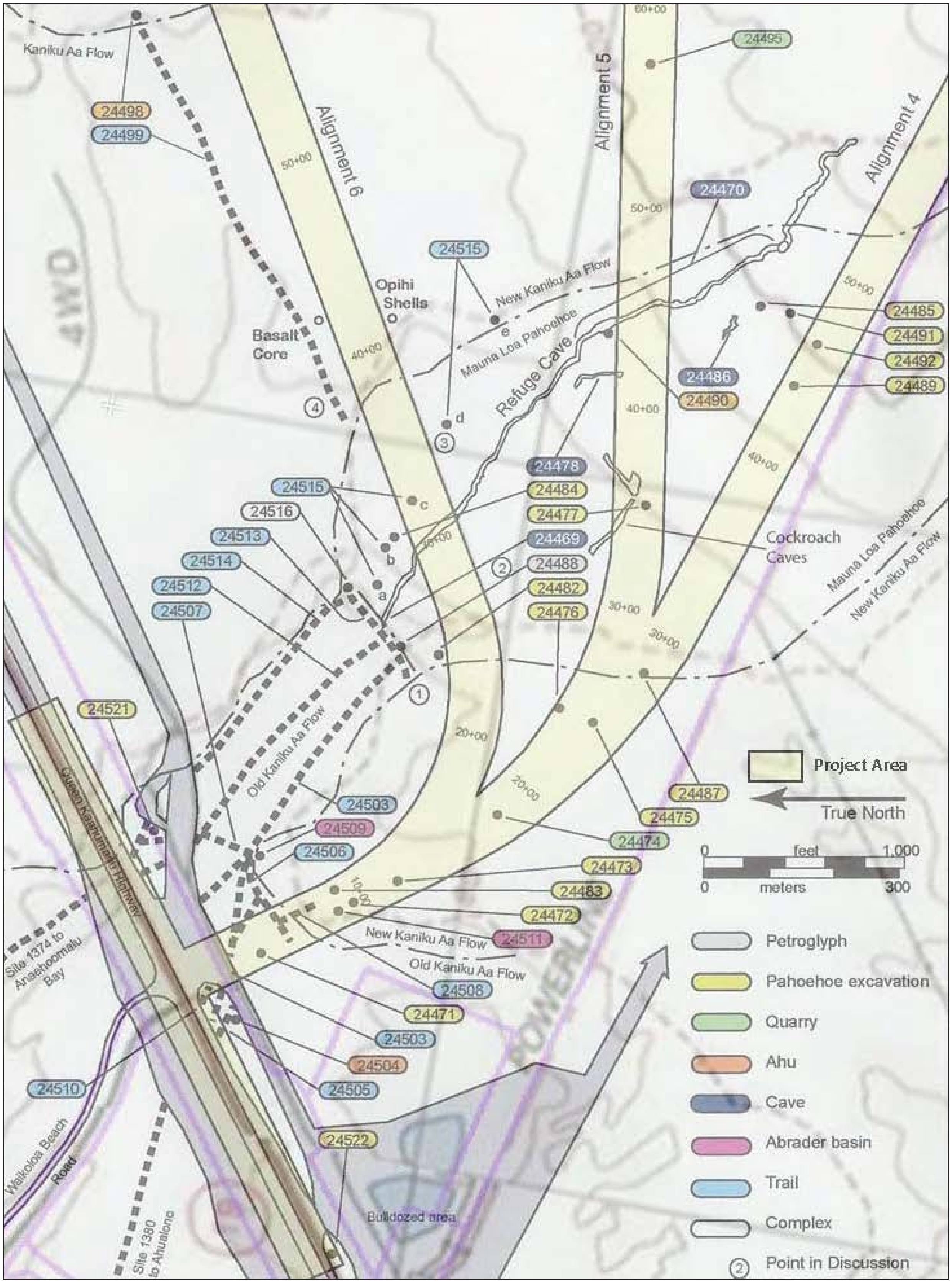

Figure 19: Inset Map of Archaeological Sites Located on the West End of Project Area.

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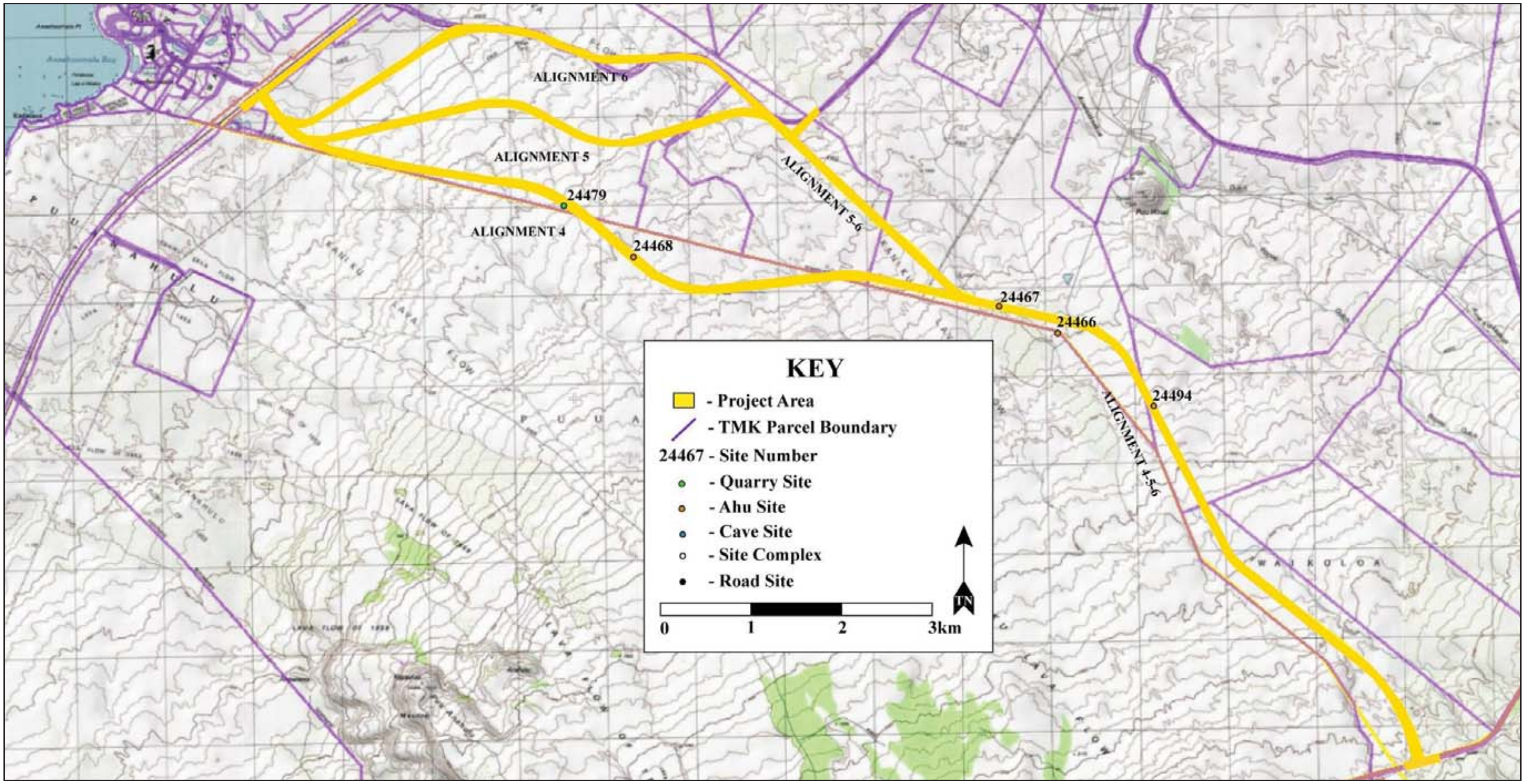

Figure 20: 7.5-Minute Series USGS Topographic Map Showing Location of Archaeological Sites Located in the Central Portion of the Project Area (Anaehoʻomalu and Puʻu Anahulu USGS Quads) (ESRI 2013. Sources: National Geographic Society, Hawaiʻi County Planning Department).

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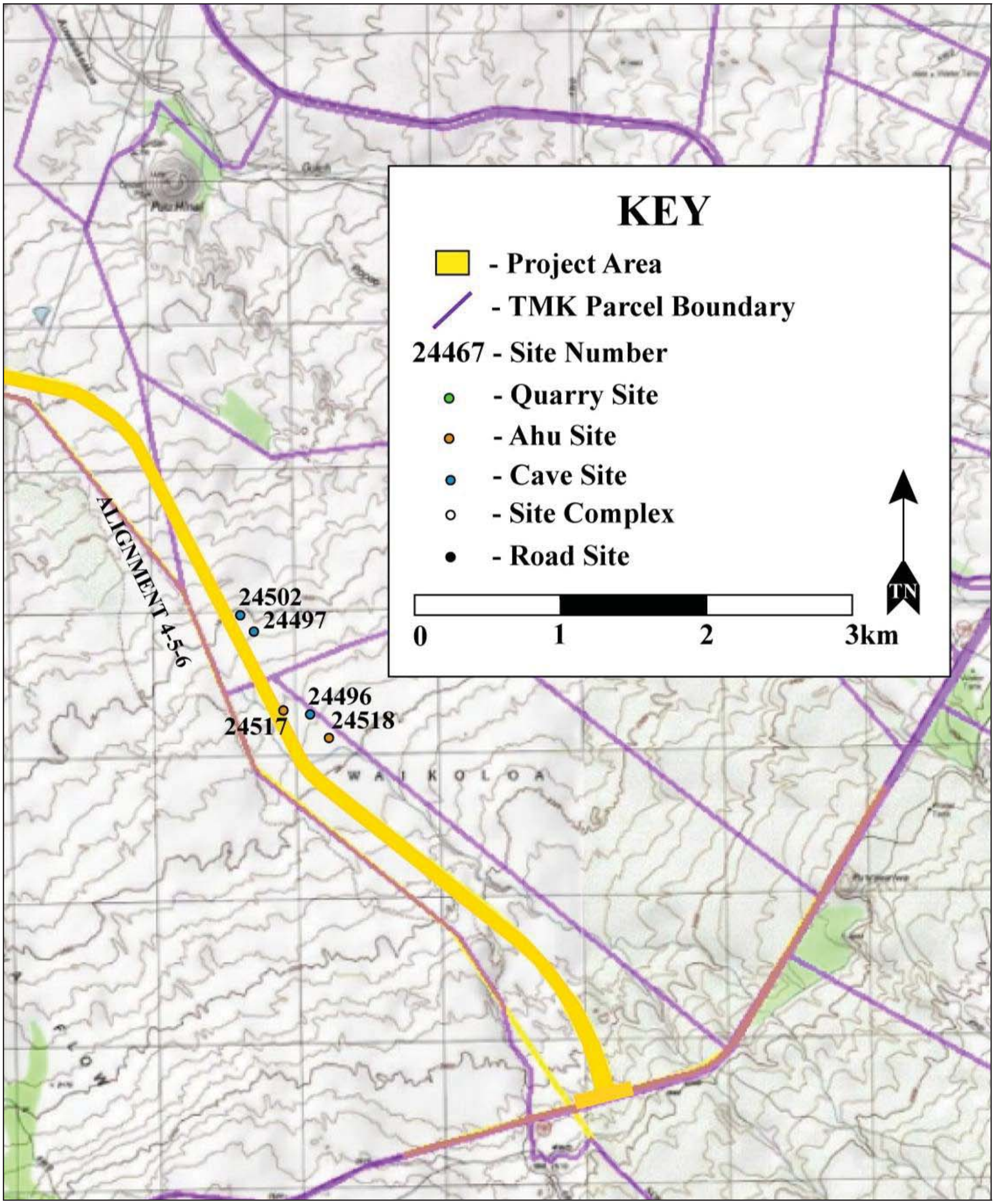

Figure 21: 7.5-Minute Series USGS Topographic Map Showing Location of Archaeological Sites Located in the Eastern Portion of the Project Area (Puʻu Hīnaʻi and Puʻu Anahulu USGS Quads) (ESRI 2013. Sources: National Geographic Society, Hawaiʻi County Planning Department).

SITES RECORDED IN THE NEAR COSTAL PORTION OF THE PROJECT AREA

Forty archaeological sites were recorded in the near coastal portion of the project area (see Figure 19 and Table 6). The sites are clustered around an area of level pāhoehoe containing both lava tubes and friable surface lava used to make abraders.

Table 6: Inventory of Archaeological Sites in the Near Coastal Portion of the Project Area.

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24469	3	6	Out	*Ahu* and graffiti	Possibly Pre-Contact to Historic era markers
24470	24	5	Partially in	Modified cave	Pre-Contact to Early post-Contact era c refuge cave
24471	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24472	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24473	8	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24474	6	4	In	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24475	3	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24476	1	5	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24477	2	5	In	Pāhoehoe excavations	Pre-Contact to Early post-Contact era resource extraction
24478	1	5	Partially in	*Ahu* in cave	Pre-Contact to Early post-Contact era marker
24482	4	6	Out	Pāhoehoe excavation, alignments	Pre-Contact to Early post-Contact era resource extraction and shelter
24483	1	6	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24484	1	6	Out	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24485	8	4	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24486	1	4	Out	Materials stored in cave	Pre-Contact to Early post-Contact era tool manufacture cache
24487	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24488	1	6	Out	Petroglyph	Prehistoric image
24489	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24490	1	5	Out	*Ahu* at skylight at refuge cave	Pre-Contact to Early post-Contact era marker

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24491	3	4	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24492	1	4	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24495	1	5	In	Ridge quarry	Pre-Contact to Early post-Contact era resource extraction
24498	3	6	Out	3 *ahu* with trail Site 24499	Pre-Contact to Early post-Contact era markers
24499	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24503	1	6	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24504	3	4	Out	3 *ahu* in a line	Pre-Contact to Early post-Contact era transportation
24505	1	4	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24506	1	4	Partially in	Trail	Pre-Contact to Early post-Contact era transportation
24507	1	4	Out	Trail	Pre-Contact to Early post-Contact era c transportation
24508	1	4	In	Trail	Pre-Contact to Early post-Contact era transportation
24509	27	4	Out	Abrader basin, 1 Pāhoehoe excavation	Pre-Contact to Early post-Contact era tool manufacture
24510	1	4	In	Trail	Pre-Contact to Early post-Contact era transportation
24511	11	4	In	Abrader basins	Prehistoric tool manufacture
24512	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24513	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24514	1	6	Out	Trail	Pre-Contact to Early post-Contact era transportation
24515	5	6	Partially in	5 *ahu* in a line	Pre-Contact to Early post-Contact era c transportation
24516	2	6	Out	Ahu and alignment	Pre-Contact to Early post-Contact era c marker
24521	2	QK	Out	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction
24522	2	QK	In	Pāhoehoe excavation	Pre-Contact to Early post-Contact era resource extraction

REFUGE CAVE

The Refuge Cave is approximately 3,500 feet (1,070 m) long. The cave is below Alignment 5 at Station 45+00, and below Alignment 6 at Station 26+00 (see Figure 19). Alignment 5 is above a section of the lava tube that contains archaeological features. Alignment 6 is above a section of the lava tube that does not contain archaeological features. There are two openings to the surface. The eastern opening is a large (20.0 by 14.0 m) and relatively deep (6.0 m) sink. The western opening is a skylight approximately 1.5 by 0.8 m. The cave is beneath level to gently sloping weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow that is surrounded by younger Kanikū black *a'ā* flows. There is almost no vegetation and less than 1% sedimentary deposits on the ground surface at the site.

Cultural modification of the cave is evident and concentrated in a 365 m (1,200 ft) long section of cave that roughly corresponds to the cave area between the two openings. This area is referred to as Site 24470, and is described in detail below. There are three *ahu* among modern graffiti at the *makai* terminus of the cave (western end), and this area is described as Site 24469 below. Small pieces of charred matter are widely scattered on the cave floor elsewhere, indicating that people traveled through the entire cave in the past, but these areas lack any artifacts or cultural modification and are, consequently, not considered archaeological sites.

SITE 24469	**AHU AND GRAFFITI**
FUNCTION:	Cave Exploration
AGE:	Pre-Contact Era and Historic
DIMENSIONS:	Length: 8.0 m NW/SE; Width: 6.0 m; Height, 0.8 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	Fibers
EXCAVATION:	None
LOCATION:	Outside of APE

DESCRIPTION: Site 24469 (see Figure 19) consists of three *ahu*, concentrations of fiber, and modern graffiti at the *makai* terminus of the Refuge Cave (Figure 22) beyond Alignment 6 at Station 27+00. There are no cultural features between the western opening area and the western terminus of cave (Site 24469), although small fragments of charred plant material and burnt wood were observed intermittently on the cave floor, indicating people passed through the entire cave. There is also one articulated dog skeleton in this passageway.

The graffiti at the western end of the cave and rock mounds appear to be modern. The modern graffiti is a series of letters created by strategic placement of rock, similar to the words spelled out along the roadside at Queen Ka‘ahumanu Highway. The graffiti includes the letters "SJ," "HG, "MUTI," "PK 1982," "KELE," and MURF 92."

There are three *ahu* in the center of the area, each constructed differently (see Figure 22). Feature 1 consists of three, roughly triangular shaped cobbles standing upright on their widest end. Feature 2 is constructed of angular and subangular cobbles stacked seven courses high in a conical shape. Feature 3 is constructed of eight angular, platy cobbles stacked into a conical shape. The shape and diversity of the *ahu*, and their proximity to the modern graffiti suggest that they were created during the last few decades. In contrast, it is not uncommon to encounter sets of prehistoric *ahu* at cave termini.

The primary features at Site 24469 appear to be Historic or modern. They were most likely constructed by people exploring the cave. The features have not been altered and are in good condition.

SITE 24470	**REFUGE CAVE**
FUNCTION:	Refuge Habitation
AGE:	Pre-Contact Era
DIMENSIONS:	Length: 366.0 m NW/SE; Width: 15.0 m; Height, 8.0 m Max.
CONDITION:	Good
INTEGRITY:	Impacted by Ungulates
SURFACE ARTIFACTS:	Midden
EXCAVATION:	TU-1, 2, 3, 4, and 5
LOCATION:	Inside APE Under Alignment 5 and NE and SW of Alignment 5

DESCRIPTION: Site 24470 includes 24 features within a 1,200 foot long portion of cave between the southeastern skylight entrance and the northwestern skylight entrance (see Figure 19). Site 24470 also includes the features in and around the southeastern skylight entrance. Site photographs are included in this site description and in Appendix D of this report.

The refuge cave was previously recorded in Bevacqua (1972) as Site 16. The Site 16 plan view map of cultural features recorded at two places within the cave and a map of Site 24470 illustrating the entire length of the tube where cultural material was identified can be found in Appendix E at the end of this report.

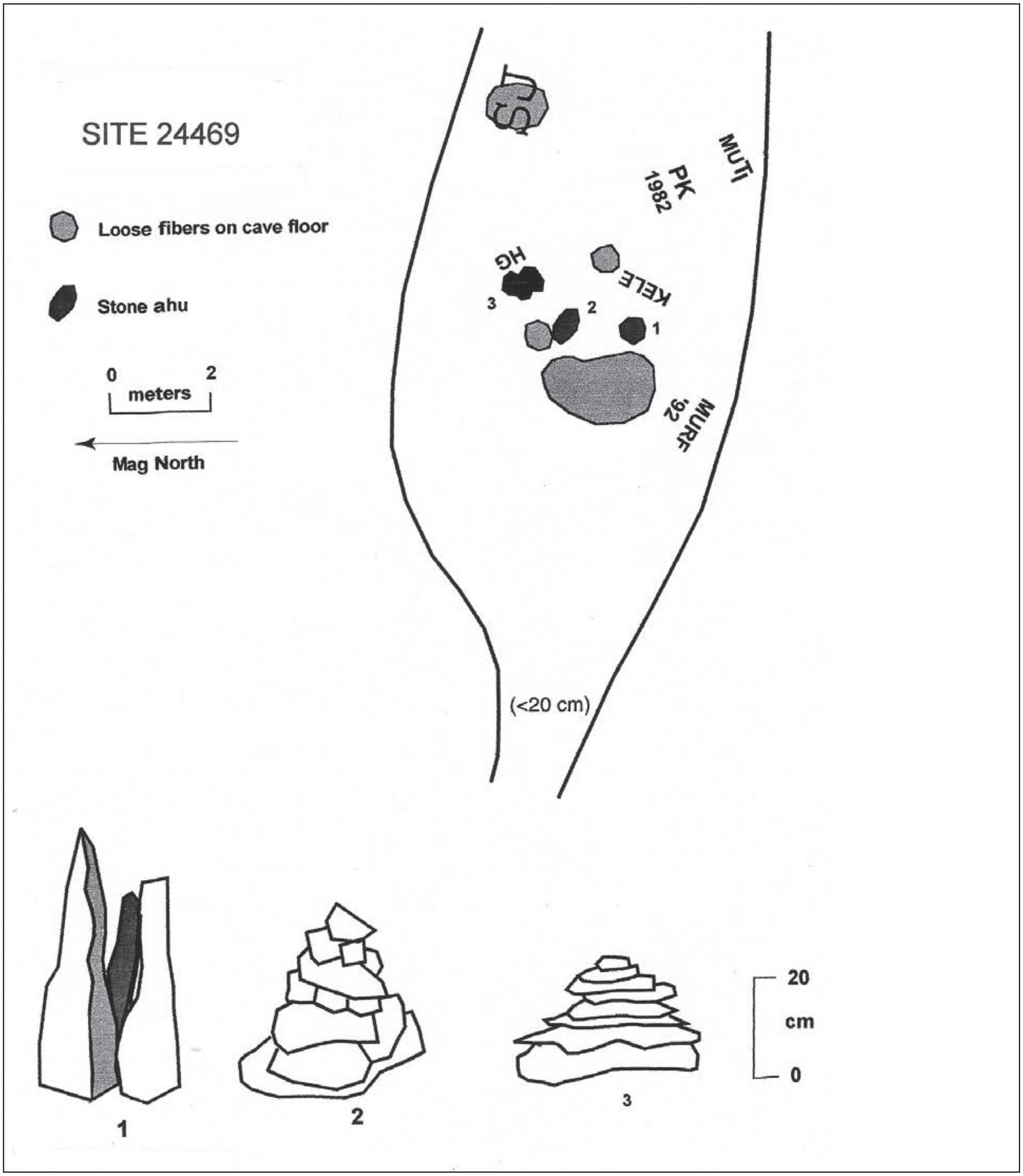

Figure 22: Site 24469 Planview Map and Feature Profiles.

The Eastern Opening

The eastern opening is in a large circular collapsed portion of the cave and is the main entrance to the cave. It is the only place where the cave can be accessed by pedestrians (Figure 23). There are several modifications within the opening sink area that are exposed to the surface (A, B, C, D, W, Y, and Z) (Figure 24), including the large wall of rock that fills most of the entrance into the northwestern cave tube (Feature C). The piled rock wall constricts the opening to the size of a human being (Figure 25). There were no artifacts observed in the portion of the eastern opening that is exposed to the surface (Table 7).

Table 7: Site 24470 Features Located at the Eastern Opening.

Feature*	Type	L x W x H (m)	Associated Material Remains
A	Paving	2.4 x 1.4 x 0.1	
B	L-shape alignment	2.5 x 2.5 x 0.8	
C	Constricted orifice	Fills cave tube	Passageway less than 1.5 m wide
D	Paving	9.0 x 2.5 x 0.8	Large boulders along rim, smaller in fill
E	Level area	3.3 x 3.0 x 0.5	Echinoid, cowrie, possible looter's hole
F	Alignment	2.5 x 0.4 x 0.7	Twigs, wood, grass
W	Level area	3.2 x 1.8 x 0.1	
X	Terrace	2.1 x 2.0 x 0.3	
Y	Terrace	1.9 x 1.8 x 0.5	

* There is no Feature L.

There is cultural debris on the cave floor around Feature E and Feature F within 40.0 meters of the eastern opening. Cultural debris included pieces of wood, animal bone, marine shell, and gourd and *kukui* shell fragments.

Test Excavations Near the Eastern Entrance of the Tube

A single 1.0 by 1.0 m test unit (TU 2) was excavated in an ash concentration near features and cultural debris approximately 22.0 meters from the eastern entrance of Site 24470. TU 2 contained a single stratigraphic layer (Layer 1) excavated as two arbitrary levels, and terminated on bedrock at a maximum depth of 0.3 m (Figure 26). Layer I was gray sandy sediment with 40% small pebbles and cobbles, with cobbles increasing to 60% near the base of excavation.

Figure 23: Photograph of Site 24470 Southeastern Skylight Opening, Looking North.

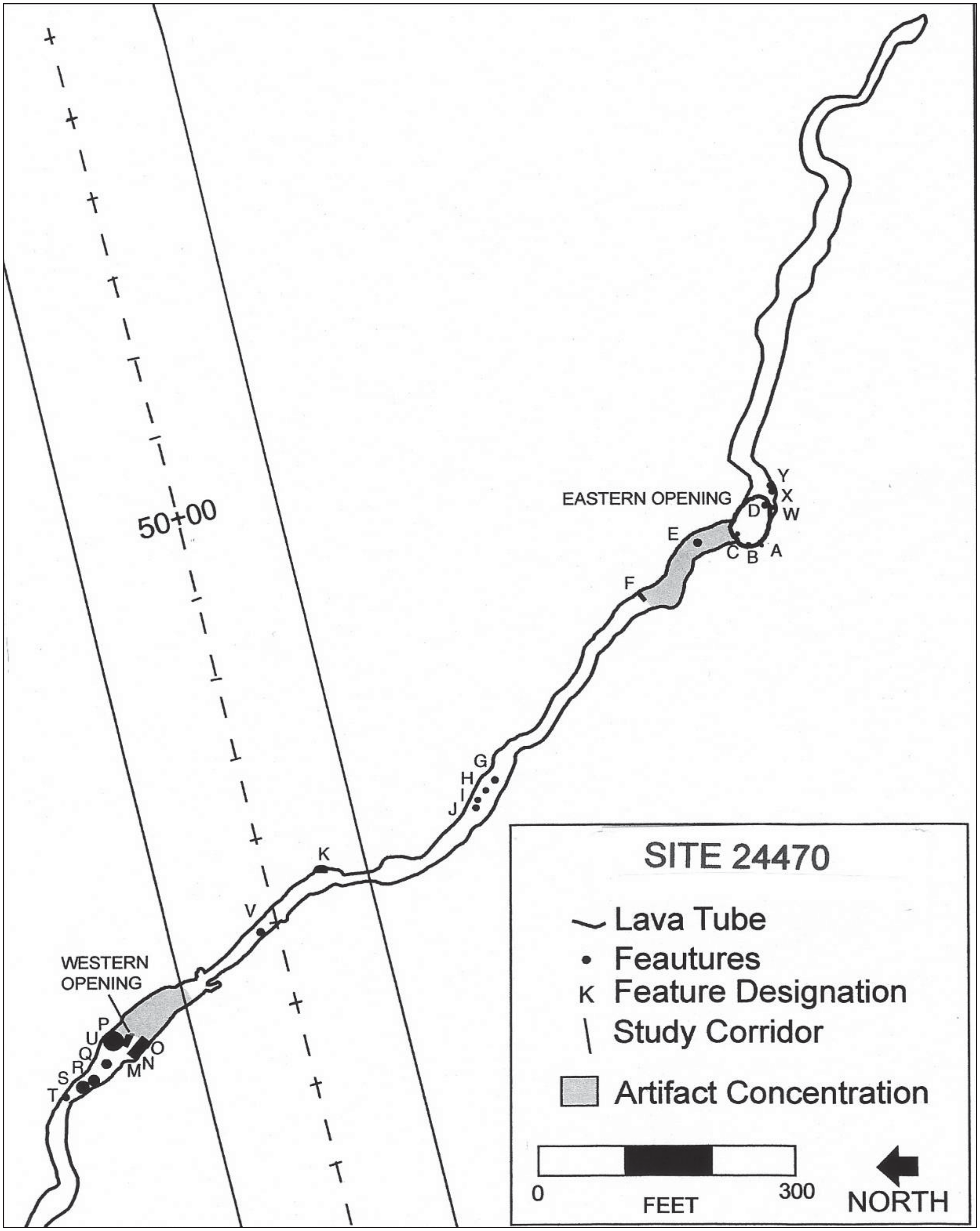

Figure 24: Site 24470 Planview Map.

Figure 25: Photograph of Site 24470 Southeast Entrance to Tube, Looking North.

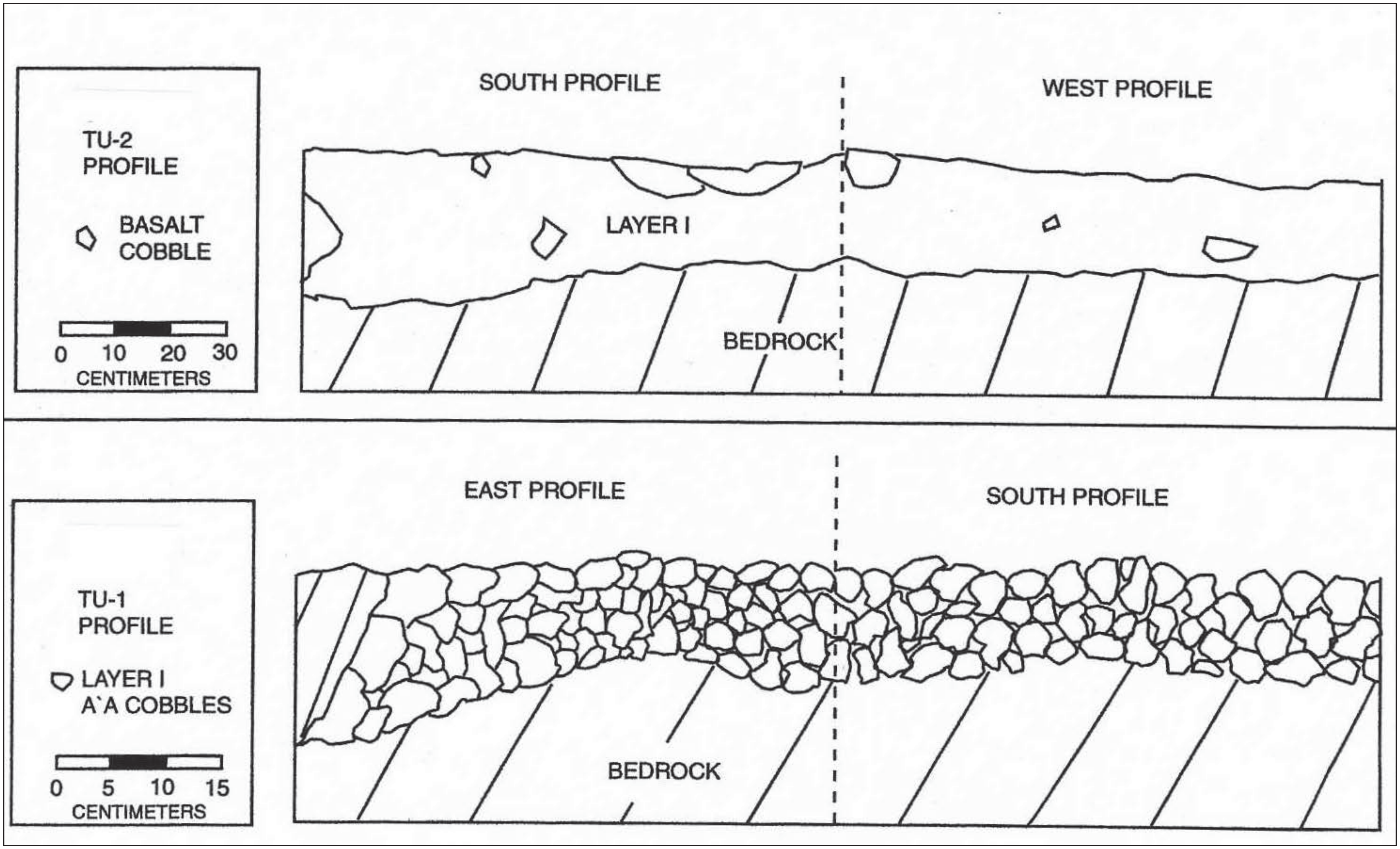

Figure 26: Site 24470, TU1 and TU2 Profiles.

A concentration of dried grass was identified on the unit surface (Table 8.). Sea urchin shell, wood, grass, plant fiber, marine shell, and charred material were recovered from Layer I matrix (Table 9). One piece of volcanic glass and one *opihi* shell with a drilled hole was recovered from Level 1 (Table 10). Charred material recovered from the screening process generated a radiocarbon date (Beta #177298) with a calibrated intercept at AD 1400, and a calibrated range at 1 sigma of AD 1320 to 1350, and AD 1390 to 1420 (Appendix C).

Table 8: Site 24470, TU 2 Floral Material.

Floral material	**Surface**	**Layer 1 Level 1**	**Layer 1 Level 2**	**Total**
	g	g	g	g.
Plant material	18.6	41.8	0.5	60.9
Wood	4.4	51.6	0.0	56.0
Gourd fragments	0.0	1.8	0.0	1.8
TOTAL	**23.0**	**95.2**	**0.5**	**118.7**

Table 9: Site 24470, TU 2 Faunal Material.

Faunal material		**Surface**		**Layer 1 Level 1**		**Layer 1 Level 2**		**Total**	
		n	g	n	g	n	g	n	g
Fish	Unidentified	0	0.0	1	0.1	1	0.3	2	0.4
Bird	Bulwer's Petrel (Bulweria bulwerii)	0	0.0	3	0.2	0	0.0	3	0.2
Mammal	Goat (medium artiodactyl)	1	4.0	0	0.0	0	0.0	1	4.0
Mammal	Pig or goat	1	7.8	0	0.0	0	0.0	1	7.8
Mammal	Unidentified (small to medium)	0	0.0	1	0.3	0	0.0	1	0.3
Vertebrate	Unidentified (small to medium)	0	0.0	0	0.0	4	0.1	4	0.1
TOTAL		**2**	**11.8**	**5**	**0.6**	**5**	**0.4**	**12**	**12.8**
Crustacean	Unidentified exoskeleton	0	0.0	251	23.6	45	1.0	296	24.6
Bird	Feathers	0	0.0	24	0.3	0		24	0.3

Table 10: Site 24470, TU 2 Shell and Artifacts.

Shell	**Layer 1 Level 1**		**Layer 1 Level 2**		**Total**	
Family/Genus/Species	n	g	n	G	n	g
Cypraeidae *Cypraea sp.*	2	4.9	0	0.0	2	4.9
Patellidae *Cellana sp.*	2	0.3	0	0.0	2	0.3

Shell	Layer 1 Level 1		Layer 1 Level 2		Total	
Family/Genus/Species	n	g	n	G	n	g
TOTAL	**4**	**5.2**	**0**	**0.0**	**4**	**5.2**
Artifacts						
Volcanic glass	1	4.4	0	0.0	1	4.4
Modified *opihi*	1	16.3	0	0.0	1	16.3
TOTAL	**2**	**20.7**	**0**	**0.0**	**2**	**20.7**

The Western Opening

The western opening is a 3.0 by 2.0 m skylight in the ground surface with a greater than 4.0 m drop to the top of the roof fall directly below the skylight, and an additional 4.0 m from the top of the roof fall to the cave floor. The tube is not accessible through the skylight without a rope or ladder. There are nine features in the cave below the skylight (Table 11). Cultural debris including pieces of wood, animal bone, marine shell, gourd, and *kukui*, is distributed on the cave floor throughout the area near the western opening.

Table 11: Site 24470 Features Located Under the Western Opening.

Feature	Type	L x W x H (m)	Associated Material Remains
M	Paving	2.7 x 1.3 x 0.1	Charred material, animal bone, marine shell, echinoid, ash, wood
N	Paving	2.5 x 2.0 x 0.1	Charred material, animal bone, marine shell, possible hearth
O	Paving	2.4 x 1.7 x 0.1	Wood, echinoid
P	Paving	4.7 x 1.5 x 0.1	On side of central roof fall area, approximately 3.0 above cave floor
Q	Platform	4.0 x 3.7 x 0.3	Abutts Feature P, but is lower in elevation
R	Enclosure	1.3 x 1.2 x 0.2	Ashy burnt grass,
S	Enclosure	3.0 x 2.8 x 0.6	Marine shell, echinoid, wood, ash
T	Enclosure	2.7 x 2.4 x 0.8	Animal bone

Feature	Type	L x W x H (m)	Associated Material Remains
U	Linear pile	3.5 x 1.7 x 0.3	On the top of central roof fall area, approximately 4.0 m above cave floor

Test Excavations Under the Northwestern Skylight Opening

Four test-units (TU 1, 3, 4, and 5) were excavated in features under the northwestern skylight opening of Site 24470.

Test Unit 1 (0.5 by 0.5 m) was excavated inside and abutting the northern corner of the enclosure, Feature R, where an ash concentration was apparent within the feature. TU 1 was excavated as a single stratigraphic layer (Layer I) and terminated on bedrock 0.18 m below surface (see Figure 26). Layer I was entirely ‘a‘ā cobbles and pebbles with burnt and charred grass, twigs and ash resting on top of the feature. The only cultural material recovered from the TU 1 was an ash sample, charred material, and crab carapace fragments.

A 3.0 by 1.5 m unit (TU 3) was excavated in Feature P, the modified roof fall under the skylight. It was excavated to bedrock. There were no *iwi kanaka* identified in the Feature P excavation.

A 1.5 by 1.3 m unit (TU 4) was excavated in Feature O, a paving of small *‘ili ‘ili* stones. It was excavated to bedrock. There were no *iwi kanaka* identified in the Feature O excavation.

A 1.0 by 1.0 m (TU 5) unit was excavated in Feature U, a step like area connecting the higher, central area with the cave floor to the northwest. The steps could be interpreted as terraces, a feature type often located on the ground surface and sometimes containing burials. TU 5 was excavated to bedrock. There were no *iwi kanaka* identified in the Feature U excavation.

The Tube Between the Openings

There are six features distributed throughout the passageway between the southeastern and northwestern openings (Table 12). There are also pieces of charred material and burnt wood scattered in light density throughout this area.

Table 12: Site 24470 Features Located Between the Southeast and Northwest Openings.

Feature	Type	L x W x H (m)	Associated material remains
G	Platform	3.0 x 2.5 x 1.1	Wood
H	Piled rocks	2.3 x 2.0 x 1.7	
I	Piled rocks	1.5 x 0.7 x 1.7	
J	Platform	1.4 x 1.2 x 1.5	
K	Enclosure	4.0 x 2.0 x 0.3	
V	Circular cleared area	1.3 m diameter	Sandy soil in interior

Site 24470 Discussion

The constricted entrance at the eastern opening of the cave suggests that the cave was used for refuge during times of warfare (Kolb and Dixon 2002). Stone features, including walls, platforms, terraces, and related features are often concentrated near the entrances of refuge caves. Site 24470 is relatively unique in that there is a concentration of features a notable distance (1,200 feet) from the cave entrance. This can be attributed to the fact that the western opening skylight provides light into the cave chamber while precluding pedestrian access to the cave. The group of features within the lighted area, under the western opening, was probably used during times of refuge.

The one radiocarbon date obtained from the area near the eastern opening indicates that the cave was being used as early as the mid 1300s to early 1400s. Whether this date applies to refuge activity is not patently evident in the data, however. The date could apply to early habitation that was conducted within the cave opening area lit by sunlight. The constricted entrance could have been built later, with refuge activity being concentrated in the western portion of the cave under the western opening.

SITE 24471	**PĀHOEHOE EXCAVATION**
FUNCTION:	Resource Extraction
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 1.8 m E/W; Width: 1.50 m; Height, 0.2 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Inside APE

DESCRIPTION: Site 24471 (see Figure 19) is a pāhoehoe excavation in Alignment 4 at Station 4+50, at an elevation of 60 feet amsl (18 m). The 1.8 by 1.5 m excavated area is in a pāhoehoe portion of the black, ropy and cindery Kanikū flow dated from 3,000 to 5,000 ybp (Figure 27). Blocks of pāhoehoe have been quarried from the bedrock and placed on the rim around the quarried area. The site is interpreted as a pāhoehoe excavation created during the extraction of scoriaceous lava most likely for abrader production. Site 24471 does not appear to have been altered and is in good condition.

SITE 24472 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 14.0 m E/W; Width: 7.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Inside APE
DESCRIPTION: Site 24472 (see Figure 19) is a pāhoehoe excavation area 14.0 by 7.0 ms situated on a level black, ropy and cindery Kanikū flow dated from 3,000 to 5,000 ybp. It is in Alignment 4 at Station 8+50, at an elevation of 60 feet amsl (18 m). Pāhoehoe has been removed from a cluster of three pits at the site to depths ranging from 0.4 to 1.0 m below surface (Figure 28). Cobbles and pebbles excavated from the pits have been placed upside down on the ground surface surrounding them. The excavated material is a black, highly vesicular, and rough *aʻā* containing small olivine crystals. The site is interpreted as a pāhoehoe excavation created during the extraction of scoriaceous lava most likely for abrader production. Site 24472 has not been altered and is in good condition. Site photographs are included in Appendix D of this report.

SITE 24473 **PĀHOEHOE EXCAVATIONS & ABRADER BASINS**

FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 80.0 m E/W; Width: 65.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted

Figure 27: Photograph of Site 24471 Looking West.

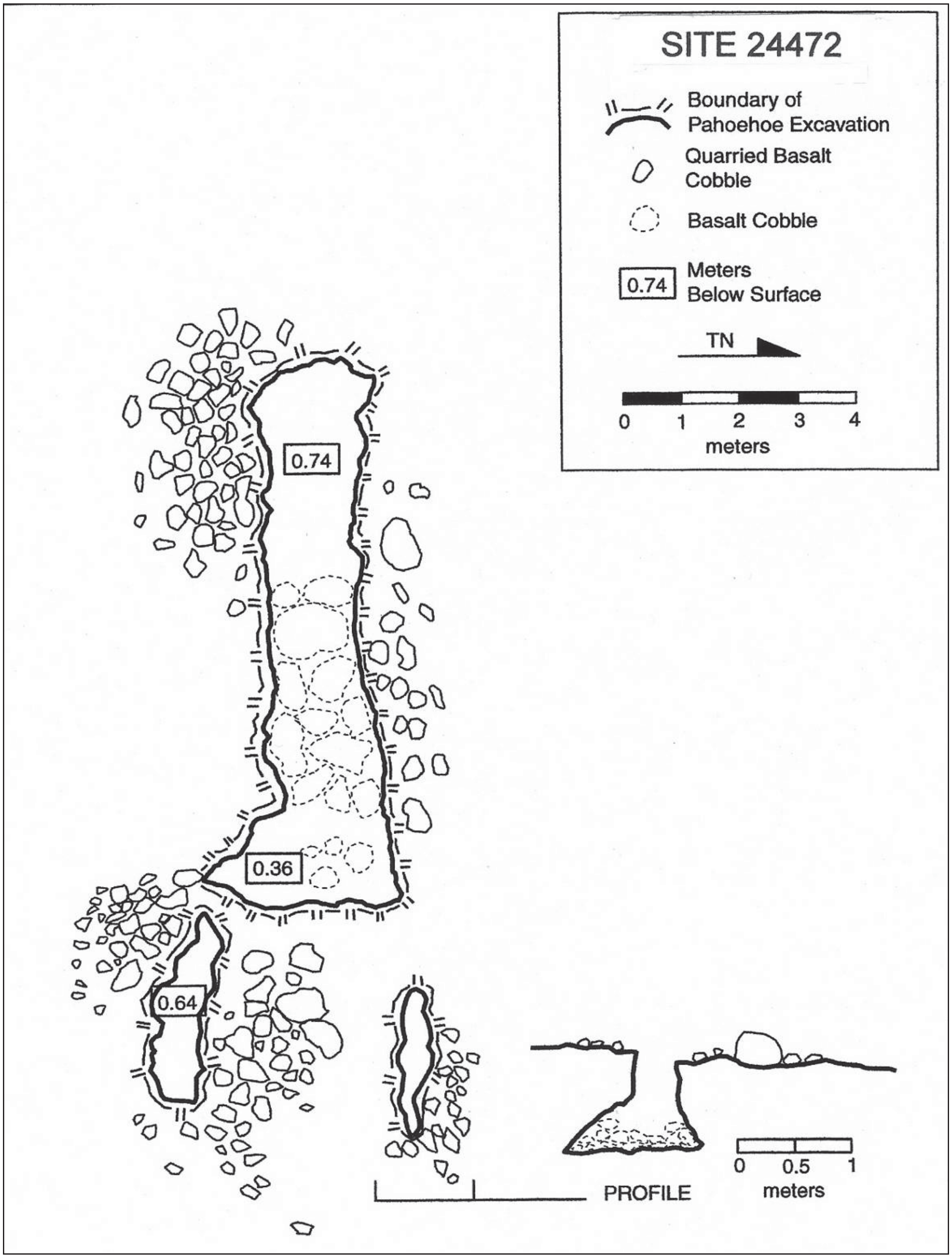

Figure 28: Site 24472 Planview Map.

SURFACE ARTIFACTS: None
EXCAVATION: None
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
LOCATION: Inside APE
DESCRIPTION: Site 24473 (see Figure 19) is a cluster of seven pāhoehoe excavations, one cluster of six pāhoehoe excavations, and four abrader basins in Alignment 5 (also in Alignment 4 overlap) between Stations 9+00 and 13+00, at an elevation of 60 feet amsl (18 m) (Table 13 and Figure 29). Pāhoehoe excavations are areas where the top of small lava blisters were manually broken into slabs and were placed around the rim of the excavated blisters. Abrader basins are areas where scoriaceous lava blocks were shaped by rubbing them on the pāhoehoe ground surface. The action of shaping the abrader blocks left shallow "basins" and grooves in the pāhoehoe surface. Site 24473 has not been altered and is in good condition. Site photographs are included in Appendix D of this report.

Table 13: Site 24473 Features and Dimensions.

Feature	Type	Length (m)	Width (m)	Depth (m)
1	Pāhoehoe excavation	0.6	0.6	1.0
2	Pāhoehoe excavation	0.6	0.3	0.5
3	Pāhoehoe excavation	2.2	1.0	0.7
4	Pāhoehoe excavation	4.3	2.6	0.4
5	Pāhoehoe excavation	1.0	0.5	0.3
6	Pāhoehoe excavation	2.3	1.3	0.7
7	Pāhoehoe excavation	1.8	0.5	0.6
8	Cluster of 6 pāhoehoe excavations	5.0	4.0	0.8
9	Cluster of 4 abrader basins	1.5	1.0	0.1

SITE 24474 **RIDGE QUARRY**
FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 80.0 m E/W; Width: 65.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None

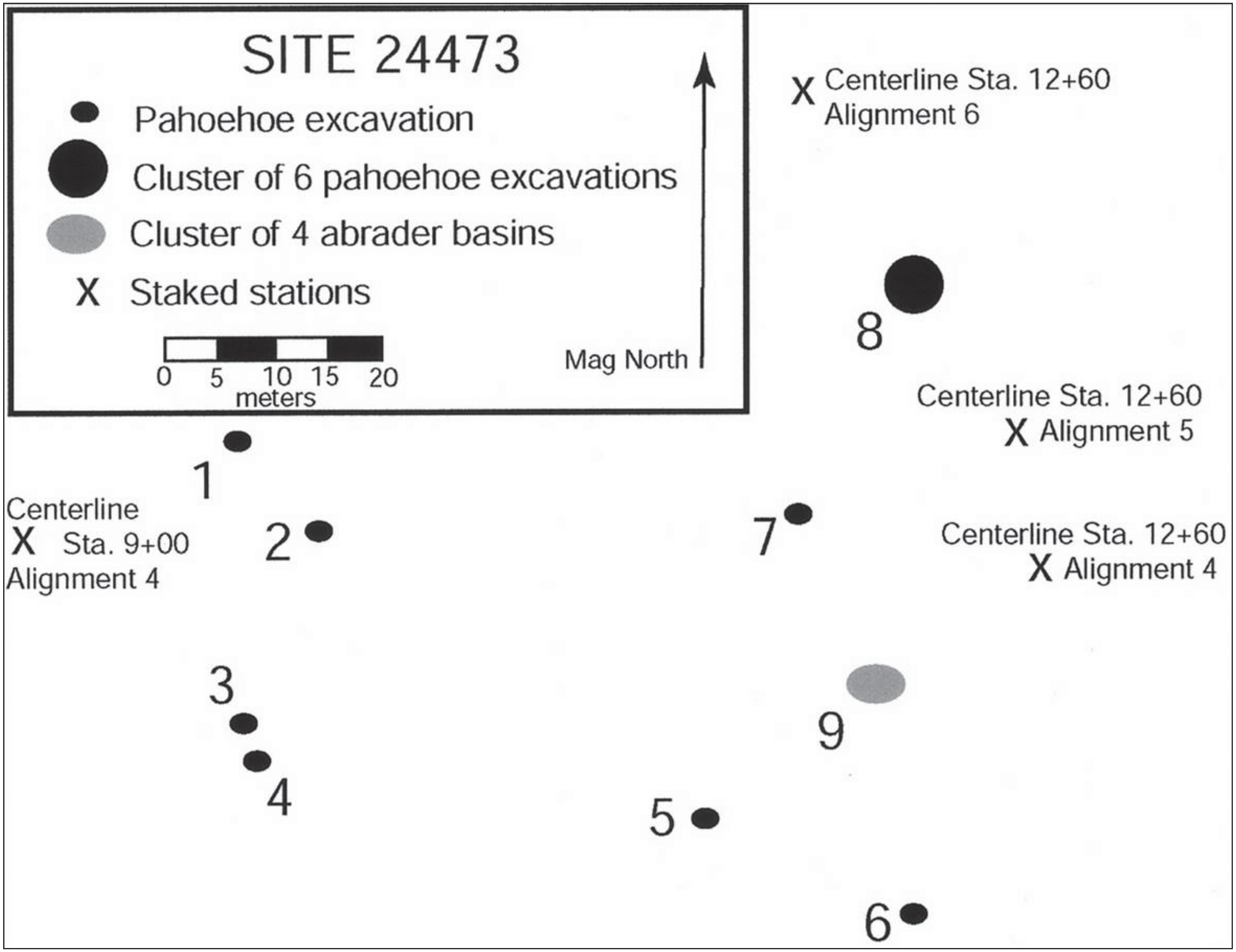

Figure 29: Site 24473 Planview Map.

LOCATION: Inside APE

DESCRIPTION: Site 24474 (see Figure 19) is a series of basalt material extraction areas in Alignment 4 between Stations 17+00 to 18+00, at an elevation of 100 feet amsl (30 m). The site is roughly 23.0 by 15.0 m (Figure 30), and is situated on a Mauna Loa lava flow dating to 3,000 to 5,000 ybp. There are five basalt extraction areas (Features 1 through 5), and a rock alignment (Feature 6). Site photographs are included in this site description and in Appendix D of this report.

Features 1 and 2

Features 1 and 2 are quarry areas on the vertical face of a bedrock ridge that is up to 3.2 m higher than the surrounding ground surface (Figure 31). A large quantity of basalt cobbles have been quarried from two locations in the vertical sides of the ridge (Features 1 and 2). Quarried pieces are scattered at the base of the ridge.

Features 3 and 4

Feature 3 consists of three oblong pits excavated along natural fissures in the black cindery pāhoehoe surface. They vary in length from 2.2 to 4.4 m and in width from 0.2 to 1.0 m. Maximum depths range from 0.2 to 0.6 m below ground surface.

Feature 4 is a pāhoehoe excavation 4.0 long by 2.2 m wide, with a depth of 0.6 m below the ground surface. Cobbles removed from the pits in Features 3 and 4 lie upside down around the pits. The excavated material is a black, highly vesicular, and rough *a'ā* containing small olivine crystals.

Feature 5

Feature 5 is an excavated blister at the top of the northern edge of the ridge. It is 0.6 m in diameter, and extends 0.9 m below ground surface. The majority of the scoriaceous basalt has been removed from the blister.

Feature 6

Feature 6 is a C-shaped enclosure located along the southwestern edge of the site. It is 2.5 by 0.5 m, and is 0.4 m in height. It is constructed of pāhoehoe cobbles stacked two to three stones wide and two to three courses high. There is no facing evident. The enclosure is interpreted as a temporary habitation, likely associated with scoriaceous basalt extraction at the site. The features at Site 24474 do not appear to have been altered and are in good condition.

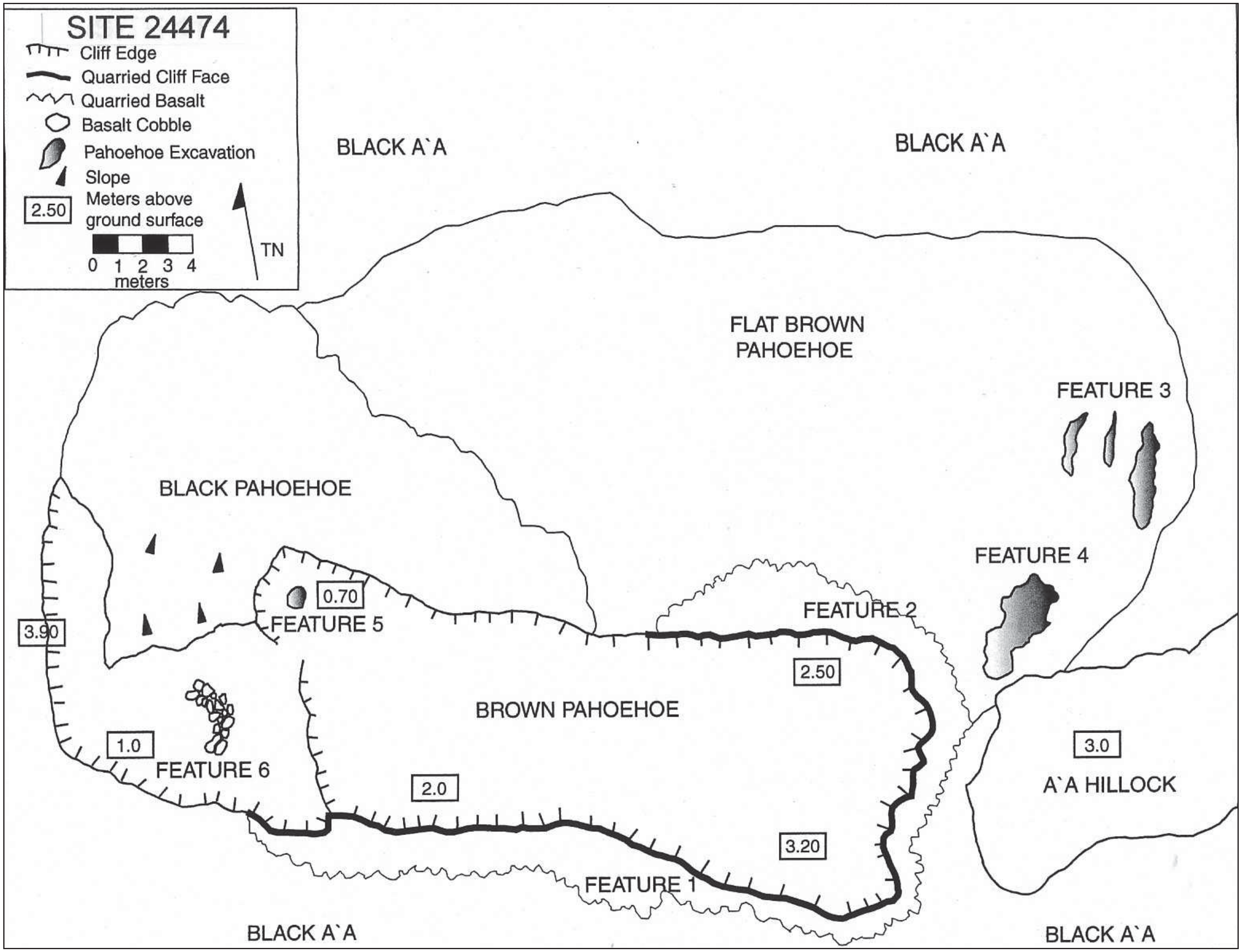

Figure 30: Site 24474 Planview Map.

Figure 31: Photograph of Site 24474, Feature 2 Looking North.

SITE 24475 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 80.0 m E/W; Width: 65.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24475 (see Figure 19) consists of six pāhoehoe excavations in Alignment 4 at Station 25+00, at an elevation of 65 feet amsl (20 m) (Table 14 and Figure 32). The excavations are in the black, ropy and cindery pāhoehoe portion of the Kanikū flow dated to 3,000 - 5,000 ybp. Blocks of pāhoehoe have been quarried from the bedrock, and placed around the rim of the quarried areas. Site 24475 does not appear to have been altered and is in good condition. Site photographs are included in Appendix D of this report.

Table 14: Site 24475 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	1.0	0.9	0.4
2	1.5	1.1	0.3
3	0.8	0.8	0.6
4	1.6	1.0	0.3
5	1.2	0.6	0.4
6	1.0	1.0	0.4
Average	1.18	0.9	0.4

SITE 24476 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 0.8 m E/W; Width: 0.3 m; Height, 0.1 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24476 (see Figure 19) is a pāhoehoe excavation in Alignment 5 at Station 24+00, at an elevation of 70 feet amsl (21 m). The excavated area is in a pāhoehoe portion of the black, ropy and cindery Kanikū flow dated from 3,000 to 5,000 ybp (Figure 33).

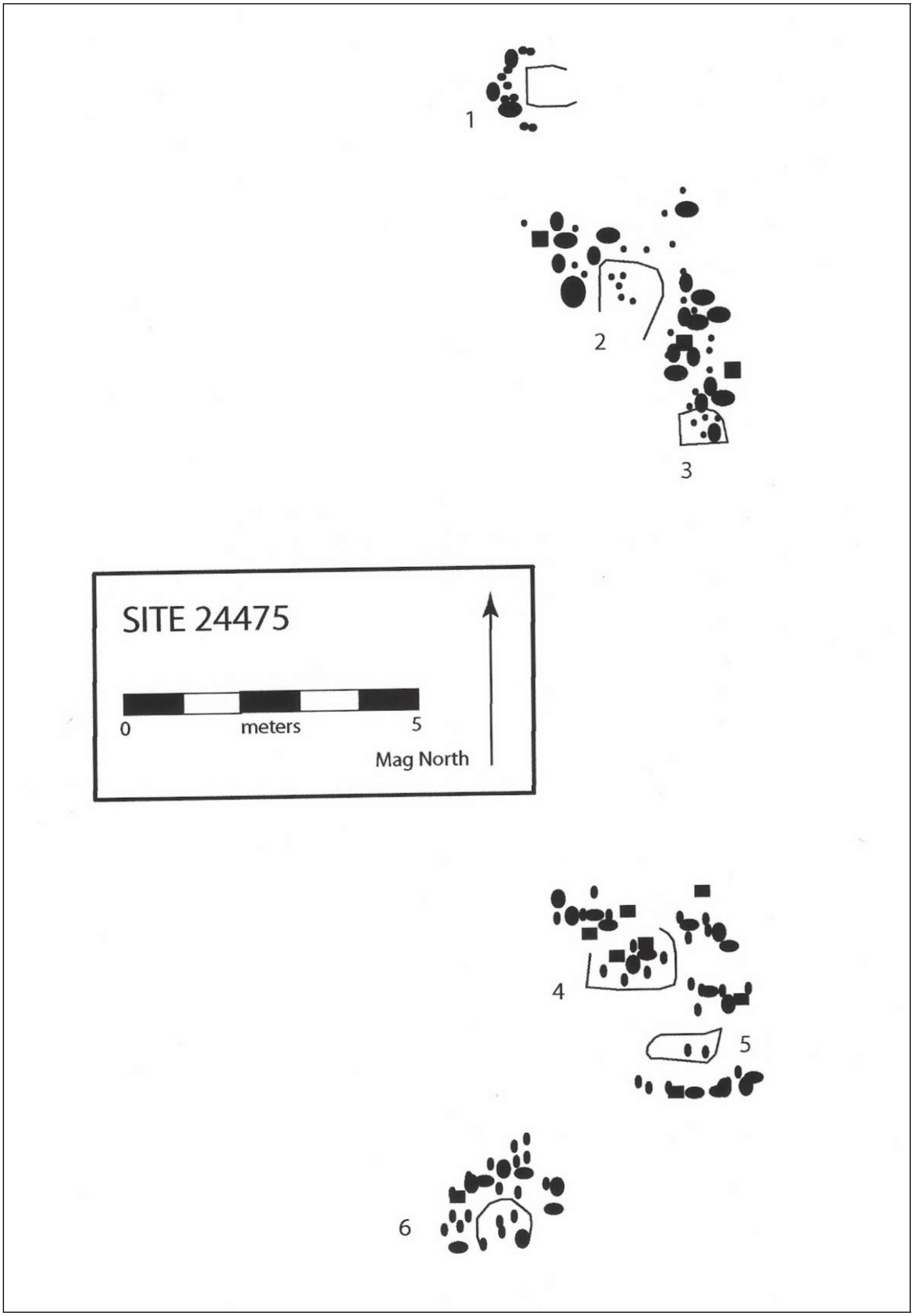

Figure 32: Site 24475. Planview Map.

Figure 33: Photograph of Site 24476 Looking South.

Blocks of pāhoehoe have been quarried from the bedrock and are scattered around the quarried area. The site is interpreted as a pāhoehoe excavation created during the extraction of scoriaceous lava, most likely for abrader production. Site 24476 does not appear to have been altered and is in good condition.

SITE 24477 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 34.0 m NW/SE; Width: 16.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24477 (see Figure 19) consists of eight pāhoehoe excavations in Alignment 5 between Stations 33+00 and 36+00, at an elevation of 100 feet amsl (30 m) (Figure 34 and Table 15).

Table 15: Site 24477 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	2.1	1.6	0.3
2	3.8	1.4	0.4
3	8.1	0.6	0.3
4	1.9	0.5	0.5
5	4.1	3.5	0.4
6	2.2	1.1	0.1
7	4.6	3.1	0.5
8	2.6	0.6	0.2
Average	3.7	1.6	0.3

Blocks of pāhoehoe have been quarried from the old, smooth, light brown Mauna Loa bedrock and placed around the rim of the quarried area. The excavated areas are relatively close together. Feature 3 is larger than most pāhoehoe excavations observed within the project area.

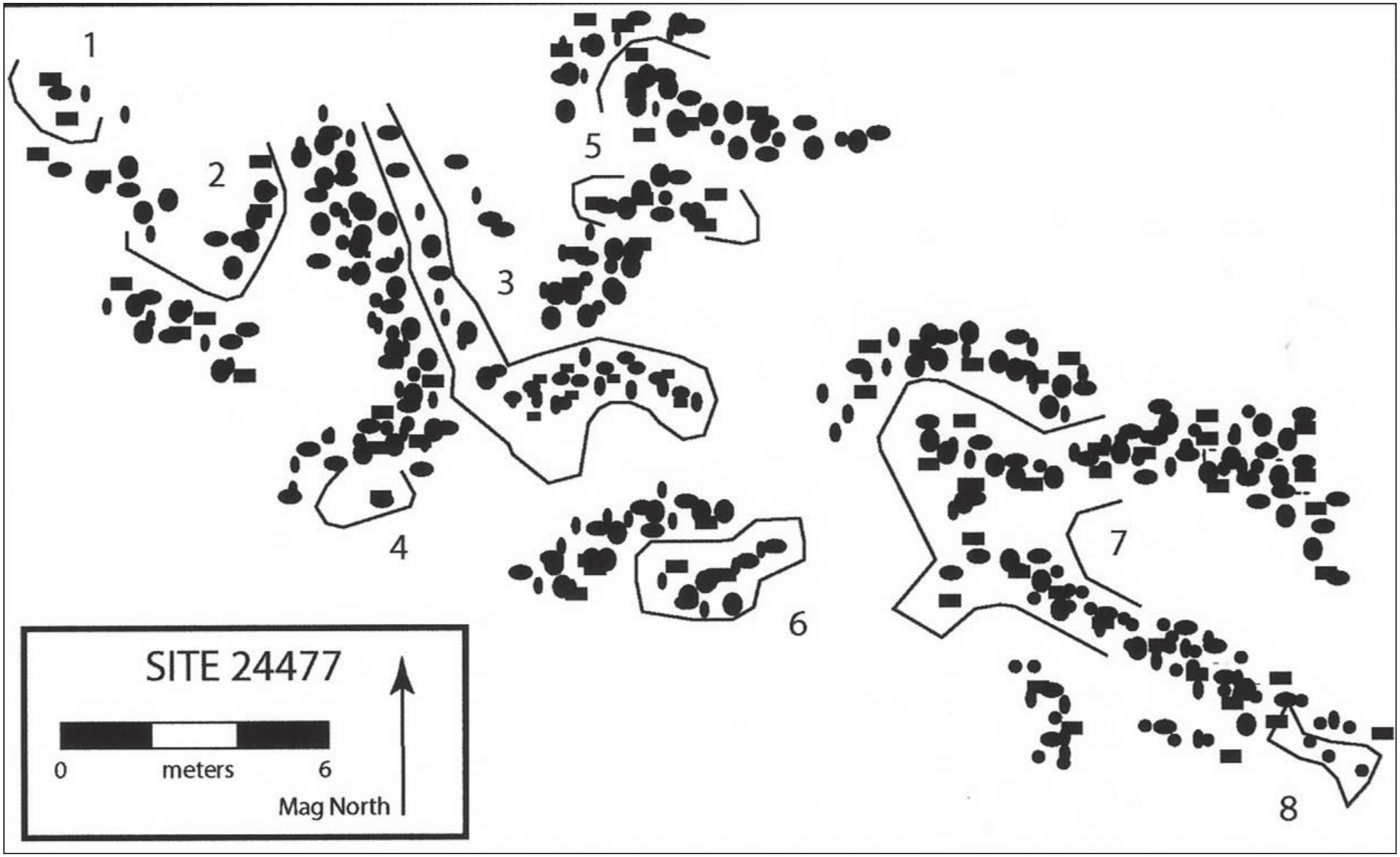

Figure 34: Site 24477 Planview Map Showing Feature (#) Locations.

AHU CAVE

The Ahu Cave is a roughly 60 m (200 ft) long cave located partially in Alignment 5 at Station 43+00, at an elevation of approximately 65 feet (20 m) amsl in the older Mauna Loa flow (see Figure 19). The opening at the southern end of the lava tube is within the Alignment 5 APE. There are cultural modifications at the entrance of the cave and there is an *ahu* at the terminus of the cave (Figure 35). The cultural modifications and the *ahu* were recorded as Site 24478.

SITE 24478 **LAVA TUBE MODIFICATIONS**

FUNCTION: Temporary Habitation, Activity Area
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 70.0 m NE/SW; Width: 6.0 m; Height, 2.3 m Max.
CONDITION: Good
INTEGRITY: Impacted by Ungulates
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: South End of Tube Under Alignment 5
DESCRIPTION: Site 24478 (see Figure 19) consists of the cultural modifications within the Ahu Cave (see Figure 35). There is a small area of rough paving (1.5 x 1.0 m) in the sink at the cave opening. There are two low alignments that span the width of the cave near the cave entrance. An *ahu* composed of some cobbles leaning against one another and some additional stacked cobbles, is situated at the interior terminus of the cave. The *ahu* is 0.3 m in diameter and 0.4 m in height. It has been constructed on a 0.7 m high pile of roof fall. Site photographs are included in Appendix D of this report.

SITE 24482 **PĀHOEHOE EXCAVATION & ROCK ALIGNMENTS**

FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 40.0 m NE/SW; Width: 20.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE

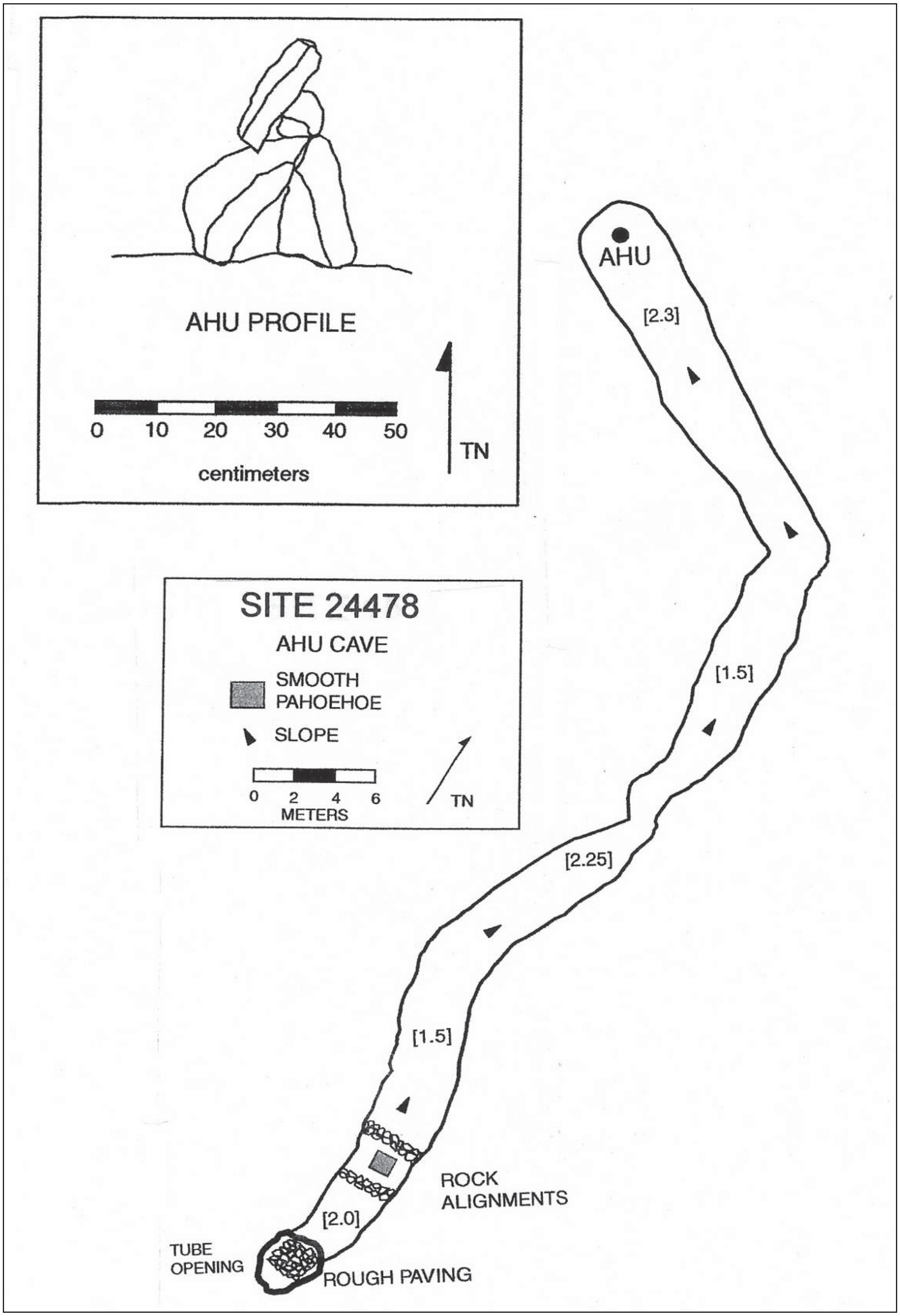

Figure 35: Ahu Cave Planview Map.

DESCRIPTION: Site 24482 (see Figure 19) consists of two stone alignments (Features 2 and 4) and two pāhoehoe excavation areas (Features 1 and 3) located on the western edge of Alignment 6 at Station 24+00, at an elevation of approximately 65 feet (20 m) amsl (Figure 36). Feature 2 alignment is approximately 20.0 m long, 1.5 m wide and two to three courses high (0.3 m). The alignment is oriented so that it is in line with trail Site 24513 where it leaves the *a'ā* and enters the smooth pāhoehoe at petroglyph Site 24488. It is possible that the alignment represents a trail pathway marker. The other alignment (Feature 4) is against higher rough ropey pāhoehoe, and could be a 5.0 m long ramp from the lower terrain to a slightly higher terrain (1.5 m). Feature 1 pāhoehoe excavation is 0.5 by 0.5 m in diameter and 0 .4 m deep Feature 3 pāhoehoe excavations is 0.8 by 0.5 m in diameter and 0.3 m deep. Site 24482 does not appear to have been altered and is in good condition.

SITE 24483 PĀHOEHOE EXCAVATION

FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 11.0 m NE/SW; Width: 3.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Inside APE
DESCRIPTION: Site 24483 (see Figure 19) consists of a series of eight pāhoehoe excavations along the interface of smooth and rough pāhoehoe (Table 16 and Figure 37) on the northern edge of the combined alignments at Station 9+00, at an elevation of approximately 60 feet (18 m) amsl. The smooth pāhoehoe has been broken into, and the broken pieces have been left near the perimeter of the opened areas (Figure 38), which suggests that this activity was designed to locate and collect rock with a specific quality to the underside, and may account for the majority of the rocks being left at the site. The quality that has been selected for is not entirely understood, as the pieces that satisfy that criteria have been taken away.

Pāhoehoe excavations are generally not uniform, or of any particular size. At this site, however, they are all situated at the interface of the smooth and rough pāhoehoe and are somewhat similar in size. Site 24483 does not appear to have been altered and is in good condition. Site photographs are included in this site description and in Appendix D of this report.

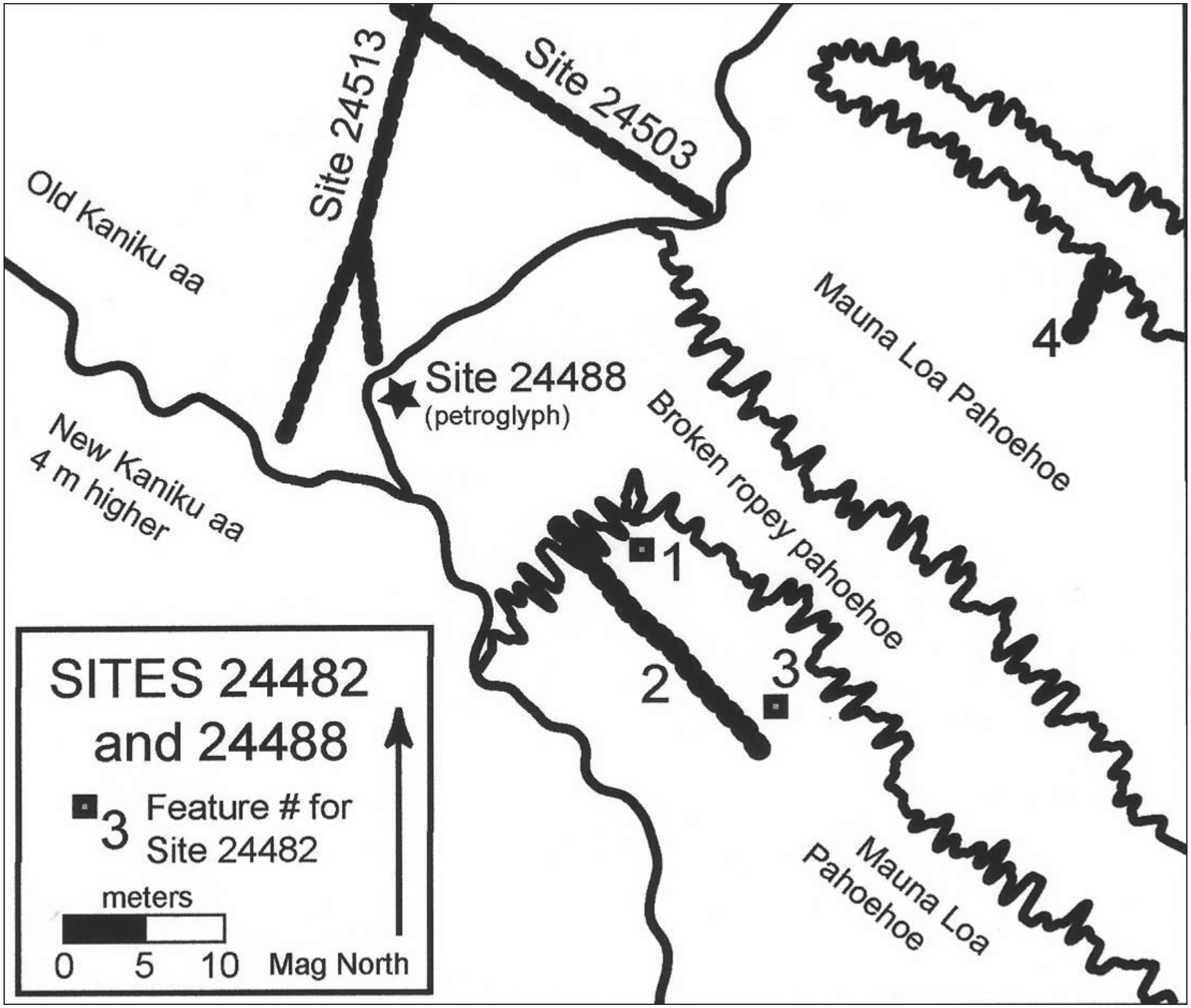

Figure 36: Sites 24482 and 24488 Planview Map.

Table 16: Site 24483 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	1.6	2.0	0.6
2	0.5	0.6	0.4
3	0.8	0.3	0.7
4	0.7	0.3	0.6
5	0.7	0.7	0.5
6	0.8	0.4	0.3
7	1.0	0.4	0.4
8	0.7	0.3	0.3
Average	0.85	0.63	0.48

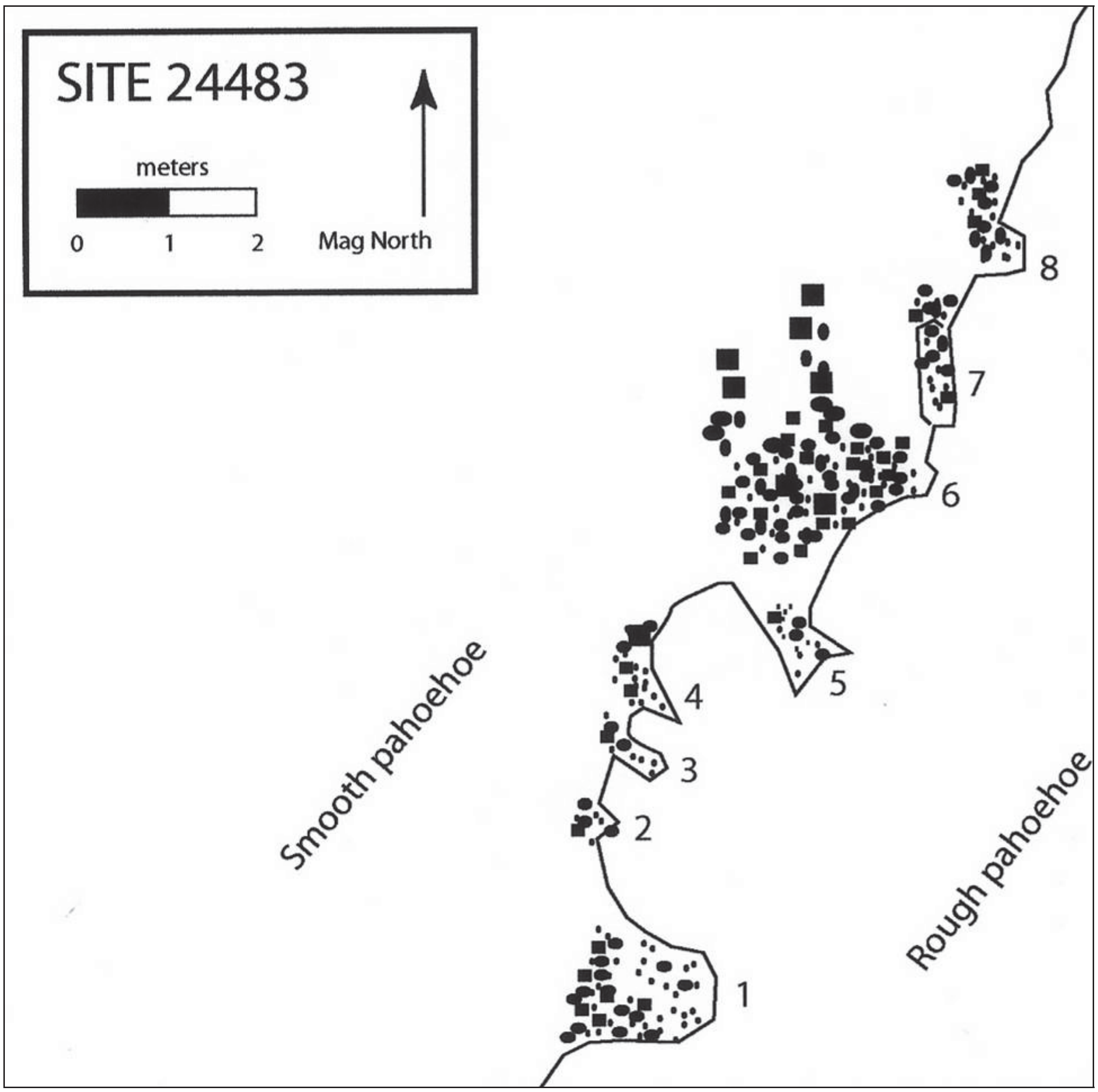

Figure 37: Site 24483 Planview Map.

Figure 38: Photograph of Site 24483 Features 6, 7, and 8 (Right to Left) Looking East.

SITE 24484 **RIDGE QUARRY**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 10.0 m NE/SW; Width: 5.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24484 (see Figure 19) is an extraction area located on a ridge west of Alignment 6 at Station 31+00, at an elevation of 123 feet amsl (37.5 m). An up thrust of dark brown basalt dating from 3,000 to 5,000 ybp has been quarried, with pieces of basalt removed within a 10.0 by 5.0 m area (Figure 39). Site 24484 does not appear to have been altered and is in good condition. Site photographs are included in Appendix D of this report.

SITE 24485 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 10.0 m NE/SW; Width: 5.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24485 (see Figure 19) consists of an area with eight pāhoehoe excavations, to the north of Alignment 4 at Station 47+00 (Figure 40). These pāhoehoe excavations are some of the largest in the project area (Table 17), several of which being over 4.0 m long. Basalt pieces removed from the pits have been placed to the sides of each area. The majority of the excavated pieces have been placed upside down. Site 24485 does not appear to have been altered and is in good condition.

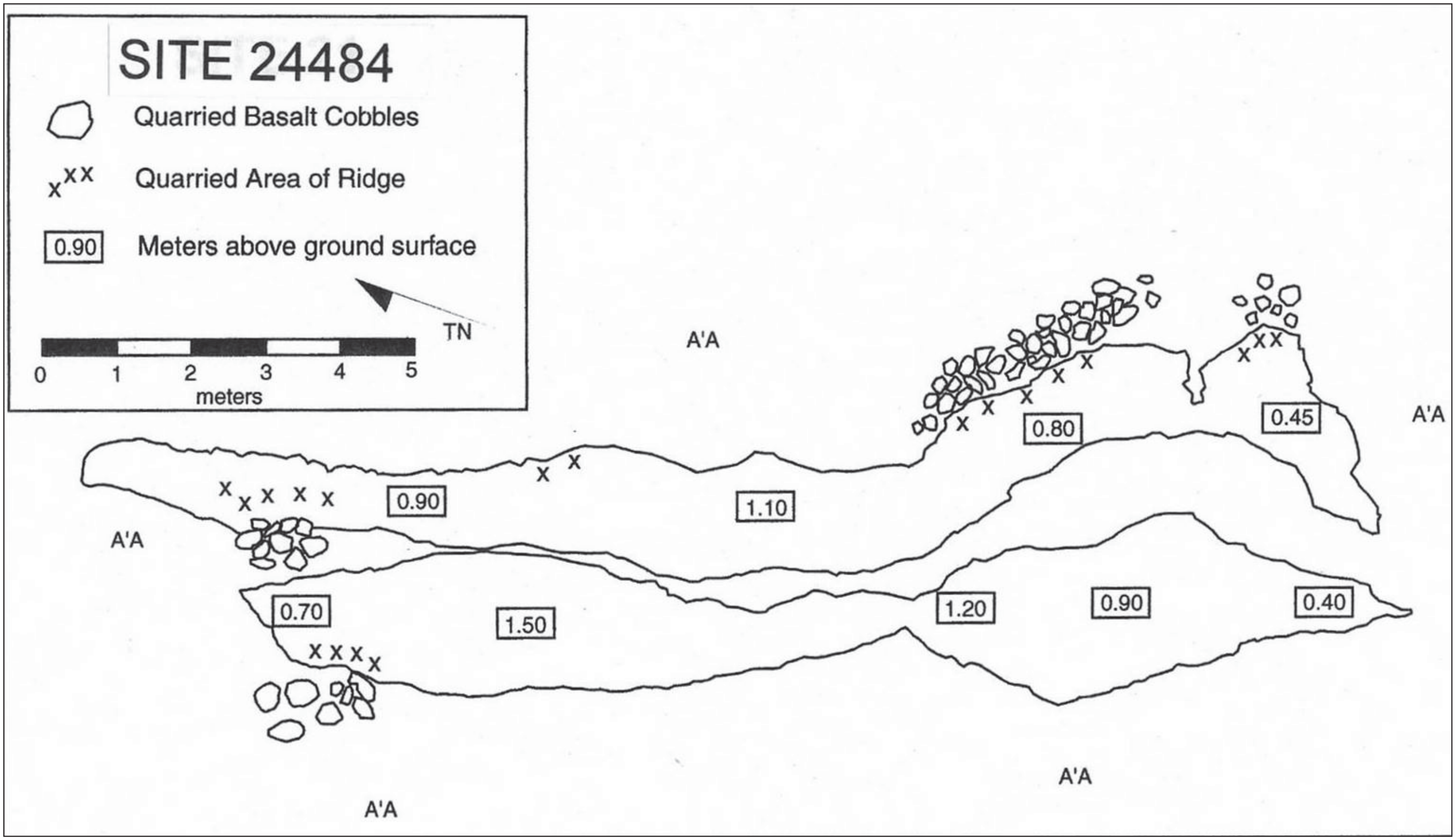

Figure 39: Site 24484 Planview Map.

Figure 40: Site 24485 Planview Map.

Table 17: Site 24485 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	6.2	3.1	0.4
2	4.3	2.7	0.5
3	5.8	1.4	0.5
4	6.7	4.4	0.3
5	9.5	3.4	0.3
6	1.3	1.2	0.3
7	2.5	1.3	0.3
8	1.0	1.0	0.3
Average	4.66	2.31	0.36

CACHE CAVE

The Cache Cave is situated between Alignments 4 and 5 near Station 45+00, and is outside of the APE (see Figure 19). The cave opening connects to two small tubes, neither of which have been modified (Figure 41). The western tube (down slope) is approximately 45.0 m in length, and up to 12.0 m wide, with a maximum height of 2.0 m. Scattered pieces of charred material and burnt wood indicate that people passed through the cave, however, there are no material concentrations or features. The eastern tube is Site 24486 and is described below. There is a blister approximately 0.3 m to the north of the Cache Cave opening. It has a small opening (approximately 1.0 x 1.0 m) which is the only entrance to the blister. The blister interior is 10.0 m in length and 4.5 m wide. There was no cultural material observed within the blister.

SITE 24486 **MATERIALS CACHE**

FUNCTION: Storage

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 0.5 m diameter; 0.1 m Max.

CONDITION: Good

INTEGRITY: Some Deterioration

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24486 (see Figure 19) is a cache of materials placed in the eastern portion of the Cache Cave (Figure 41). The tube is 18.0 by 13.0 m with a maximum height of 1.5 m. Site photographs are included in Appendix D of this report. The site is an artifact concentration along the south wall of the cave (Table 18). add labels to map .. ?

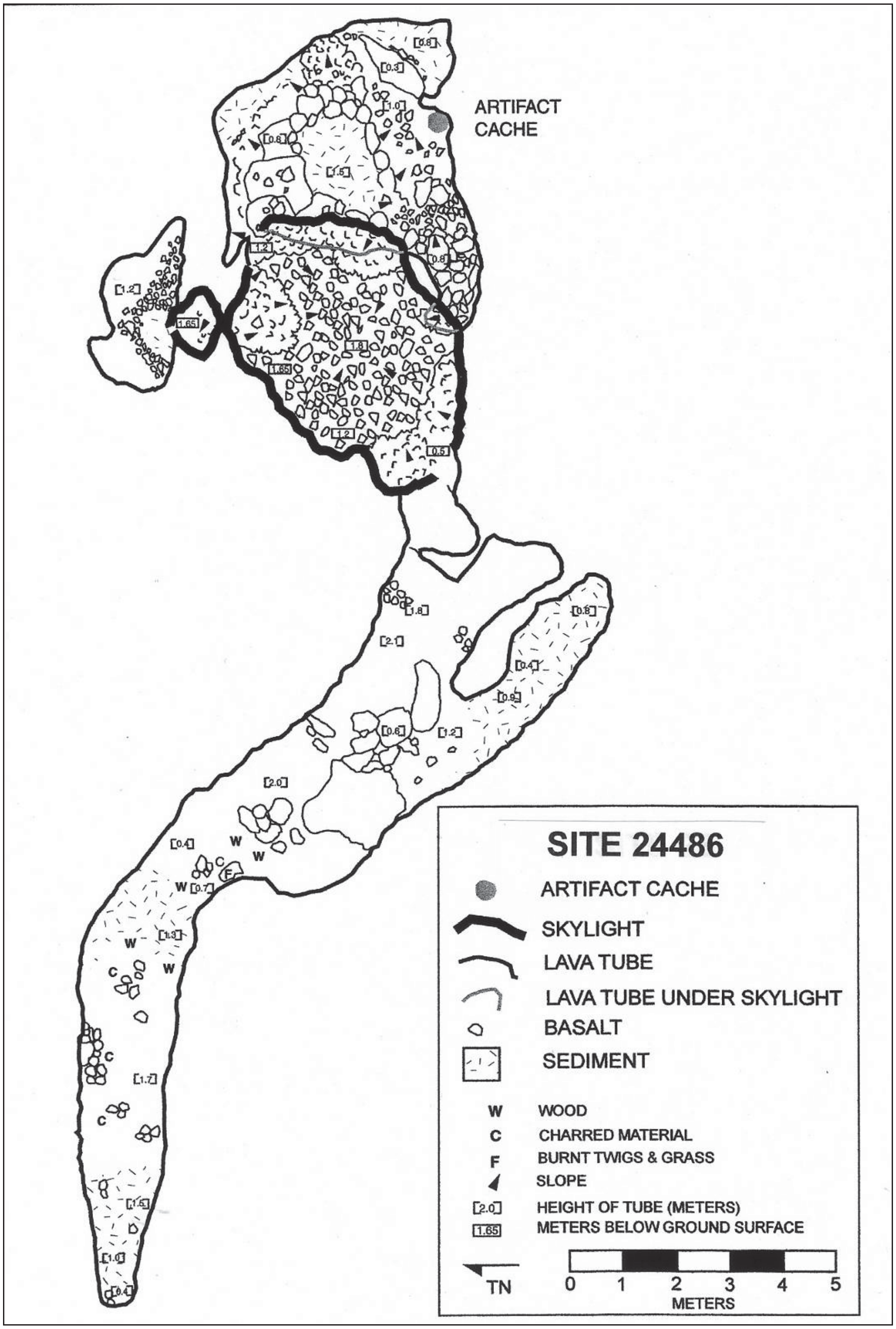

Figure 41: Cache Cave and Site 24486 Planview Map.

Table 18: Inventory of Site 24486 Artifacts.

Artifact	Raw material	Modifications	Grams
Gourd debris	Gourd fiber	None	3.0
Octopus lure	Cypraeidae	2 drilled holes, 1 side of interior reduced	63.0
Octopus lure	Cypraeidae	1 drilled hole, 1 side of interior reduced	15.1
Octopus lure toggle	Unknown mammal	Cut, drilled, shaped	0.8
Octopus lure toggle	Unknown mammal	Cut, drilled, shaped	1.1
Hook blank	Sus scrofa, Tibia	Broken proximal end, shaft cuts	19.3
Hook blank	Medium mammal limb	Broken proximal end, shaft cuts	9.3
Hook blank	Medium mammal limb	Shaft cuts	3.5
Fish hook shank	Unknown mammal	Cut, shaped	5.3
Unknown	Sus scrofa, Left femur	Both ends broken off	42.0
Unknown	Sus scrofa, Right femur	Proximal end broken off	49.1
Unknown	Sus scrofa, Right femur	Both ends broken off	41.0
Unknown	Sus scrofa, Left humerus	Both ends broken off	42.7
Unknown	Sus scrofa, Left humerus	Both ends broken off	23.4
Unknown	Sus scrofa, Right humerus	Both ends broken off	45.3
Unknown	Sus scrofa, Left radius	Proximal end broken off	17.8
Unknown	Sus scrofa, Right radius	Proximal end broken off	18.9
Unknown	Sus scrofa, Right radius	Proximal end broken off	14.3
Unknown	Sus scrofa, Right ulna	Distal end broken off	23.9
Unknown	Sus scrofa, Metapodial	None	5.0
Unknown	Sus scrofa, Metapodial	None	5.3
Unknown	Sus scrofa, Left scapula	Broken distal margin, cut spinal process	43.1
Unknown	Anal spine of Holocentrid	Distal end break and polish	1.3
Unknown	Medium procellariid, Right humerus	Breakage to both ends	2.1
Unknown	Medium procellariid, Right humerus	Breakage to both ends	2.0
Unknown	Tellinidae tellina sp	None	5.5
Unknown	Tellinidae tellina sp	None (not a bivalve pair with Artifact #3)	6.0

A cluster of artifacts rest on decomposing fibers that appear to be the remains of a gourd. This material concentration was hidden under a protruding edge of the blister ceiling.

Several of the artifacts in this group are clearly fishing related. Most of the remaining materials in the cache have been modified in some way, although perhaps still in the beginning stages of modification and closer to raw material. The modifications do not allow for conclusive determination as to how these items were used. The context in which they were found, however, which is in direct association with fishing gear, suggests that they may be related to the manufacture and/or use of fishing equipment.

There are four pieces of *heʻe* lure, representing a minimum of two lure sets. There is also a complete fish hook shank made from a small piece of animal bone. Two bones have been cut and appear to be in the initial stages of fish hook manufacture. There are 13 pig bones, representing a minimum of two individuals. All of the larger bones have been modified. The limb bones have at least one broken end. It is not clear as to how removal of the bone end relates to fish hook manufacture. It is possible that the marrow of these bones were first consumed, and that these pieces were selected for potential hook production. The quantity of bone suggests that the other bones present in this grouping are also from the same minimum of two pigs.

The function of the *Holocentriid* spine, *procellariid humeri* with broken ends, and the two unmodified *Tellinidae* are not known. They may be part of a manufacturing tool kit, raw material to be manufactured into fishing gear, or have some unrelated function. The artifacts are slightly altered by weathering and are in good condition.

SITE 24487	**PĀHOEHOE EXCAVATION & C-SHAPE ENCLOSURE**
FUNCTION:	Resource Extraction and Resting Location
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 18.0 m N/S; Width: 18.0 m; Height, 0.3 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Inside APE

DESCRIPTION: Site 24487 (see Figure 19) consists of two pāhoehoe excavations (Features 1 and 2) and a C-shaped enclosure (Feature 3) which are situated on the northern edge of Alignment 4 at Station 27+00, at an elevation of approximately 60 feet (18 m) amsl (Figure

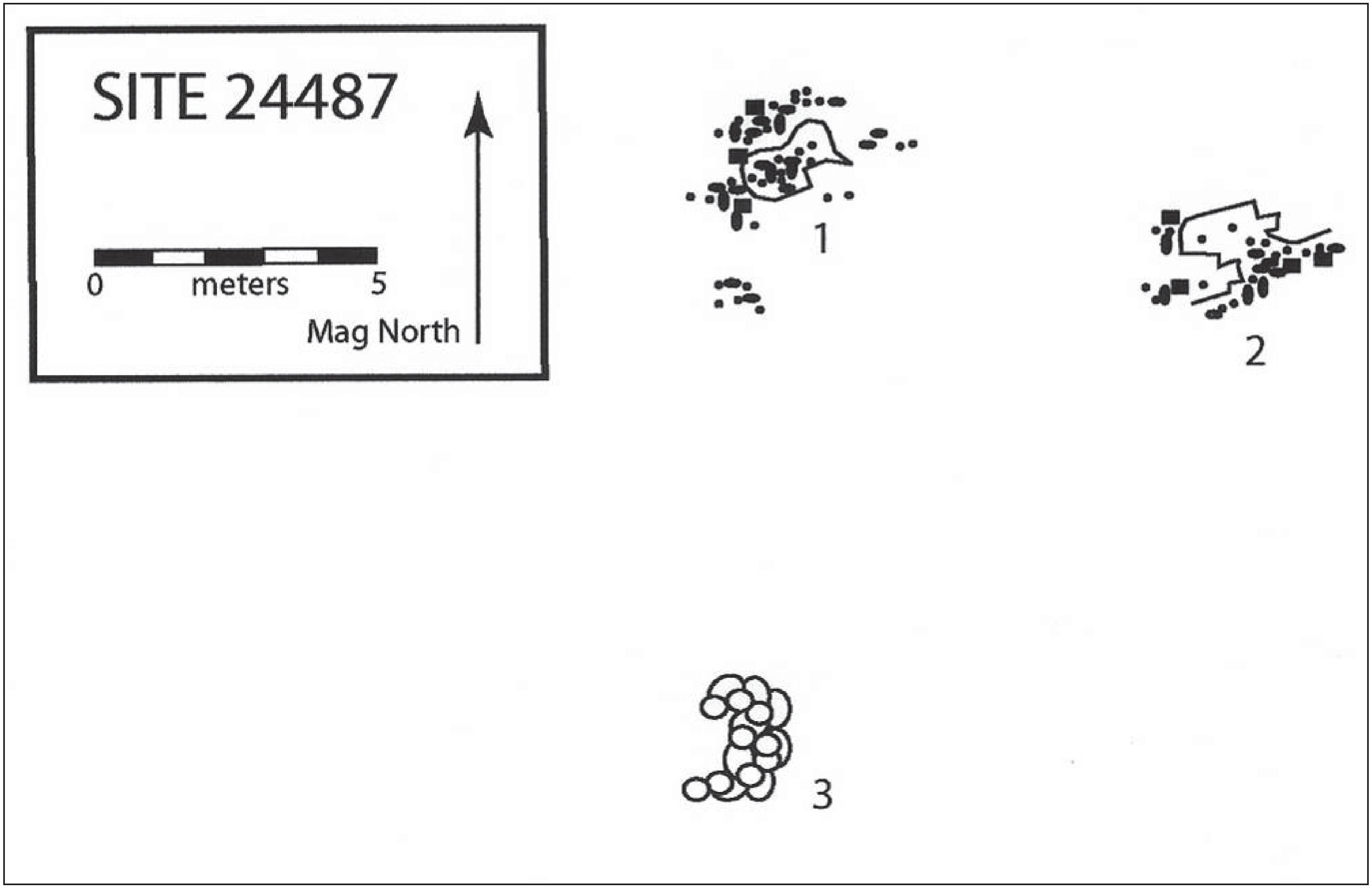

Figure 42: Site 24487 Planview Map.

42). Feature 1, a pāhoehoe excavation, is 2.1 by 1.0 m, and 0.4 m deep. Feature 2, a pāhoehoe excavation, is 2.1 by 0.9 m, and 0.4m deep. Feature 3, a C-shaped enclosure, is 2.3 by 1.6 m, with a maximum height of 0.5 m.XXX

SITE 24488 **PETROGLYPH**
FUNCTION: Marker/Art
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 0.24 m N/S; Width: 0.22 m; Height, 0.0 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24488 (see Figure 19) is an anthropomorphic petroglyph which is located to the northwest of the APE in Alignment 6 at Station 25+00, at an elevation of 65 feet amsl (20 m). The petroglyph is situated on a gently sloping weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow. A younger Mauna Loa (3,000-5,000 ybp) black Kanikū *a'ā* flow is to the west. Vegetation for the most part is nonexistent, with less than 1% sedimentary deposition on the ground surface at the site.

The image is a human figure 0.24 m in height, (321° from foot to head) by 0.22 m wide (Figure 43 and Figure 44). The figure's legs are turned upwards at the knees with the bottoms of the feet pointing towards the bottoms of the down-turned arms. The petroglyph is roughly 1.0 m south of trail Sites 24503 and 24513. The proximity of the petroglyph to the trails, and the form of the image which depicts a "running" person, reinforces the notion that it is directly associated with the movement of people on the trail. Site 24488 does not appear to have been altered and is in good condition. Messenger .. ?

SITE 24489 **PĀHOEHOE EXCAVATION**
FUNCTION: Resource Extraction
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 14.0 m N/S; Width: 5.0 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None

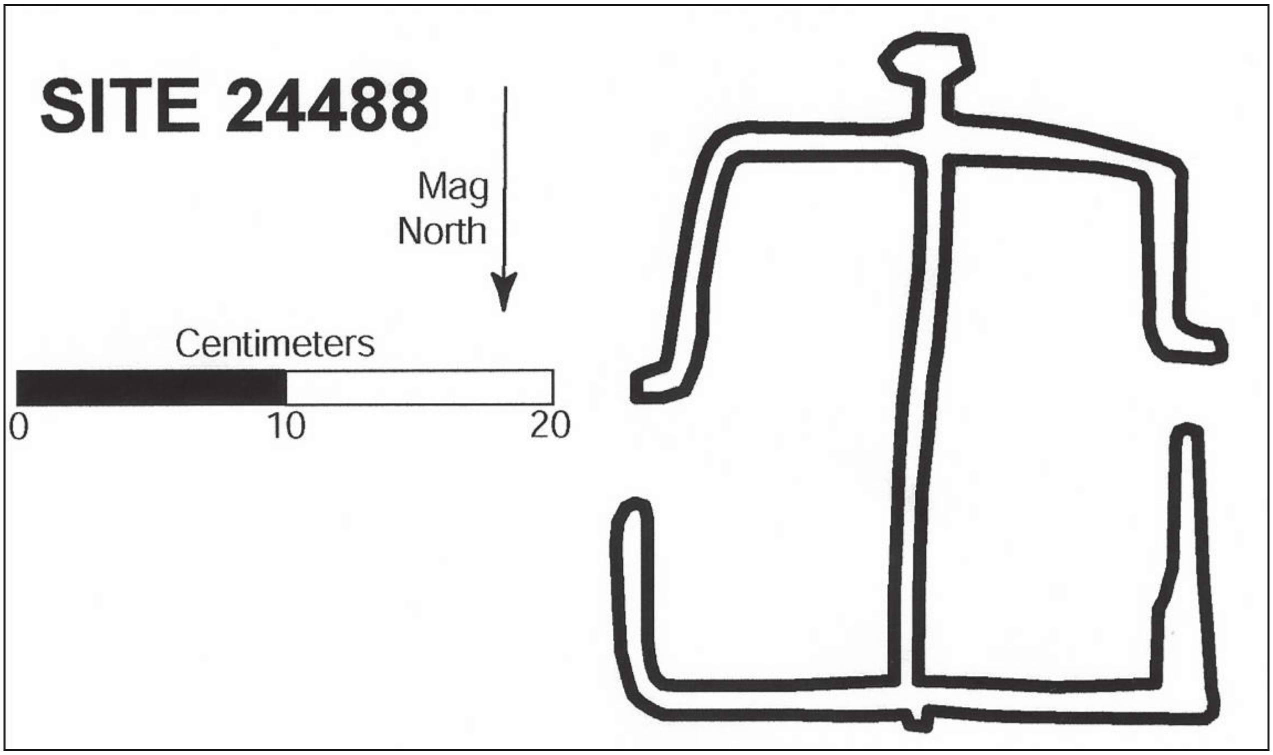

Figure 43: Site 24488 Sketch of Petroglyph.

Figure 44: Photograph of Site 24488 Petroglyph Looking Southeast.

LOCATION: Inside APE

DESCRIPTION: Site 24489 (see Figure 19) consists of three pāhoehoe excavations which are located on the northern edge of Alignment 4 at Station 44+00, at an elevation of approximately 190 feet (58 m) amsl (Figure 45 and Table 19). Site 24489 does not appear to have been altered and is in good condition. Dimensions .. ?

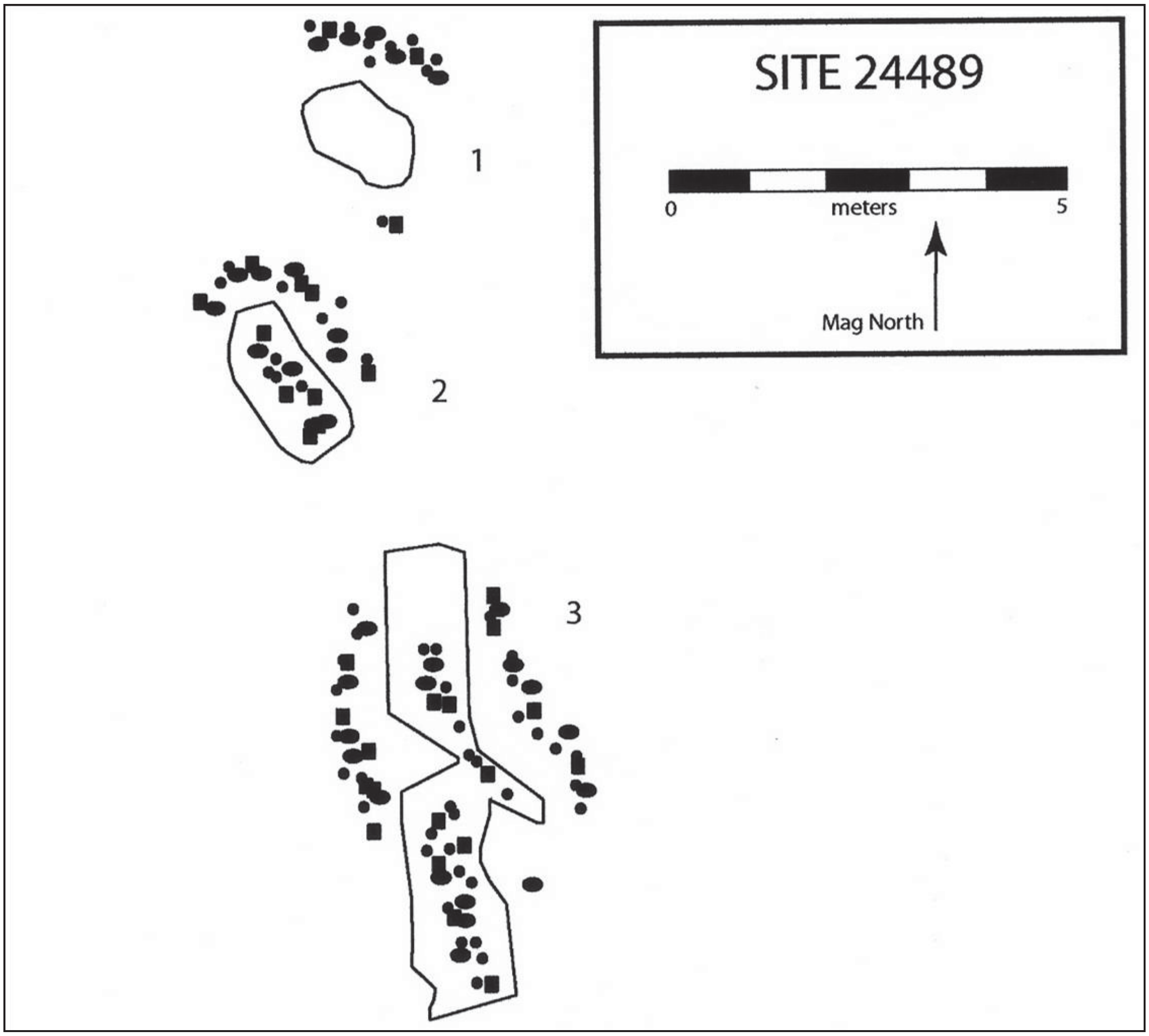

Figure 45: Site 24489 Planview Map.

Table 19: Site 24489 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	1.5	1.0	0.4
2	2.1	1.0	0.4
3	5.8	1.3	0.6
Average	3.1	1.1	0.5

SITE 24490 **AHU**

FUNCTION: Marker

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 0.9 m in Diameter; Height, 0.6 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24490 (see Figure 19) consists of a single *ahu* on the ground surface to the north of Alignment 5 at Station 44+00, and is out of the project area (Figure 46). It is 5.8 m to the south of the western opening of the Refuge Cave. The *ahu* is 0.9 m in diameter, with a maximum height of 0.6 m. A length of bamboo (approximately 1.0 m), holds up a rusted can and rests against the western base of the *ahu*. The *ahu* may be a marker for the western opening to the Refuge Cave. Site 24490 does not appear to have been altered and is in good condition. Figure Order

SITE 24491 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 12.0 m NW/SE; Width: 6.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24491 (see Figure 19) consists of a group of three pāhoehoe excavations within a 16.0 by 7.0 m area (Table 20 and Figure 47) to the north of Alignment 4 at Station 47+00. Basalt pieces have been excavated from the area and paced along the sides of each pit. The majority of the excavated pieces are upside down. Site 24491 does not appear to have been altered and is in good condition.

Figure Order

Table 20: Site 24491 Feature Dimensions.

Feature	Length (m)	Width (m)	Depth (m)
1	1.6	1.4	0.4
2	2.8	1.5	0.4
3	2.0	1.2	0.3
Average	2.13	1.37	0.37

SITE 24492 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 5.5 m N/S; Width: 5.5 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24492 (see Figure 19) consists of a single pāhoehoe excavation on the northern edge of Alignment 4 at Station 46+00, at an elevation of approximately 200 feet (61 m) amsl. It is 4.2 by 1.8 m, with a maximum depth of 0.4 m (Figure 48). Site 24492 does not appear to have been altered and is in good condition.

SITE 24495 **RIDGE QUARRY**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 80.0 m E/W; Width: 65.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24495 (see Figure 19) is a ridge quarry which is located along a large bedrock outcrop on the Kanikū lava flow in Alignment 5 at 57+00, at an elevation of 220 feet amsl (67 m). The outcrop is roughly 40.0 m in length and 20.0 m wide, with a maximum height of 6.0 m above the surrounding ground surface (Figure 49). A large area of exfoliated, dense vesicular basalt on the west face of the outcrop, as well as areas to the north and south,

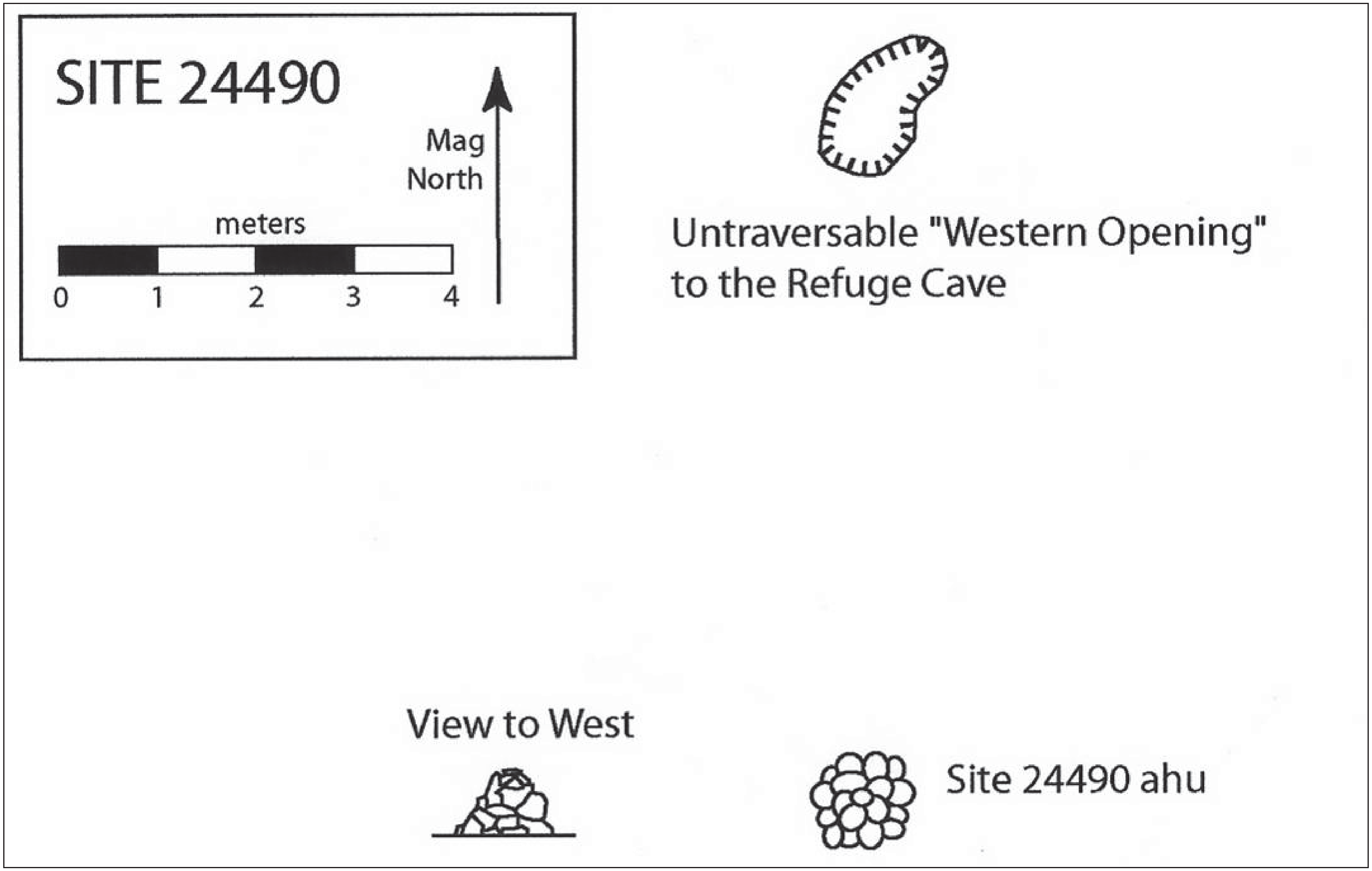

Figure 46: Site 24490 Planview Map.

Figure 47: Site 24491 Planview Map.

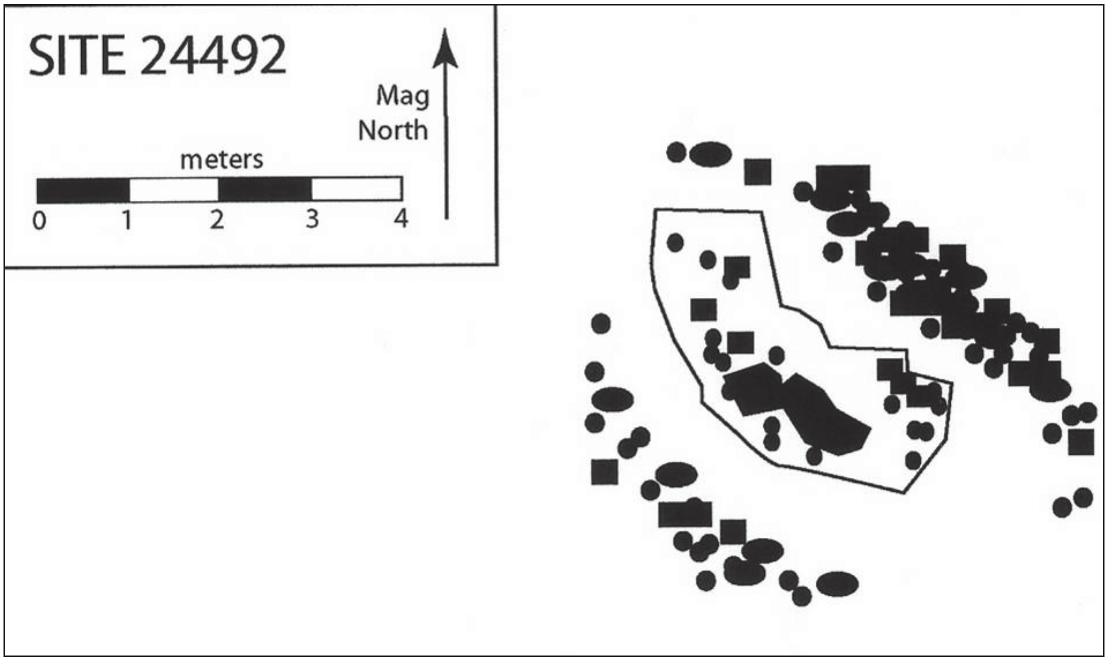

Figure 48: Site 24492 Planview Map.

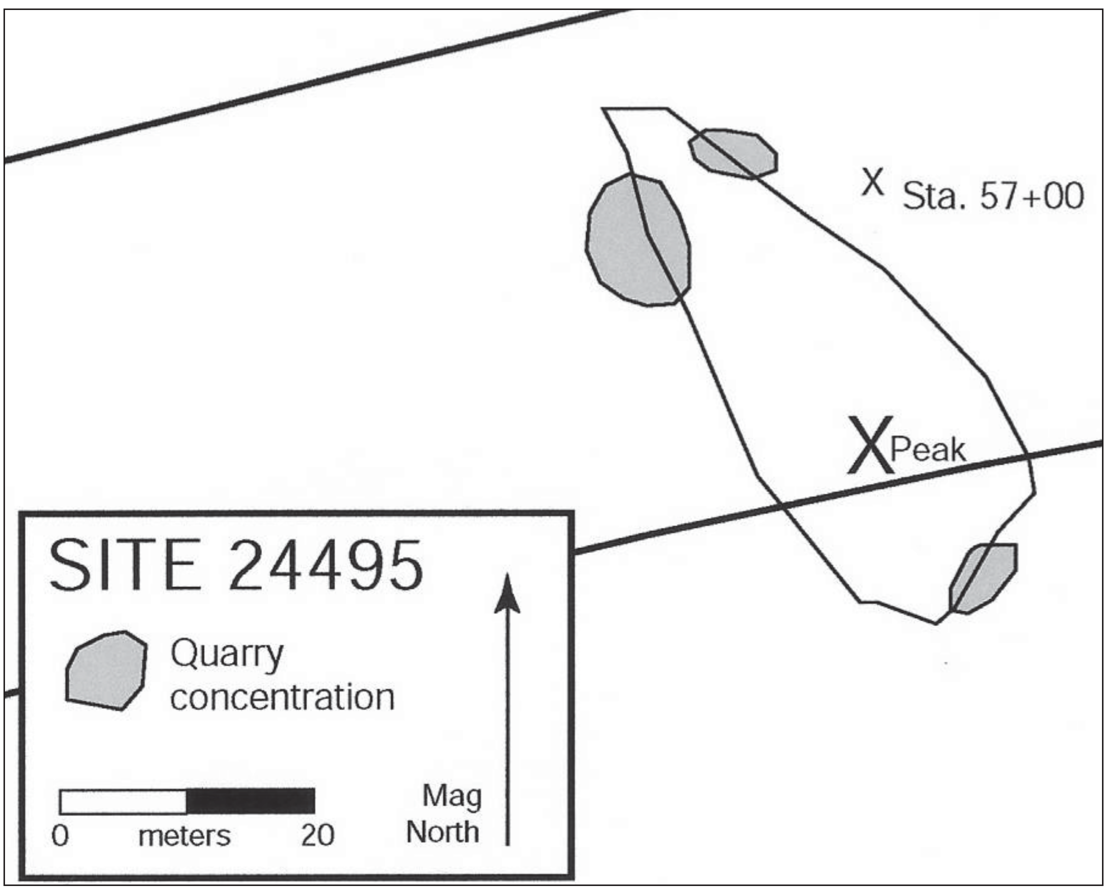

Figure 49: Site 24495 Planview Map.

appear to have been used for resource extraction . Numerous pieces of basalt have been broken away from the surface around the perimeter of the outcrop, as well.

There is no obvious trail to the area, even though it is situated within the difficult to traverse Kanikū flow. However, it does appear to be directly aligned with trail Site 24515. It is possible that this very high ridge, higher than any other prominence for hectares in any direction, also served as an "*ahu*", or trail marker, similar to that of any stacked stone *ahu* . Also, traffic to this area may have been infrequent, precluding the need to build a trail here. Site 24495 does not appear to have been altered and is in good condition.

SITE 24498 **THREE AHU**

FUNCTION: Marker

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 34.0 m NE/SW; Width: 3.0 m; Height, 0.8 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24498 (see Figure 19) is a series of three *ahu* situated on an alluvial/colluvial surface, at the base of a ravine that may represent a collapsed lava tube from the younger Kanikū flow (Table 21 and Figure 50). The site is 65.0 m to the north of Alignment 6 at Station 60+00, at an elevation of 77 feet (23 m). The *ahu* are at the northwestern terminus of trail Site 24499 where it descends 5.0 m off of the Kanikū ʻaʻā flow. The location and orientation of the *ahu* , which align with trail Site 24499, suggest that they mark the direction of the trail. Site 24494 does not appear to have been altered and is in good condition.

Table 21: Site 24498 Feature Dimensions.

Feature	Length (m)	Width (m)	Height (m)
1	2.1	2.0	0.7
2	3.1	2.3	0.8
3	2.8	2.7	0.5
Average	2.7	2.3	0.7

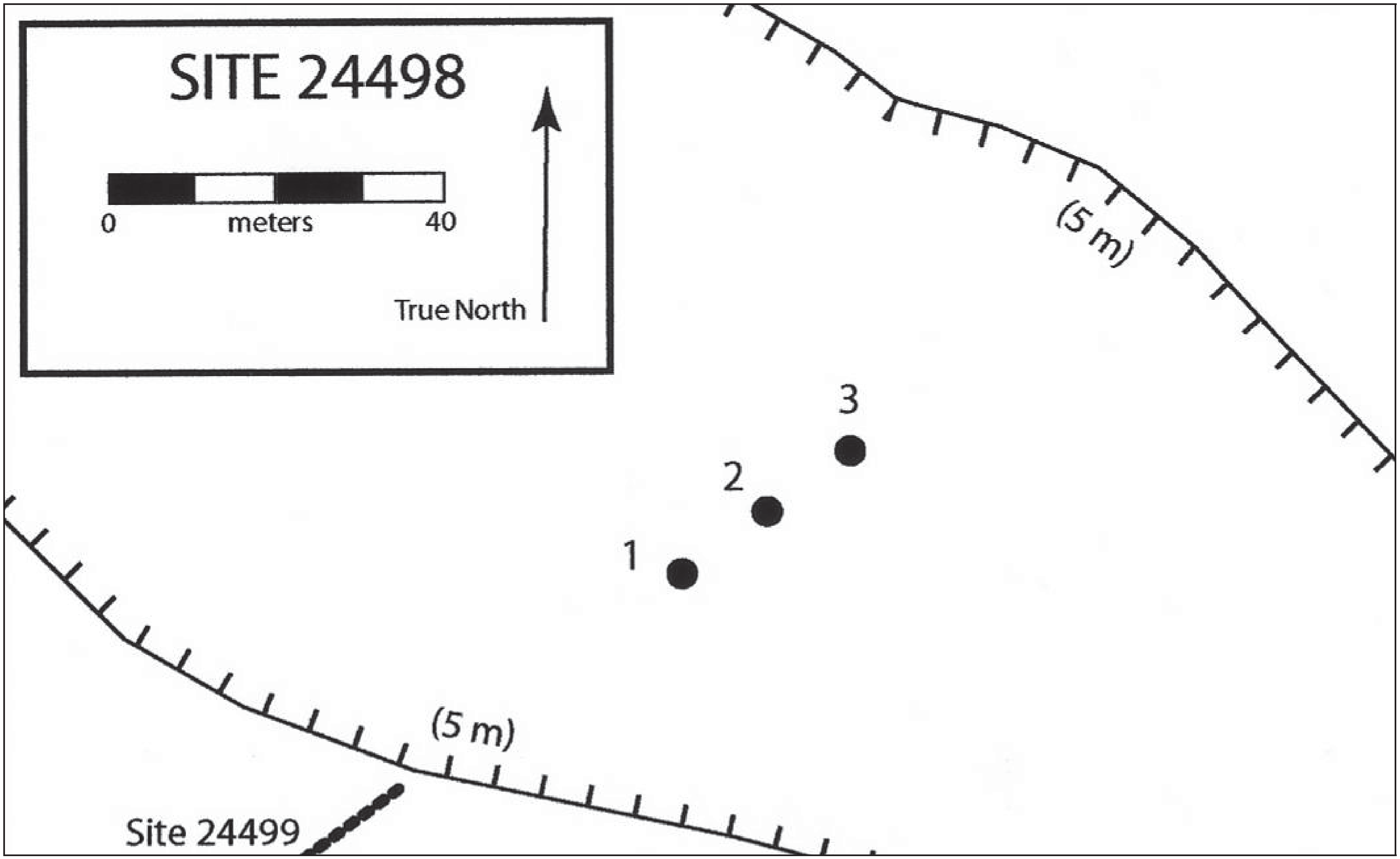

Figure 50: Site 24498 Planview Map.

SITE 24499 **TRAIL**

FUNCTION: Transportation

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 650.0 m NE/SW; Width: 1.0 m; Height, 0.8 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24499 is a trail on the Kanikū flow north of Alignment 6 which extends from Station 37+00 to 60+00, at an elevation of 140 feet (43 m) (see Figure 19). The trail in the rough Kanikū ʻaʻā is manifest as an approximately 1.0 m wide meandering pathway (Figure 51). Larger pieces of lava have been moved aside to form the pathway. The Kanikū flow in this location is brittle, and walking is sufficient to break up the lava into smaller pieces. The combination of the movement of larger pieces of rock and pedestrian use has worn a recognizable pathway into the surface, by creating pieces of basalt smaller than 20.0 cm. The relatively uniform condition of the rocks which compose the pathway is a byproduct of use, rather than the result of the importation of "paving" rocks.

The pathway meanders with the undulating terrain. There are several places where larger stones have been brought in to fill crevices within the pathway. The trail is only evident on the Kanikū flow. There is no apparent surface modification for the trail in the older flows to the north, although there are three *ahu* (Site 24498) near the base of the Kanikū flow. There are also no apparent surface modifications for the trail in the older flows to the south, a region where many trails converge.

ISOLATED ARTIFACT FINDS

A basalt core was observed near trail Site 24499 north of Alignment 6 at Station 42+00 (see Figure 19). The core was of a notably different material than the surrounding ʻaʻā, and appeared similar to pieces of broken basalt observed at ridge quarries in the APE. The piece was probably dropped during transport from a quarry to a manufacturing area.

Figure 51: Photograph of Site 24499 Trail Surface Looking Northeast.

Two large, unmodified ‘*opihi* shells were observed approximately 40.0 m inland from trail Site 24499 (perpendicular to Alignment 6 at Station 41+00). There was no trail apparent at or near the ‘*opihi* location. The shells may have been discarded soon after the associated food contained within them was consumed. The presence of ‘*opihi* shells on the Kanikū flow, where there is no apparent trail, provides support for the proposition that people were moving off of the main and well worn trails into the rugged terrain in an unrestricted fashion, to explore for and procure particular basalt pieces.

SITE 24503	**TRAIL**
FUNCTION:	Transportation
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 600.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION:	Good
INTEGRITY:	Impacted by Powerline Road
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Partially in Alignment 4

DESCRIPTION: Site 24503 is an approximately 600.0 m segment of trail, which exists primarily to the north of Alignment 4 (Figure 52). The majority of the trail pathway is the same morphology as that described for trail Site 24499. The trail surface is an average of 0.3 m wide and is evident on the Kanikū flow from the shoulder of Queen Ka‘ahumanu Highway to the edge of an older weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow to the east. The last visible vestiges of the eastern edge of the trail are at the convergence of several trails, a place marked with the petroglyph Site 24488. A portion of the trail is on smooth pāhoehoe, and that portion is manifest as a worn, darker, shallow groove in the lava (Figure 53).

A 75.0 m long portion of the trail crosses Alignment 4 at Station 3+00. The trail has been impacted by past construction associated with roads built near the intersection of the Queen Ka‘ahumanu Highway and the HELCO access road. A small segment (approximately 15.0 m) of the trail in an un-disturbed portion of the Queen Ka‘ahumanu APE. Site 24503 connects to Site 1380 (Ching 1971) to the west of Queen Ka’ahumanu Highway. The trail is a well-worn pathway that connects to Ahualono. The unaltered portions of the trail are in good condition.

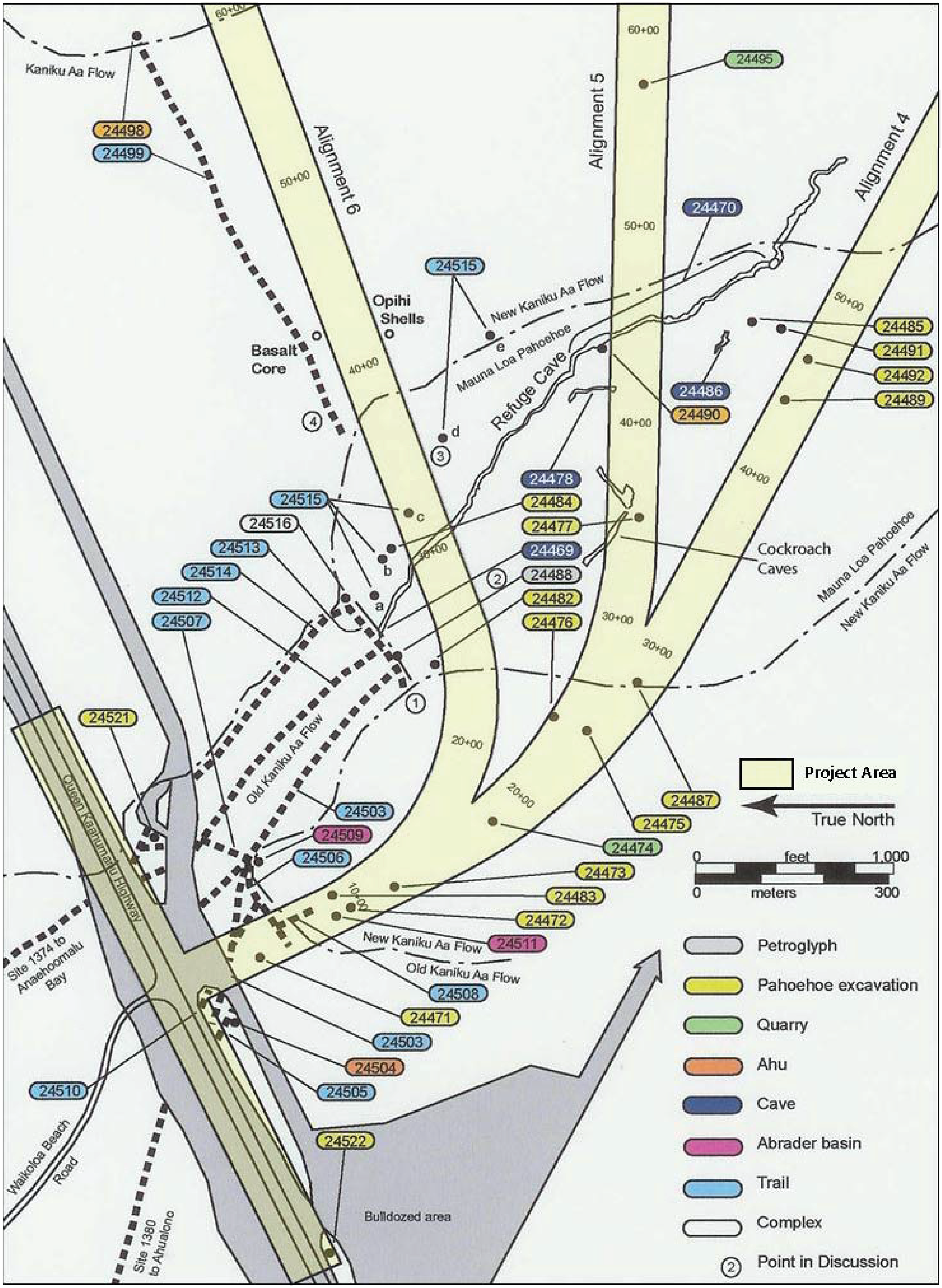

Figure 52: Site 24515 Located on West End of Project Area Map.

Figure 53: Photograph of Site 24503 Worn Pāhoehoe Trail Looking Southeast.

SITE 24504 **THREE AHU**

FUNCTION: Markers
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 600.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Slightly Impacted by Ungulates
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24504 (see Figure 52) consists of three small *ahu* approximately 60.0 m south of Alignment 4 within the Queen Kaʻahumanu Intersection corridor, at an elevation of 44 feet amsl (13 m). The *ahu* form a line oriented east/west on an uneven Kanikū ʻaʻā flow (Figure 54). They are constructed of platy pāhoehoe cobbles stacked two to three courses high in a single column and are very similar in size, measuring approximately 0.2 to 0.3 m in diameter, and 0.3 m in height. The *ahu* most likely mark the direction of a trail where foot travel along the hard pāhoehoe surface has left no wear or other indications of its existence. Site 24504 has been mildly impacted by ungulates and is in good condition.

SITE 24505 **TRAIL**

FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 50.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Partially in Alignment 4
DESCRIPTION: Site 24505 is a 50.0 m segment of trail approximately 60.0 m south of Alignment 4 within the Queen Kaʻahumanu Intersection corridor, at an elevation of 44 feet amsl (13 m). The trail surface consists of worn and crushed ʻaʻā cobbles and pebbles (approximately 0.3 m in width) on uneven Kanikū ʻaʻā flow, similar to that at Site 24499. The trail has been heavily impacted by grading activities, but may have connected with a trail system that accessed numerous pāhoehoe excavation pits and abrader manufacturing stations to the north.

Figure 54: Photograph of Site 24504 *Ahu* in Foreground, Middle, and Background Looking South.

SITE 24506 **TRAIL**
FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 70.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Partially in Alignment 4
DESCRIPTION: Site 24506 (see Figure 52) is a 70.0 m segment of trail partially within Alignment 4 at Stations 4+00 to 6+00, at an elevation of 50 feet amsl (15 m). The trail surface consists of worn and crushed ʻaʻā cobbles and pebbles (approximately 0.3 m in width) on uneven Kanikū ʻaʻā flow, similar to Site 24499. The trail segment connects to trail Sites 24503 and 24506, and is part of a network of trails that connects to numerous pāhoehoe excavation pits and abrader manufacturing stations in this region.

SITE 24507 **TRAIL**
FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 180.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24507 (see Figure 52) is a 180.0 m segment of trail located north of proposed Alignment 4 at station 6+00, at an elevation of 44 feet amsl (13 m). The trail surface consists of a light gray worn track averaging 0.30 m in width on uneven Kanikū pāhoehoe flow, similar to that at Site 24499. The easternmost extremity of the trail diminishes in clarity to the point where the trail can no longer be discerned.

SITE 24508 **TRAIL**
FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 120.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good

INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Partially in Alignment 4
DESCRIPTION: Site 24508 (see Figure 52) is a 120.0 m segment of trail that is within Alignment 4 from station 6+00 to 10+00, at an elevation of 50 feet amsl (15 m). The trail surface consists of a light gray worn track averaging 0.3 m wide across a black cindery, uneven Kanikū pāhoehoe flow, similar to Site 24499. It is an ephemeral trail segment that connects to near the southern end of trail Site 24507, and diminishes to the point of not being visible at its eastern extremity. Based on this morphology, it is suggested that the trail was used to access the pāhoehoe excavation pits and abrader manufacturing stations in the Kanikū pāhoehoe flow to the south of the convergence area. As people moved southward from the convergence area, they would have dispersed into the flow in a random fashion, moving in a variety of directions away from the trail.

SITE 24509 **ABRADER BASINS**
FUNCTION: Resource Extraction and Tool Manufacture
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 15.0 m NW/SE; Width: 0.7 m; Height, 0.3 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24509 (see Figure 52) consists of a series of abrader basins near the convergence of trail Sites 24503, 24506, and 24507 north of Alignment 4 at Station 7+00, at an approximate elevation of 50 feet amsl (15 m). There are 32 shallow oval to elliptical basins in the smooth bedrock outcrop over a 15.0 x 7.0 m area (Figure 55). The basins are approximately 0.3 to 0.7 m in length and width, with a maximum of 6.0 cm, and were most probably created as a byproduct of shaping scoriaceous pāhoehoe cobbles into abrading tools.

There are observable differences in the wear and weathering among the basins. Some are smooth, and others have hexagonal cracks. The smoother basins may have been created more recently, and are less weathered than the cracked basins created earlier. The pathway of Trail 24503 lies directly over one of the basins. The pathway has worn into the bedrock

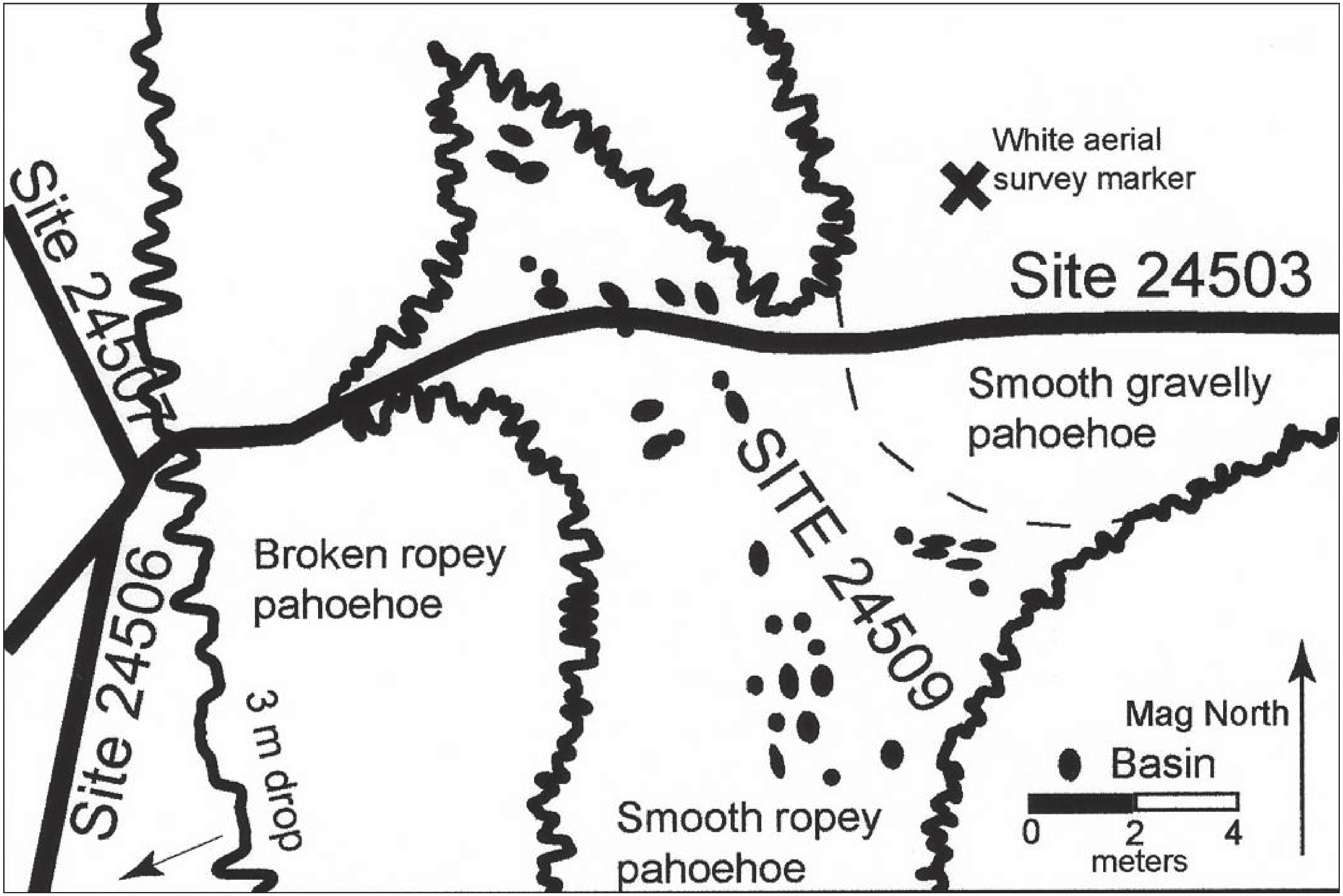

Figure 55: Site 24509 Planview Map.

approximately 3.0 cm deeper than the basin, indicating that the trail was used after the abandonment of that particular basin. Site 24509 is in good condition.

SITE 24510	**TRAIL**
FUNCTION:	Transportation
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 20.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Partially in Alignment 4

DESCRIPTION: Site 24510 (see Figure 52) is a 20.0 m segment of trail approximately 30.0 m south of Alignment 4 from Stations 1+00 to 3+00, at an elevation of 44 feet amsl (13 m). The trail surface is composed of worn and crushed ‘a‘ā cobbles and pebbles and is approximately 0.3 m width, traversing the uneven Kanikū ‘a‘ā flow, similar to Site 24499. The trail segment has been heavily altered by grading activities, but may have connected with a trail system that accessed numerous pāhoehoe excavation pits and abrader manufacturing stations to the immediate north. Trail morphology is more ephemeral than the nearby trail Site 24503.

SITE 24511	**ABRADER BASINS**
FUNCTION:	Resource Extraction and Tool Manufacture
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 2.0 m NE/SW; Width: 2.0 m; Height, 0.3 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	In APE

DESCRIPTION: Site 24511 (see Figure 52) consists of a series of abrader basins within Alignment 4 at Station 9+00), at an elevation of 60 feet amsl (18 m). There are six shallow basins over a 2.0 by 2.0 m area in the smooth bedrock outcrop, created from repeated scraping of rock on the surface (Figure 56). The basins are approximately 0.3 to 0.5 m in length and width. Two of the basins are narrow grooves (0.05 to 0.10 m) which are 0.2 m in length and are oriented parallel to one another. These were most likely created as a byproduct of shaping

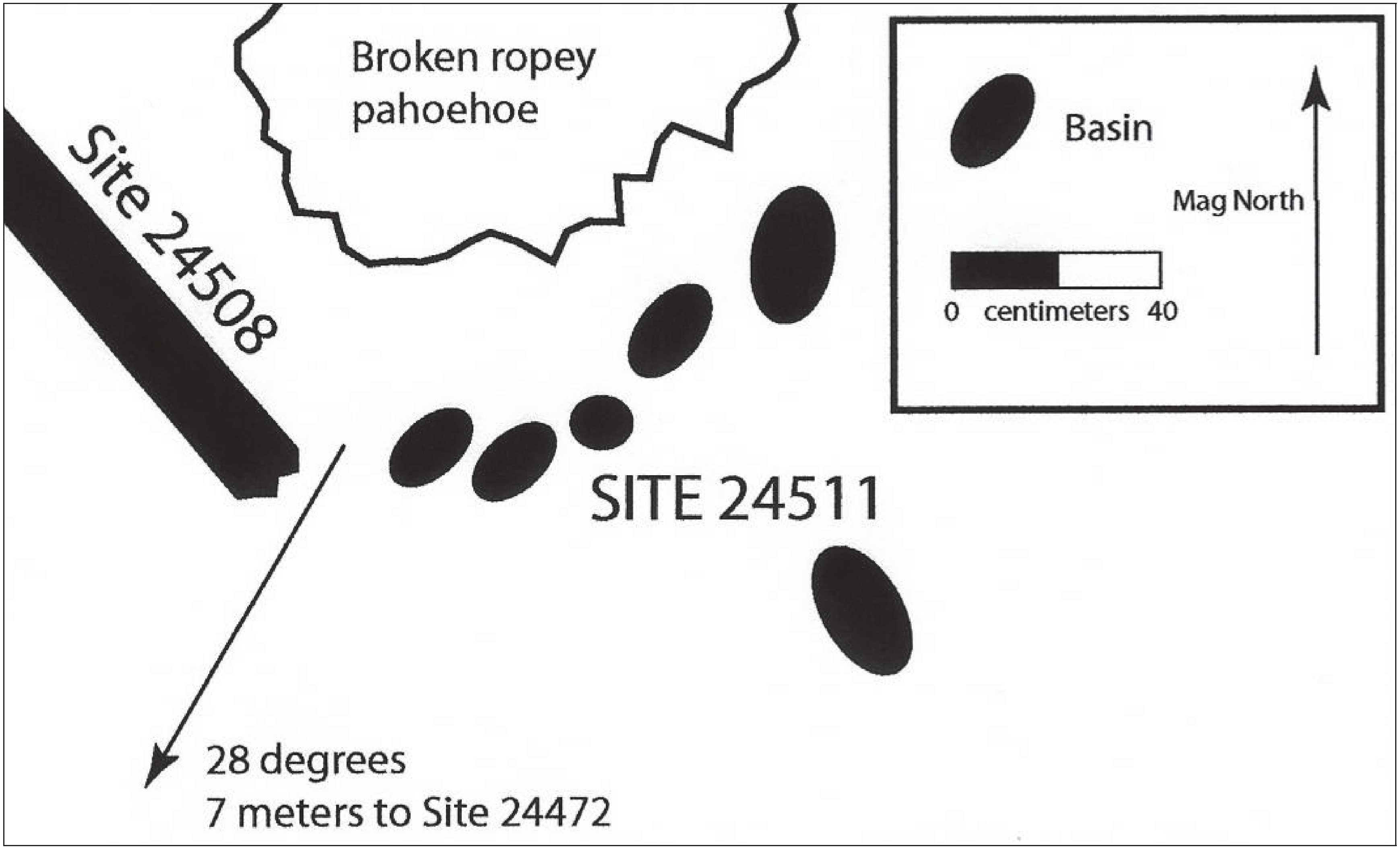

Figure 56: Site 24511 Planview Map.

scoriaceous pāhoehoe cobbles into abrading tools. Site photographs are included in Appendix D of this report.

SITE 24512 **TRAIL**

FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 600.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24512 (see Figure 52) is a 600.0 m segment of trail 35.0 m to the north of and parallel to trail Site 24503, at an elevation of 65 feet amsl (20 m). The trail is approximately 300.0 m north of Alignment 4 and 100.0 m west of Alignment 6. The trail surface averages 0.3 m in width and is evident on the Kanikū flow from the shoulder of a HELCO gravel access road at the trail's western terminus to the edge of an older weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow to the east.

The trail pathway is composed of worn and crushed ʻaʻā pebbles in places and is a slightly discolored worn track where it is located on smooth pāhoehoe, similar to that at Site 24499. This trail is not as apparent as nearby trail Sites 24503 and 24514, suggesting that it was not used as frequently, or for as long a period as some of the other trails.

SITE 24513 **TRAIL**

FUNCTION: Transportation
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 150.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Outside of APE
DESCRIPTION: Site 24513 (see Figure 52) is a 150.0 m segment of trail 100.0 m west of Alignment 6 from Stations 24+00 to 29+00, at an elevation of 65 feet amsl (20 m). The trail surface is composed of worn and crushed ʻaʻā cobbles and pebbles approximately 0.3 m

wide, similar to Site 24499. It is situated along the eastern edge of an uneven Kanikū ʻaʻā flow, as it meets an older gently sloping weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow. The trail parallels the interface of the older Mauna Loa and the younger Kanikū flow, and links trail Sites 24503, 24512 and 24514. Trail Site 24515 also connects to Site 24513 near the convergence of trails at petroglyph Site 24488.

SITE 24514	**TRAIL**
FUNCTION:	Transportation
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 500.0 m; Width: 0.3 m; Height, 0.1 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Outside of APE

DESCRIPTION: Site 24514 (see Figure 52) is a 500.0 m segment of trail, 35.0 m to the north of and parallel to trail Site 24512, along the southern base of a high Kanikū ʻaʻā flow. The site is situated at an elevation of 65 feet amsl (20.0 m), and is approximately 100.0 m to the west of Alignment 6. The trail is composed of worn and crushed ʻaʻā pebbles, is 0.3 m in width, and is similar to Site 24499.

The eastern terminus of the trail merges with older weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe where it may continue, but is not visible, perhaps a result of the density of the pāhoehoe. Trail Site 24513 connects to Site 24514 at this location. A portion of the trail has been dozed to the west, for construction of the access road and the Queen Kaʻahumanu Highway. The trail continues to the west side of Queen Kaʻahumanu Highway, connecting to ʻAnaehoʻomalu Bay via previously identified Site 1374 (Ching 1971).

SITE 24515	**FIVE AHU**
FUNCTION:	Markers
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 475.0 m; Width: 0.5 m; Height, 1.6 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None

LOCATION: Partially in Alignment 6

DESCRIPTION: Site 24515 (see Figure 52) consists of five *ahu* (Table 22). Feature C is located within the Alignment 6 APE. Four of the *ahu* are small, and are situated on the weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow. The fifth *ahu* is on the crest of the higher (6.0 m above pāhoehoe), younger, gray Kanikū ʻaʻā flow where it meets the older pāhoehoe flow. The alignment created by the *ahu* also aligns with the convergence of trails at petroglyph Site 24488. Based on the alignment of the *ahu* and their relationship to the trail convergence area, it is very likely that the *ahu* are trail markers. In contrast to pathways on the Kanikū flow (for instance Sites 24499 and 24503), there is no wear pattern noticeable across the harder Mauna Loa pāhoehoe surface. Pāhoehoe can generally be more easily traversed, and can be less restrictive in terms of adherence to a trail.

Table 22: Site 24515 Feature Dimensions and Construction.

Ahu	**Distance to *ahu* to the west (m)**	**Angle to *ahu* to east (° Mag N)**	**Diameter x H (m)**	**Comments**	**Relationship to APE**
A	45*	70	0.3 x 0.4	4 platy cobbles	Outside
B	45	94	0.3 x 0.3	3 platy cobbles	Outside
C	50	94	0.3 x 0.4	3 platy cobbles	In
D	65	94	0.5 x 0.5	8 platy cobbles	Outside
E	200		1.4 x 1.6	“Pointer” rock on top of *ahu* is oriented 80°	Outside

* Distance from Ahu A to Site 24513.

The *ahu* are constructed of angular and platy cobbles and small boulders stacked on the ground surface (Figure 57). Feature C (Figure 58) is the only *ahu* in this sequence of *ahu* that is within the APE.

SITE 24516 **AHU AND ROCK ALIGNMENT**

FUNCTION: Markers

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 13.0 m NE/SW; Width: 7.0 m; Height, 0.8 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

Figure 57: Photograph of Site 24515 Feature D Showing *Ahu* Construction, Looking Northwest.

Figure 58: Photograph of Site 24515, Feature C Showing Feature Construction, Looking East.

LOCATION: Outside of APE

DESCRIPTION: Site 24516 (see Figure 52) consists of an *ahu* (Feature 1), a C-shaped rock alignment (Feature 2), and an *ahu* (Feature 3). They are located 70.0 m north of Alignment 6 at Station 29+00, and at an elevation of 65 feet amsl (20 m) (Figure 59). The site is situated on weathered light brown Mauna Loa (5,000-10,000 ybp) pāhoehoe flow, at the base of a high Kanikū ʻaʻā flow. The site is near the intersection of trail Sites 51 and 52. Feature 1 *ahu* is 1.6 m in diameter, 0.6 m in height, and is constructed of piled pāhoehoe cobbles and boulders. Feature 2 is pāhoehoe cobbles and boulders stacked two to three courses high (0.8 m) and is 0.6 m wide, and is 3.6 ms long and 1.6 ms wide. Feature 3 is a loosely piled *ahu* that is 1.0 m in diameter and 0.4 m in height.

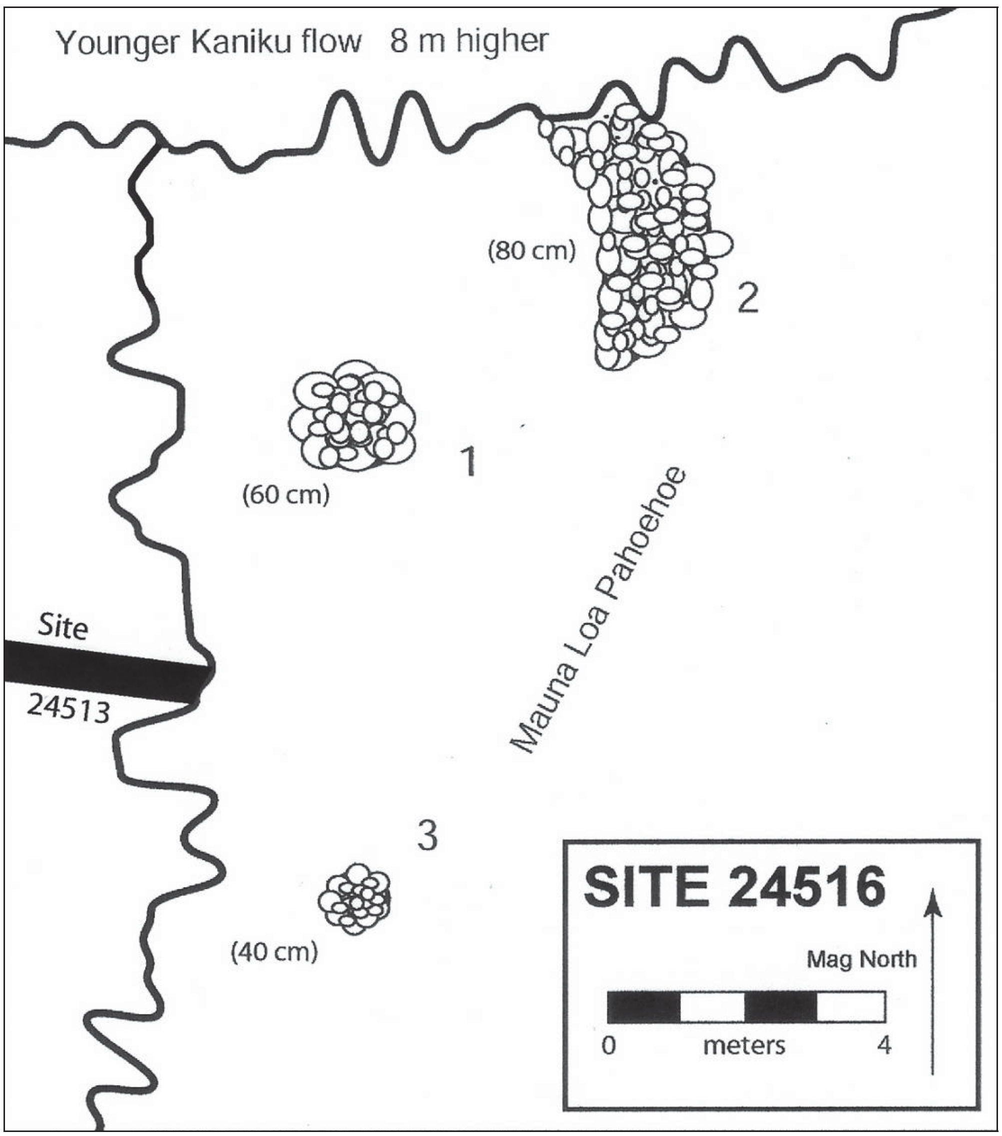

Figure 59: Site 24516 Planview Map.

SITE 24521	**PĀHOEHOE EXCAVATION**
FUNCTION:	Resource Extraction
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 9.5 m NW/SE; Width: 2.8 m; Height, 0.3 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Outside of APE

DESCRIPTION: Site 24521 consists of a series of five pāhoehoe excavations just beyond the northeastern quadrant of the Queen Ka‘ahumanu intersection, at 50 feet (15 m) amsl (see Figure 52). They are on a black, cindery *a‘ā* flow near the base of the higher Kanikū flow (Figure 60 and Table 23). These are of the usual size observed in the project area.

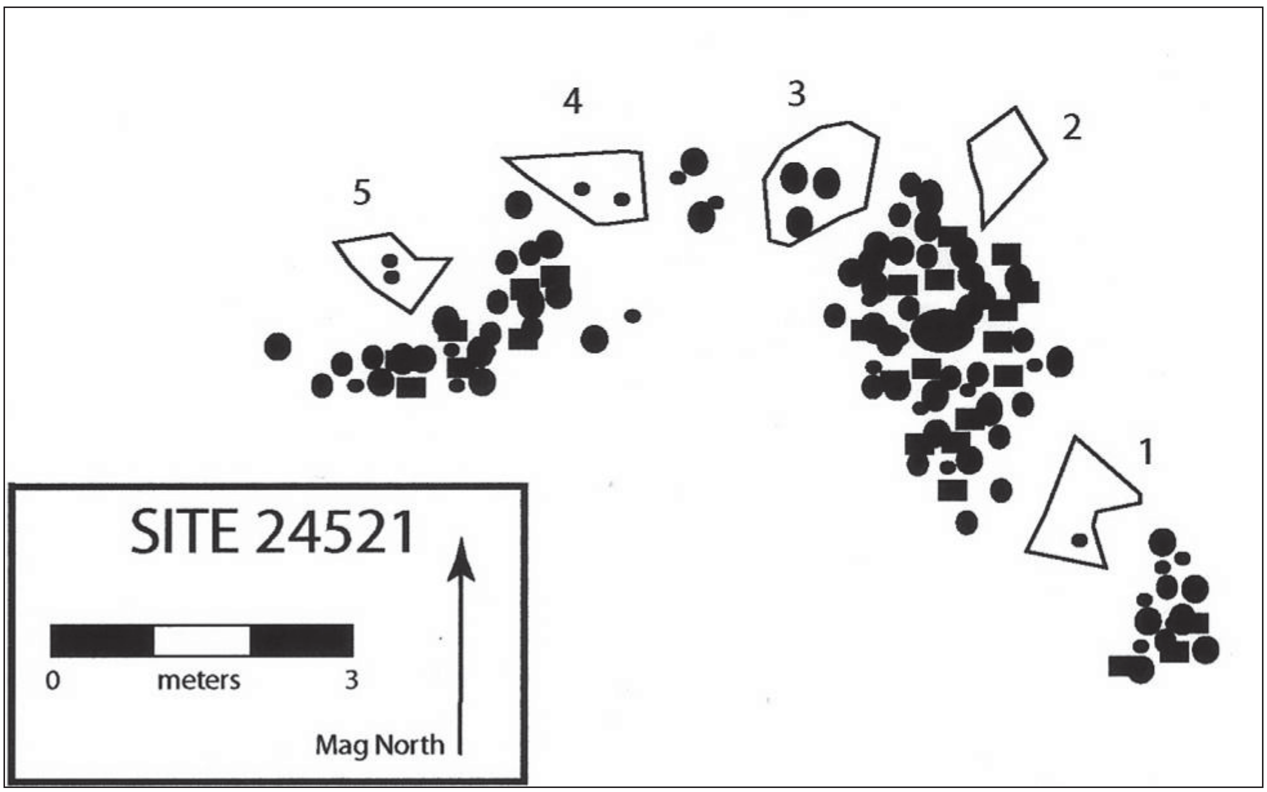

Figure 60: Site 24521 Planview Map.

Table 23: Site 24521 Feature Dimensions.

Feature	Length (m)	Width (m)	Height (m)
1	0.5	0.3	0.4
2	0.5	0.5	0.7
3	1.2	0.9	0.7
4	0.9	0.4	0.3
5	0.7	0.3	0.3
Average	0.7	0.5	0.5

SITE 24522 **PĀHOEHOE EXCAVATION**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 6.4 m NW/SE; Width: 4.6 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24522 consists of two pāhoehoe excavations at the south end of the Queen Ka‘ahumanu intersection, at 50 feet (15 m) amsl (see Figure 52). They are situated in a small outcrop of smooth pāhoehoe surrounded by the Kanikū ‘a‘ā (Figure 61). Feature 1 is 4.0 ms deep, 0.7 ms wide, and 50 cm deep. Feature 2 is 2.3 m in length, 1.1 m wide, and 90. cm in depth.

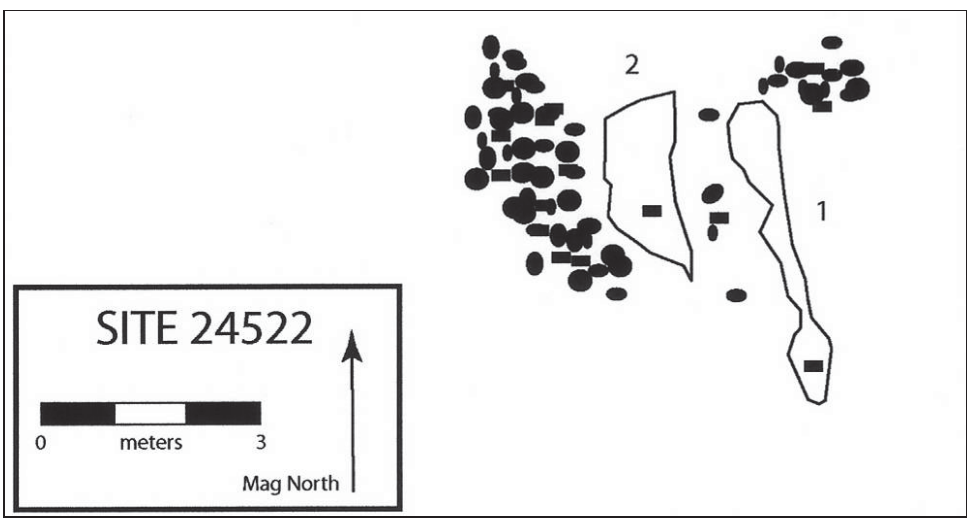

Figure 61: Site 24522 Planview Map.

SITES RECORDED IN THE CENTRAL PORTION OF THE PROJECT AREA

Five archaeological sites were recorded in the near coastal portion of the project area (Table 24 and Figure 62). Four of the sites contained rock mounds likely used to mark the boundary between South Kohala and North Kona districts. The fifth site is a ridge quarry.

Table 24: Central Project Area Archaeological Sites.

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24466	1	4-5-6	Out	*Ahu* with post	Historical survey marker
24467	3	4-5-6	In	Group of *ahu*	Pre-Contact to Early Post-Contact Era trail markers
24468	4	4	Partially in	Ridge quarry and 3 *ahu*	Pre-Contact to Early Post-Contact Era resource extraction, trail markers
24479	1	4	Partially in	Ridge quarry	Pre-Contact to Early Post-Contact Era resource extraction
24494	1	4-5-6	In	*Ahu*	Pre-Contact to Early Post-Contact Era marker

SITE 24466 **SURVEY MARKER**

FUNCTION: Survey Marker

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 2.5 m diameter; Height, 1.5 m Max.

CONDITION: Good

INTEGRITY: Impacted by Weathering

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24466 (see Figure 62) is a large *ahu* located approximately 350 feet (107 m) from the APE Alignment 4-5-6. It is 2.5 m diameter and 1.5 m in height, with a wooden post in the center (Figure 63). The site is situated at the boundary between North Kona and South Kohala districts. That place is identified as "*Ahu Kapukeiki*" on the 1867 Kaelemakule map (see Figure 9) just west (to the left of) Puʻu Hīnaʻi. The feature is an historical surveyor's boundary marker that marks a turn or angle in the boundary between North Kona and South Kohala districts. Site 24466 has been mildly altered by weathering and is in good condition.

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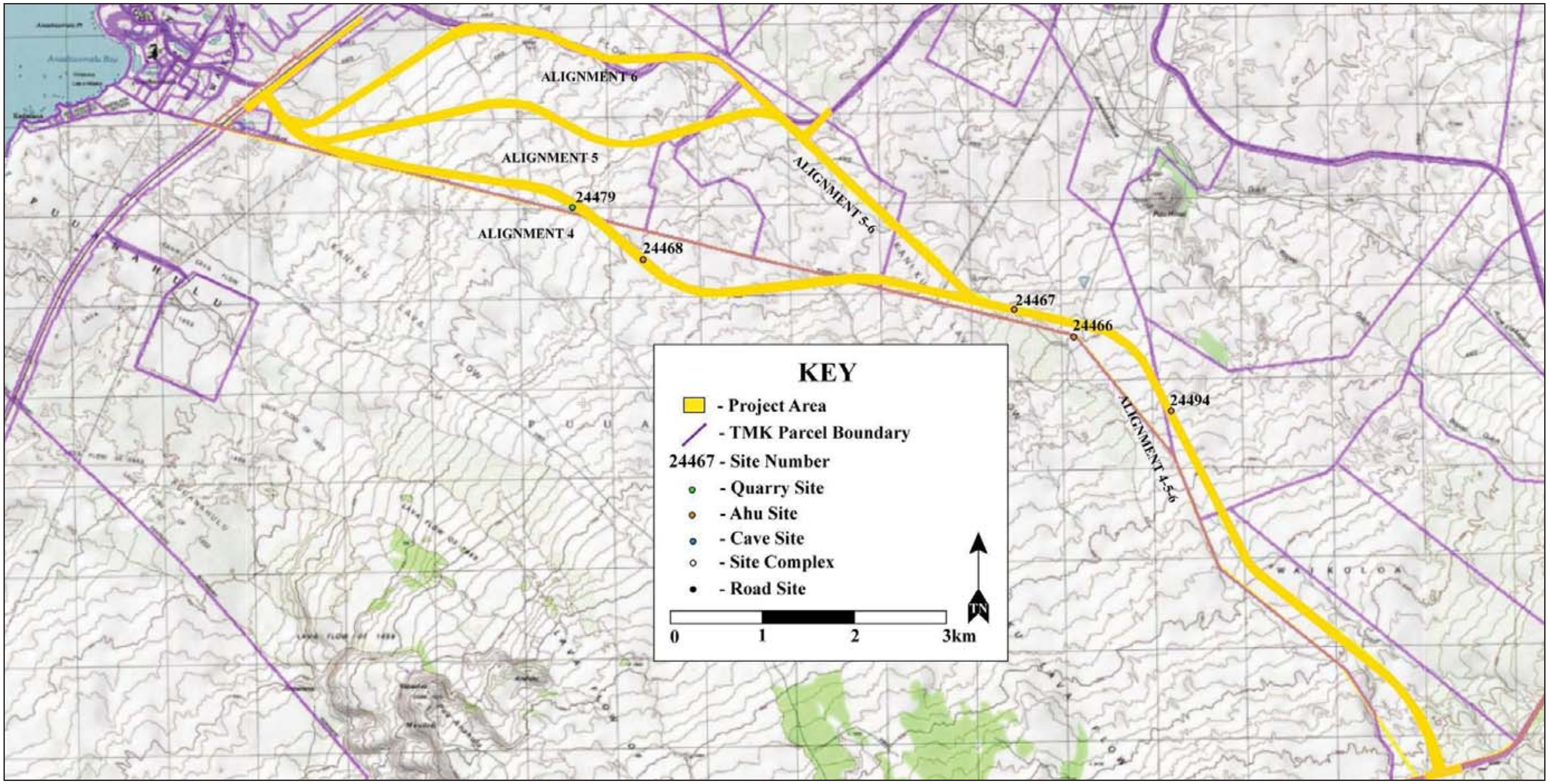

Figure 62: 7.5-Minute Series USGS Topographic Map Showing Location of Archaeological Sites Located in the Central Portion of the Project Area (Anaehoʻomalu and Puʻu Anahulu USGS Quads) (ESRI 2013. Source: National Geographic Society).

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Figure 63: Photograph of Site 24466 Looking South.

SITE 24467 **SURVEY MARKER**

FUNCTION: Survey Marker

AGE: Historic

DIMENSIONS: Length: 50.0 m N/S; Width: 3.0 m; Height, 0.5 m Max.

CONDITION: Good

INTEGRITY: Impacted by Weathering

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Inside APE

DESCRIPTION: Site 24467 consists of three *ahu*, within and south of the proposed Alignment 4-5-6 at Station 320+50, at an elevation of 1300 feet amsl (396 m) (see Figure 62). The *ahu* are aligned at 180°/360° Magnetic North atop a level Mauna Kea pāhoehoe flow dated to more than 10,000 ybp. They are constructed of loosely piled angular and sub-angular platy pāhoehoe (Table 25 and Figure 64). The *ahu* are likely prehistoric, however their function cannot be confirmed without further investigation. Until data is generated to indicate otherwise, they are interpreted as trail markers. Site photographs are included in Appendix D of this report.

Table 25: Site 24467 Feature Dimensions.

Feature	L x W x H (m)	Description
1	1.9 x 0.9 x 0.5	3 courses high, six cobbles wide at base forming low cone
2	1.0 x 0.7 x 0.2	1 course high, 6 cobbles wide at base
3	1.1 x 1.0 x 0.2	1 course high, 5 cobbles wide at base

SITE 24468 **QUARRY AND AHU**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 36.0 m N/S; Width: 8.0 m; Height, 2.5 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Partially in Alignment 4

DESCRIPTION: Site 24468 (see Figure 62) consists of a basalt extraction area at a ridge quarry (Feature 1) and an alignment of three *ahu*. They are located only partially in Alignment 4 at Station 157+00, at an elevation of 820 feet amsl (250 m). The site is situated on the broken and uneven *a'ā* surface of the Kanikū lava flow (Figure 65). There is little to no

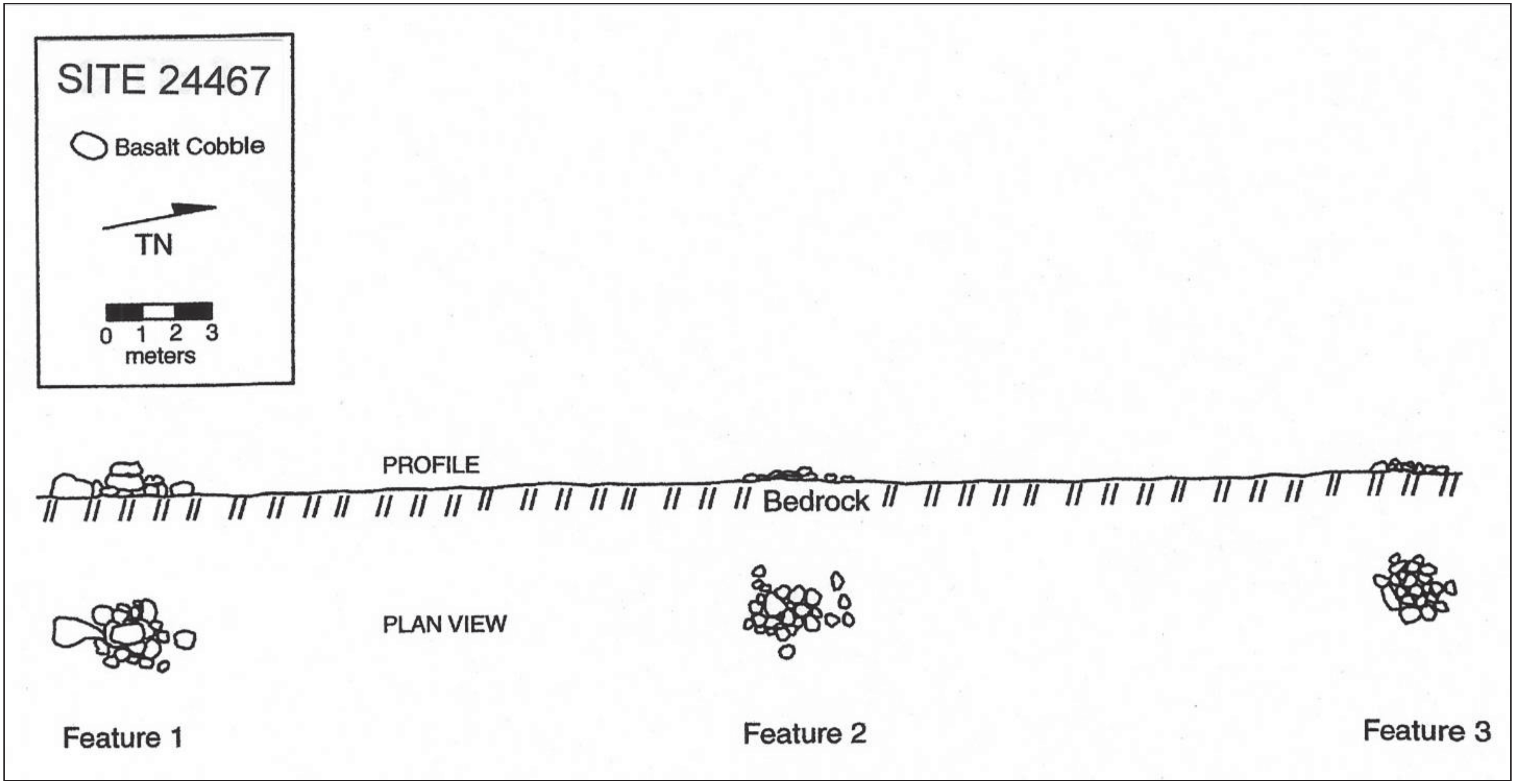

Figure 64: Site 24467 Planview Map.

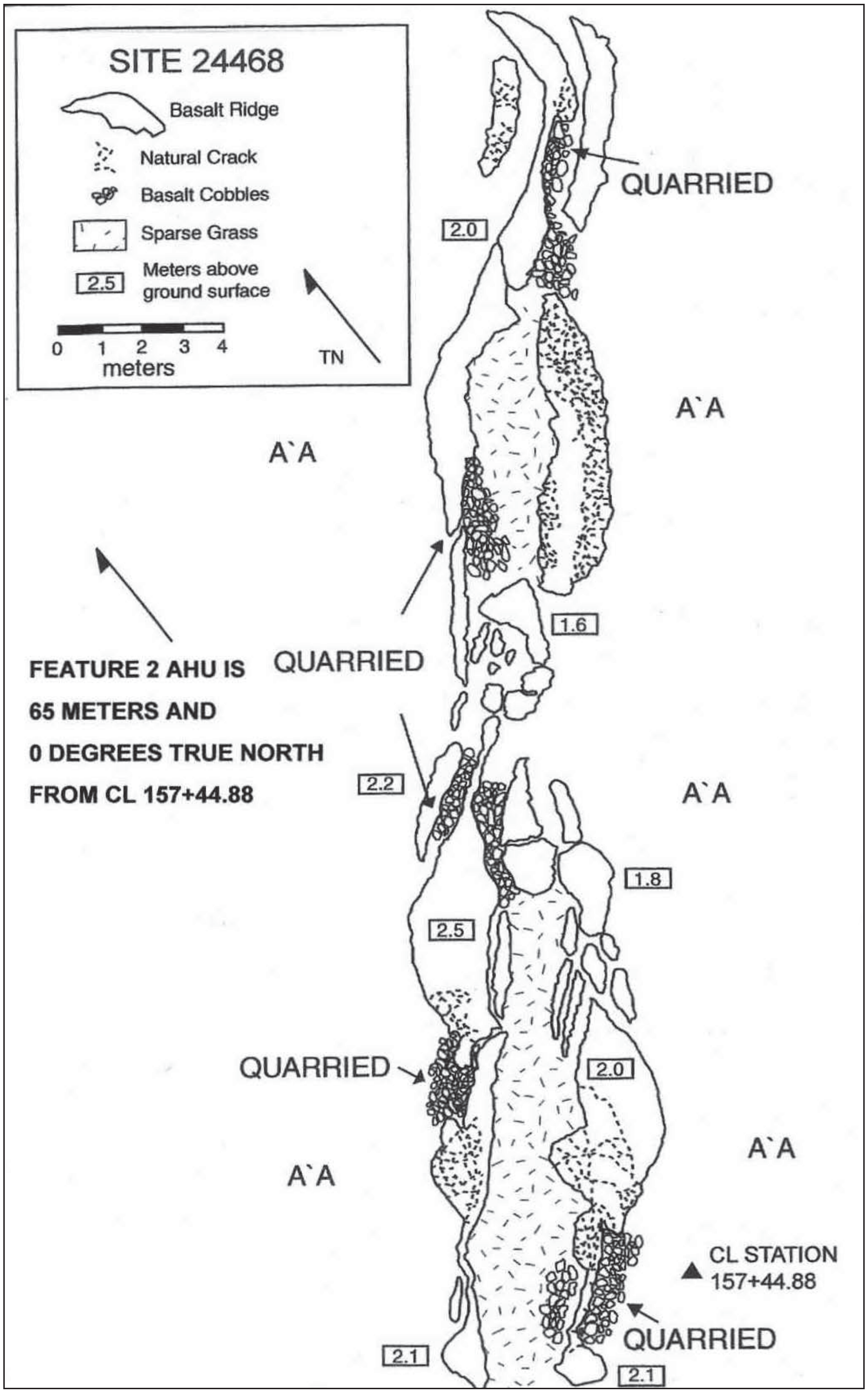

Figure 65: Site 24468, Feature 1 Planview Map.

sediment present in the area and less than 10% fountain grass on the ground surface.

Feature 1

Feature 1 is a ridge quarry associated with upright sheets of dense vesicular basalt formed at the confluence of two *a'ā* channels (Figure 66). The convergence created a rift roughly 1.5 m wide between the two channels and caused the *a'ā* flows on both sides of the rift to lift up and away from the convergence zone. The resulting lava on both sides of the rift curved back upon the channels and cooled leaving roughly convex sheets of basalt standing from 1.6 to 2.6 m above the bottom of the rift. The tops of the basalt sheets are thin (roughly 0.20 m) and show signs of natural cracking associated with cooling.

Displacement of the original cracked basalt some meters away from its source and a small amount of percussion chipping on the basalt surface suggests human action in the extraction and possible selection of the quarried basalt. Some of basalt broken off of the ridges was not removed from the site. Feature 1 is 34.0 by 2.0 to 5.5 m, with five separate extraction locations.

Feature 2

Feature 2 consists of three *ahu*. The *ahu* are outside of the study area, and are approximately 30.0 m north of Feature 1. The *ahu* are arranged in a triangle, with Ahu B 2.8 m at 112º from Ahu A, and Ahu C 4.0 m at 80º from Ahu A (Table 26, Figure 67). The *ahu* at Site 24468 probably serve to mark the pathway to the ridge quarry. The lack of an observable trail in the Kanikū lava does not necessarily mean that no trail ever existed here, but may suggest that travel to the Site 24468 ridge quarry was infrequent.

Table 26: Site 24468, Feature Three *Ahu* Dimensions.

Ahu	L x W x H	Comments
A	2.6 x 2.0 x 0.8	5 stones wide and 3 courses high; 2 branches inserted into top
B	1.0 x 0.8 x 0.8	2 courses high
C	0.8 x 0.6 x 0.6	2 courses high

Figure 66: Photograph of Site 24468, Feature 1 Looking West.

Figure 67: Photograph of Site 24468, Feature 2 Three *Ahu* Looking West.

SITE 24479 **RIDGE QUARRY**

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 80.0 m E/W; Width: 65.0 m; Height, 0.3 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Partially in Alignment 5

DESCRIPTION: Site 24479 (see Figure 62) consists of eight quarry features partially in the study area at Alignment 5 near Station 112+50, at an elevation of 415 feet (125 m) amsl. Features 1 through 5 are quarry areas on the slope of prominent formations that rise 3.0 m and 6.0 m above the surrounding rugged Kanikū ‘a‘ā (Figure 68 and Table 27). Basalt pieces from 20.0 to 60.0 cm in diameter have been broken off of the hill slope and “ridges.” Site 24479 does not appear to have been altered and is in good condition.

These kinds of quarries far from the ocean in rugged terrain may seem unusual, although the lack of recording of these types of features may simply be due to a lack of investigation in the remote areas in which they occur. It is a reasonable assumption that fractured lava may have been the result of target practice conducted by U.S. fighting ships that took aim on the slopes of Waikoloa during World War II. However, the kind of modification to the natural bedrock observed at Site 24479 does not seem to have been created by projectile impacts for these reasons:

- The debris fields are linear, not circular or conical as might be expected with projectile impact.
- There are debris fields on the inland side of one of the hill slopes, away from the trajectory of the projectiles originating from the ocean.
- No shrapnel was observed in these areas.

In contrast, circular debris fields with associated shrapnel were observed elsewhere during this investigation, and those areas were interpreted as products of U.S. Navy target practice during World War II.

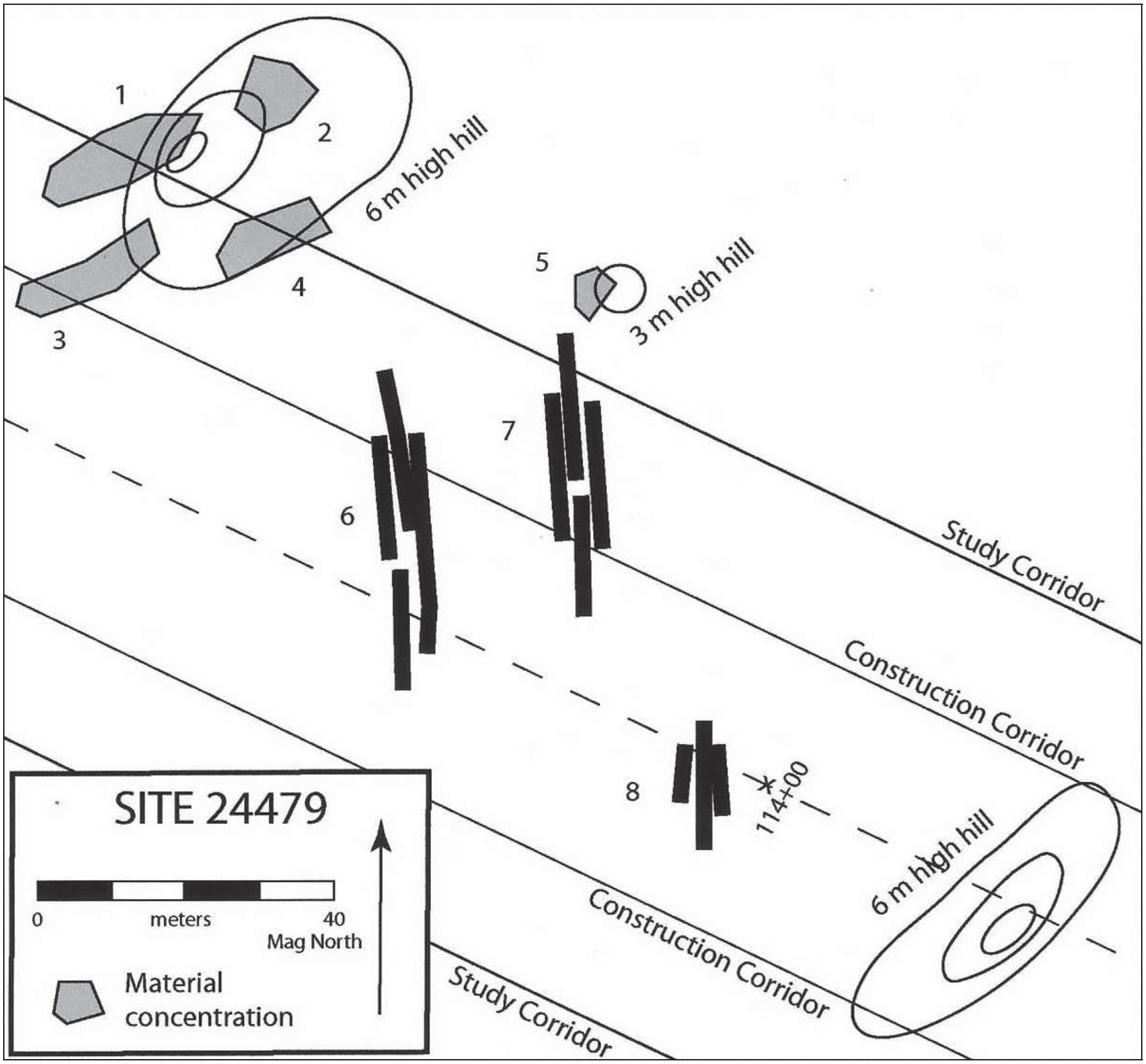

Figure 68: Site 24479 Planview Map.

Table 27: Site 24479 Features and Dimensions.

Feature	Type	Length (m)	Width (m)
1	On hill slope	22.0	8.0
2	On hill slope	12.0	11.0
3	On hill slope	25.0	7.0
4	On hill slope	14.0	9.0
5	On hill slope	6.0	5.0
6	Ridge	42.0	8.0
7	Ridge	37.0	8.0
8	Ridge	16.0	9.0

It may be difficult to conceive of ancient Hawaiians travelling to this remote location to procure raw material. However, it should be noted that there are fifteen well made and relatively large stone platforms another mile inland from Site 24479 (Jensen and Burgett 1991b). Those sites emphatically demonstrate that ancient Hawaiians traveled through the rugged Kanikū flow. Site 24479 may be on a seldom used route between the shoreline and fifteen platforms further inland. Whether it is or not, the presence of the platforms isolated in the Kanikū far from other features, provides a reliable indication that people traveled within, and were engaged in activities within the area.

SITE 24494 **AHU**
FUNCTION: Marker
AGE: Pre-Contact to Early Post-Contact Era
DIMENSIONS: Length: 1.1 m in Diameter; Height, 0.8 m Max.
CONDITION: Good
INTEGRITY: Not Impacted
SURFACE ARTIFACTS: None
EXCAVATION: None
LOCATION: Inside APE
DESCRIPTION: Site 24494 (see Figure 62) consists of a single *ahu* situated on a gently sloping Mauna Kea pāhoehoe flow dated to more than 10,000 ybp in Alignment 4-5-6 at Station 381+00, at an elevation of 1600 feet amsl (488 m). The ground surface is roughly 70% shallow Waikoloa and Pu‘u Pa series sediments with approximately 40% grass cover. The *ahu* is a single pāhoehoe cobble atop a bedrock outcrop (Figure 69). The cobble is 1.1 m wide, 0.8 m in height, and extends to 2.2 m above the surrounding ground surface. The bedrock outcrop is 4.0 m in diameter and 1.1 m in height. There was no cultural material observed at the site. Site

24494 is unaltered and is in good condition. Site photographs are included in Appendix D of this report.

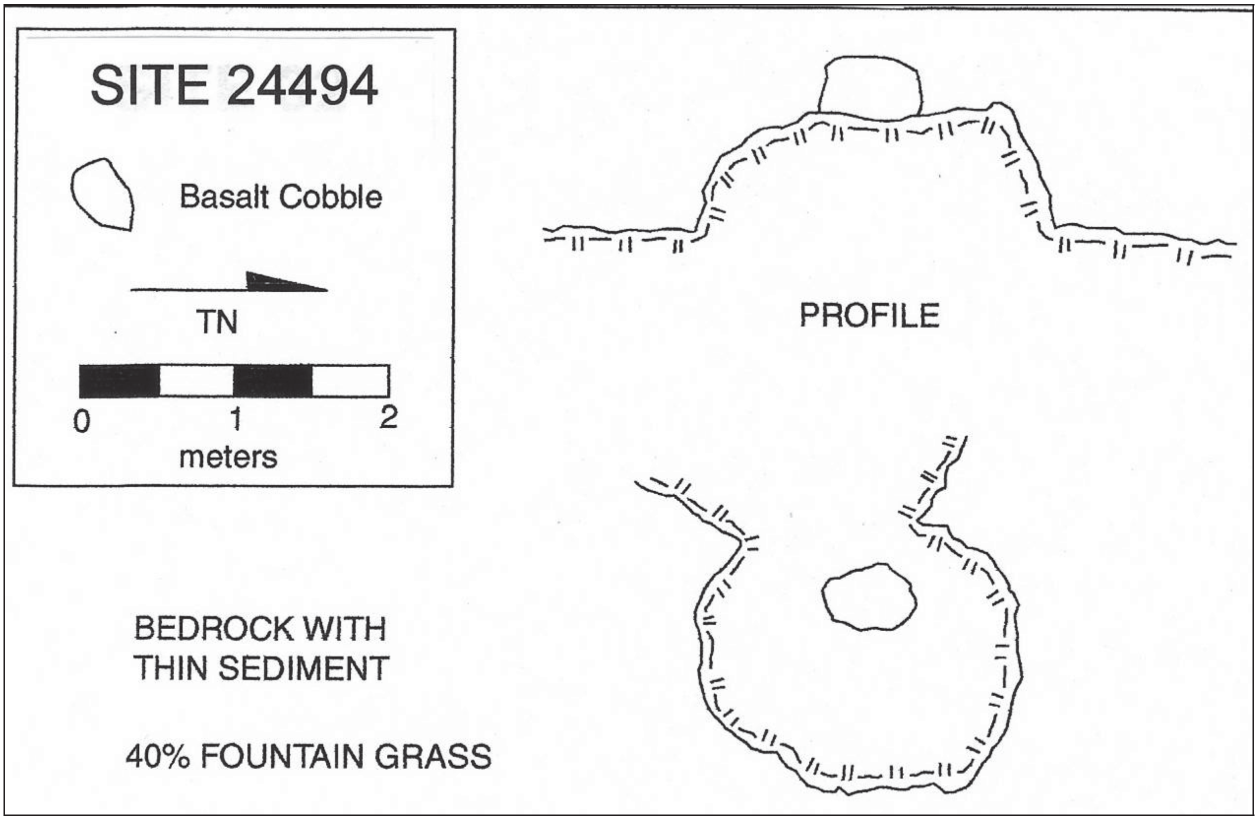

Figure 69: Site 24494 Planview Map.

SITES RECORDED IN THE INLAND PORTION OF THE PROJECT AREA

Five archaeological sites were recorded in the inland portion of the project area (Table 28 and Figure 70). Three of the sites were located in lava tubes. One lava tube site contained cultural material (Site 24496), one contained a quarry feature (Site 24502), and one was marked by rock mounds (Site 24497). There are no lava tube sites located within the project area APE. They will not be impacted by the proposed road construction.

The remaining two sites (Site 24517 and site 24518) are rock mound markers (*ahu*). Site 24517 is located within the project area APE (within Alignment 4-5-6).
Map/photo

Figure Order

Table 28: East Archaeological Sites.

SIHP	Features (n)	Alignment	Relation to APE	Site Type	Chronology and Function
24496	2	4-5-6	Out	Fire and material collection	Pre-Contact to Early Post-Contact Era shelter
24497	3	4-5-6	Out	2 *ahu* in Beta 3 opening	Pre-Contact to Early Post-Contact Era shelter
24502	1	4-5-6	Out	Quarry in cave	Pre-Contact to Early Post-Contact Era quarry
24517	1	4-5-6	In	Ahu	Pre-Contact to Early Post-Contact Era marker
24518	1	4-5-6	Out	Ahu	Pre-Contact to Early Post-Contact Era marker

BAT CAVE

The Bat Cave is a large cave system near Alignment 4-5-6 that contains Site 24496 and Site 24497) (see Figure 70 and Figure 71). The cave is outside of the project area APE. It is located within a Mauna Kea pāhoehoe flow dated to more than 10,000 ybp. The ground surface is roughly 70% shallow Waikoloa and Pu‘u Pa series sediments with 40% grass cover. The cave is approximately 1,160 meters (3,800 feet) from the eastern to the western terminus. The two main openings are referred to as the eastern and western openings. In addition to two sites (Sites 24496 and 24497), there are occasional pieces of charred material and burnt wood distributed along the length of the cave. There are notably fewer such remains in this cave than in others in the study area.

There is a large volume of bat bone in the southern branch of the tube (see Figure 71, Bat Chamber). The southern branch is accessible through a very small, less than 30.0 cm in diameter opening from the main tube. The southern tube, or Bat Chamber, does not contain archaeological features or exhibit any indication that people have been in the chamber (for example, charred material or burnt wood). There are, however, hundreds and perhaps thousands of bat skeletons on the cave floor. Dr. Alan Ziegler, Hawaiian faunal specialist and bat expert, inspected one set of bat bones provided to him, and determined that they represent the known Hawaiian bat species (*Lasiurus cinereus semotus*). This was subsequently confirmed by the measurement of over 30 ulna of bats *in situ,* yielding measurements between 45.0 and 50.0 cm (Hawaiian hoary bat ulna is diagnostically 45.0 to 50.0 cm in length). The presence of numerous bats in this part of the cave is not related to human activity. The absence of any items associated with human activity in the cave is an indication that people have not been inside this difficult to access chamber. The bat remains are not a cultural resource.

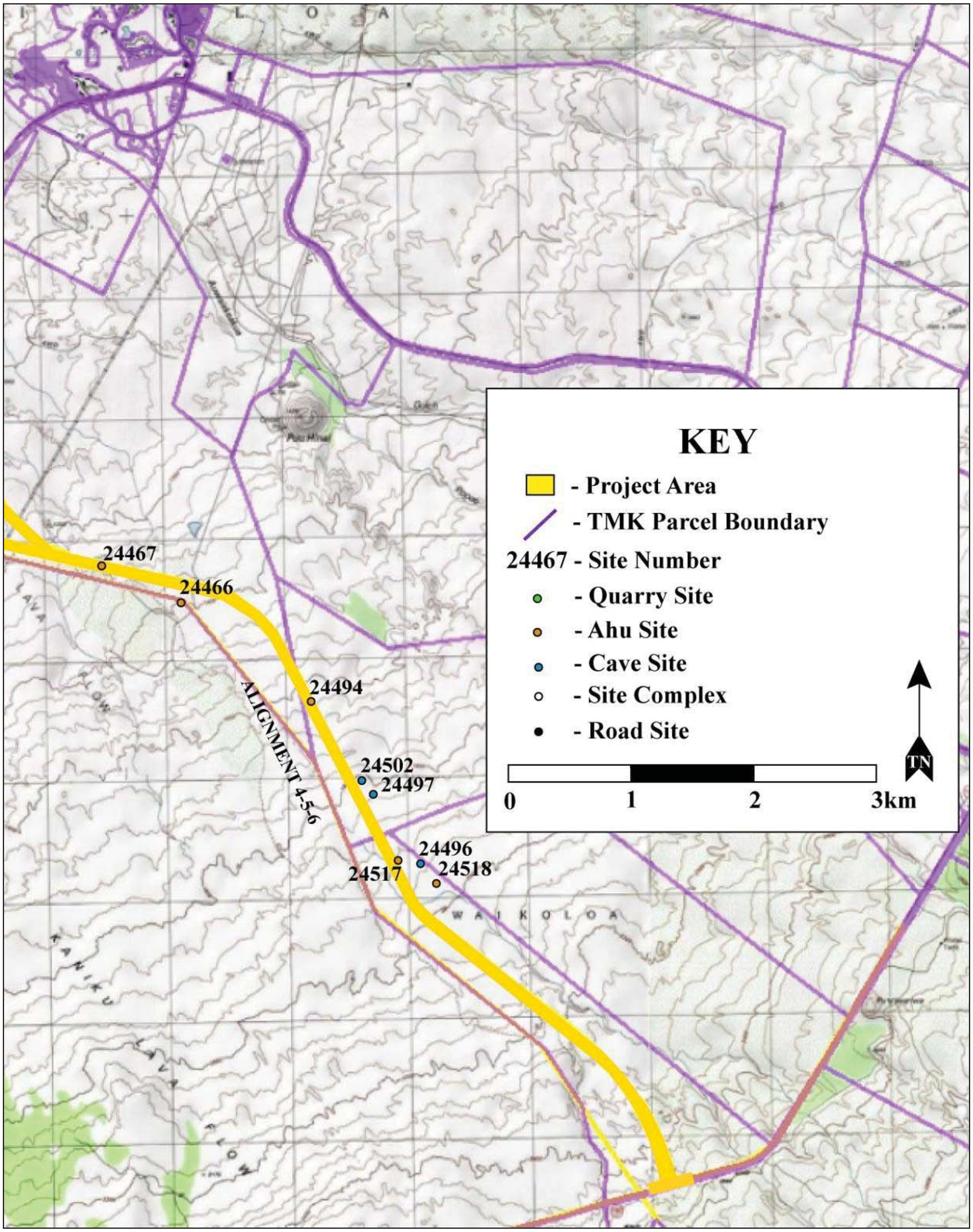

Figure 70: 7.5-Minute Series USGS Topographic Map Showing Location of Archaeological Sites Located in the Eastern Portion of the Project Area (Puʻu Hīnaʻi and Puʻu Anahulu USGS Quads) (ESRI 2013. Source: National Geographic Society).

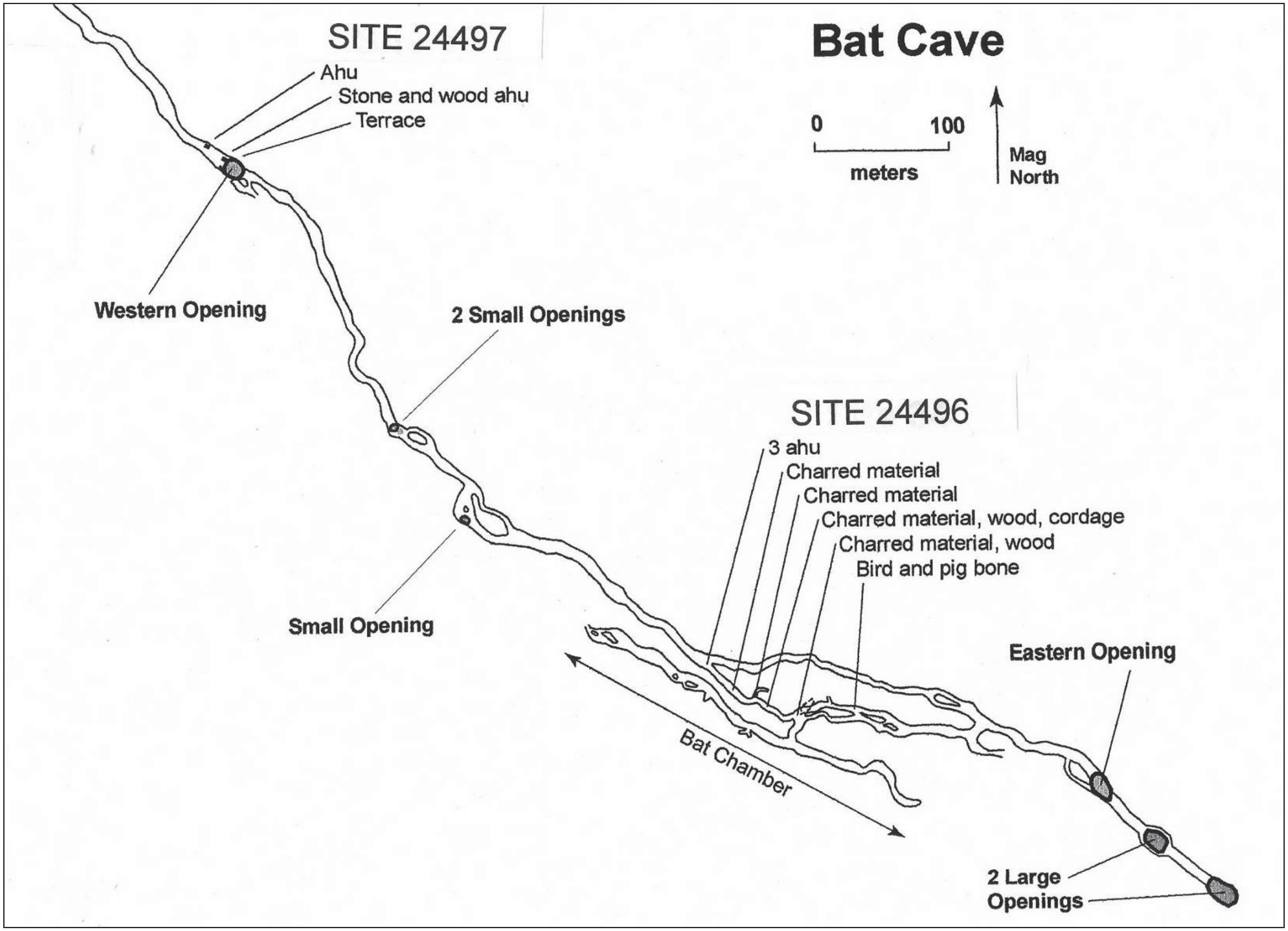

Figure 71: Bat Cave Planview Map Showing Locations of Sites 24496 and 24497.

SITE 24496 **LAVA TUBE SHELTER**

FUNCTION: Temporary Habitation

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 120.0 m NW/SE; Width: 8.0 m; Height, 1.3 m Max.

CONDITION: Good

INTEGRITY: Slightly Impacted by Ungulates

SURFACE ARTIFACTS: Midden and Charred Material

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24496 is in the Bat Cave and is mostly a series of charred material concentrations distributed over a 120.0 m long portion of the cave floor (see Figure 70 and Figure 71). Site 24496 is not within the Alignment 4-5-6 APE. There are three *ahu* at the western end of the site. They are situated at the convergence of two cave tubes. At the eastern end of the site is a large bird bone, and three pig bones (Table 29). The lack of a constricted entrance, the lack of features other than the *ahu*, the paucity of subsistence remains, and the distance from the opening argues against this site being a refuge area. The concentrations of charred material suggests that the area was used on multiple occasions. The *ahu* may have served as *ahu* often do on the ground surface, as marking a pathway. Alternatively, the presence of three *ahu* may have served as a symbolic barrier marker to the passageway. Site 24496 has been mildly altered by ungulates and is in good condition.

Table 29: Site 24496 Faunal Material.

Faunal Material		Cave floor	
		n	g
Bird	Medium Procellariid	1	2.8
Mammal	Sus scrofa, approximately than 3 months old	3	14.0
	TOTAL	**4**	**16.8**

SITE 24497 **LAVA TUBE SHELTER**

FUNCTION: Temporary Habitation

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 20.0 m NW/SE; Width: 7.0 m; Height, 1.6 m Max.

CONDITION: Good

INTEGRITY: Slightly Impacted by Ungulates and Hunters

SURFACE ARTIFACTS: Midden and Charred Material

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24497 consists of three features within the Bat Cave (see Figure 70 and Figure 71). There is a low terrace (2.5 x 2.0 x 0.3 m) on the south side of the cave. An *ahu* is situated approximately 2.0 m west of the opening, and is constructed of pāhoehoe cobbles stacked five courses high (1.2 m) and three stones wide (1.6 m) at its base. A wooden post has been placed vertically in the *ahu* center. A second *ahu* is 16.0 m further west. It is constructed of pāhoehoe cobbles stacked four courses high (1.0 m) and two stones wide (1.4 m) at its base. There was no cultural material other than modern debris and arrows observed at the site.

Although there are modern materials at the site, it is likely that the features were constructed during prehistory, and perhaps modified during the historical period. Chronology and function cannot be determined without further investigation. Site 24497 has been mildly altered by hunters and ungulates and is in good condition.

SITE 24502 QUARRY

FUNCTION: Resource Extraction

AGE: Pre-Contact to Early Post-Contact Era

DIMENSIONS: Length: 3.0 m in Diameter; Height, 0.8 m Max.

CONDITION: Good

INTEGRITY: Not Impacted

SURFACE ARTIFACTS: None

EXCAVATION: None

LOCATION: Outside of APE

DESCRIPTION: Site 24502 (see Figure 70) consists of an alignment north of Site 24497. Several rocks are placed in a row (3.0 m long) to build up a low (20 cm) natural ledge. There are several pockets in the natural cave wall at this location, suggesting that the cave wall material was quarried away. The cave walls in this portion of the cave are white, which may be some kind of mineral or precipitate that was desired by the cave travelers. Charred material and burnt wood pieces at Site 24502 were probably left there as a byproduct of illuminating the area while the quarrying took place.

Owl Cave Discussion

Although the light distribution of charred and burnt material throughout the cave demonstrates that the cave was explored, there are very few cultural modifications in the Owl Cave. The principal activity conducted in the cave appears to be quarrying.

SITE 24517	**AHU**
FUNCTION:	Marker
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 0.5 m N/S; Width: 0.4 m; Height, 0.2 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Inside APE

DESCRIPTION: Site 24517 is an *ahu* along the southern edge of Alignment 4-5-6 at Station 428+00 (see Figure 70). The *ahu* is on a pāhoehoe outcrop north of a seasonal gulch situated on a broad alluvial/colluvial plain, at an elevation of 1870 feet amsl (570 m). The *ahu* is a single platy pāhoehoe boulder which is 0.5 by 0.4 m, and 0.2 m in height, which has been placed atop a bedrock outcrop. The outcrop raises the *ahu* 1.2 m above the surrounding ground surface (Figure 72).

The *ahu* is probably a trail marker, and may be associated with other *ahu* in the higher elevations (for instance at Sites 24465, 24493, 24518). However, *ahu* are used in a variety of ways. The Kona – Kohala boundary was marked with *ahu* (see Figure 4). The likelihood that Sites 24517 and 24518 are associated with early district boundaries, as is Site 24466 is doubtful, since they are much less substantial in size, and are clearly not on the present day district boundary.

Considering the relationship of Site 24516 to the trails in the area, it is probably associated with movement of people across the landscape. The *ahu* there are trail markers, perhaps used to mark the location of the C-shaped enclosure, a temporary shelter.

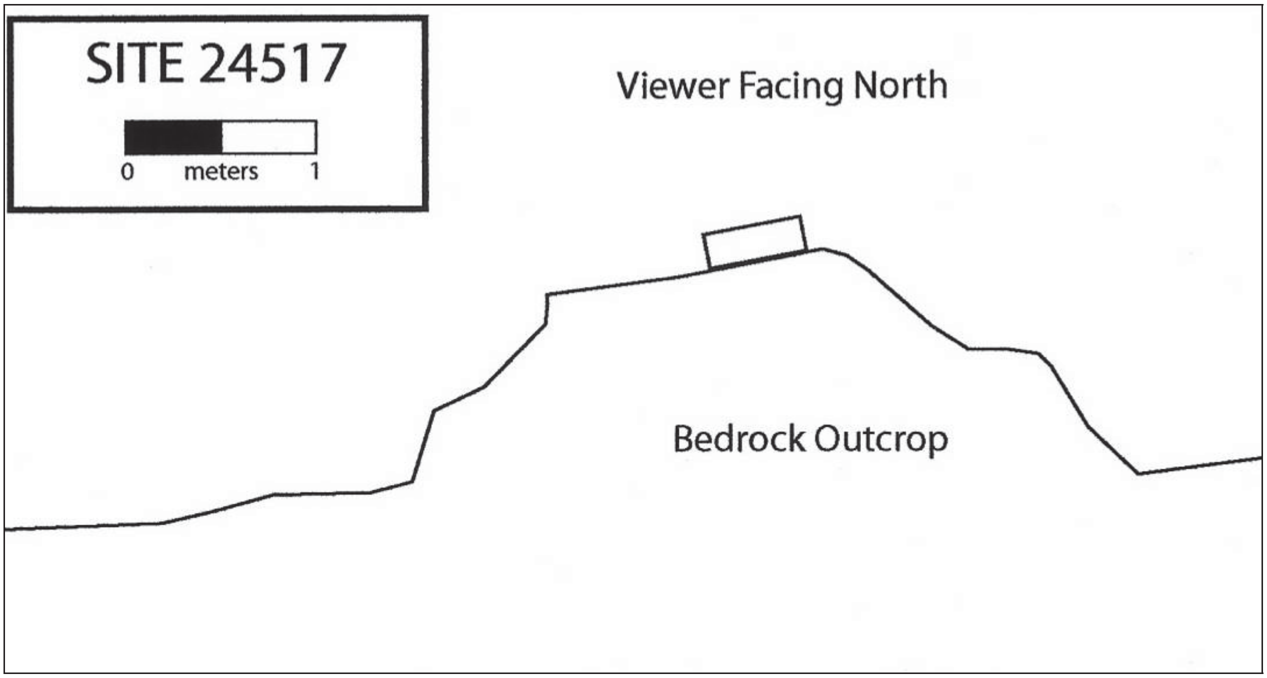

Figure 72: Site 24517 Profile.

SITE 24518	**AHU**
FUNCTION:	Marker
AGE:	Pre-Contact to Early Post-Contact Era
DIMENSIONS:	Length: 0.5 m N/S; Width: 0.4 m; Height, 0.2 m Max.
CONDITION:	Good
INTEGRITY:	Not Impacted
SURFACE ARTIFACTS:	None
EXCAVATION:	None
LOCATION:	Outside of APE

DESCRIPTION: Site 24518 is an *ahu* within Alignment 4-5-6 at Station 435+00 (see Figure 70). The *ahu* is located on a pāhoehoe outcrop north of a seasonal gulch situated on a broad alluvial/colluvial plain, at an elevation of 1965 feet amsl (600 m). The *ahu* is a single platy pāhoehoe boulder 0.4 by 0.3 m, and is 0.1 m height. It has been placed at the top of a bedrock outcrop (Figure 73). The outcrop raises the *ahu* 1.3 m above the surrounding ground surface. It is probably related to the *ahu* at Site 24517.

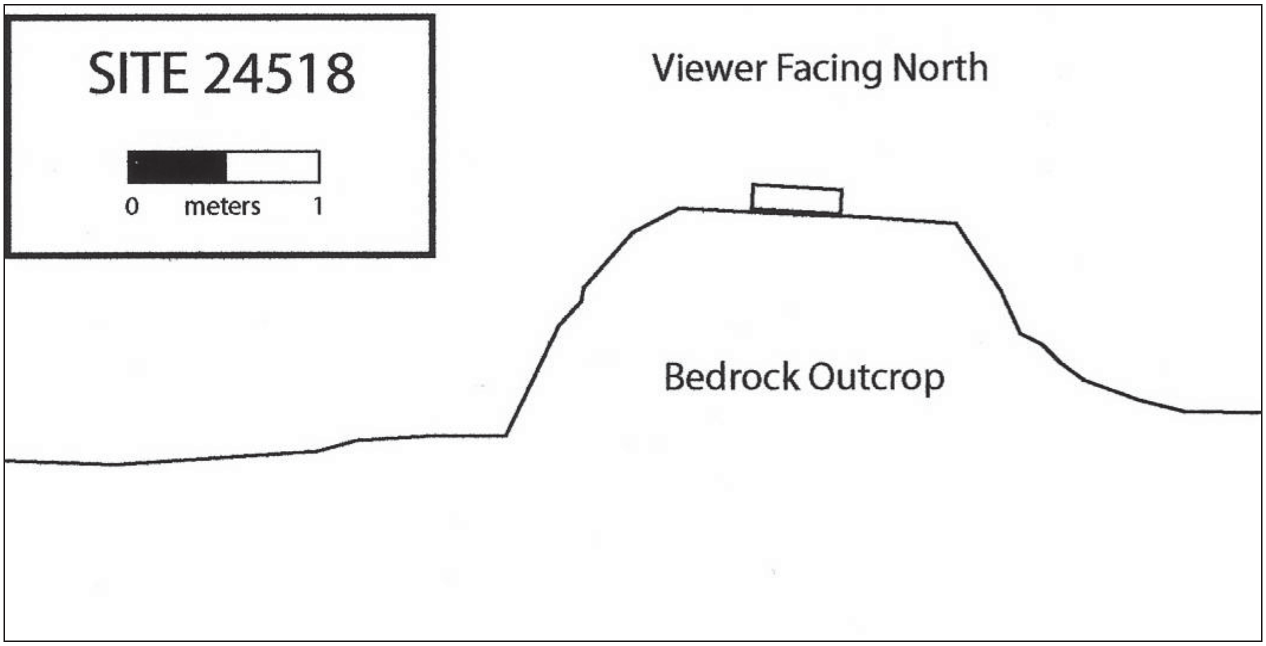

Figure 73: Site 24518 Profile.

DISCUSSION

There are a variety of types of sites and features in the Saddle Road Extension study area (Table 30). Individual sites have been described. This section includes a short discussion of how some of these sites articulate with one others, as well as with the surrounding natural and cultural landscape. This is followed by a significance evaluation for all of the sites, that includes suggestions for further work.

Table 30: Project Area Archaeological Site Types.

Type	# of Features	at # of Sites
Abrader basins	38	2
Cave burial	3	1
Cave light usage	4	4
Cave refuge	25	1
Enclosure	3	1
Historical road	1	1
Historical boundary marker	1	1
Pāhoehoe Excavation	60	16
Petroglyphs	1	1
Places with one or more *ahu*	27	12
Prehistoric trail	12	12

Type	# of Features	at # of Sites
Ridge quarry	12	3

TRAILS

The trails in the study area can be characterized by their physical makeup, and their configuration on the landscape (Table 31). The trails here are manifest in two main ways: 1) as a visible and continuous pathway visible on the lava, or 2) lacking a visible pathway being identified by intermittently spaced stone markers. The continuously visible trails are referred to here as “Restricted” trails, and the trails identified by stone markers are referred to as “Unrestricted” trails. The distinction between these two types of trails is directly related to the kind of lava surface associated with them.

Table 31: Trail Attributes.

Site	Physical makeup	Configuration
24499	Restricted	Parallel to ocean
24503	Restricted	*Mauka-makai*
24505	Restricted	Mesh like network
24506	Restricted	Mesh like network
24506	Restricted	Mesh like network
24508	Restricted	Mesh like network
24510	Restricted	*Mauka-makai*
24512	Restricted	*Mauka-makai*
24513	Restricted	Parallel to ocean
24514	Restricted	*Mauka-makai*
24515	Unrestricted	*Mauka-makai*
24517	Restricted	Parallel to ocean
n=12	Restricted: 11 (91.7%)	Parallel to ocean: 3 (25.0%)
	Unrestricted: 1 (8.3%)	*Mauka-makai*: 5 (41.7%)
		Mesh like network: 4 (33.3%)

Restricted Trails

Restricted trails are those trails where the pathway can be clearly seen on the lava surface. The pathway can be manifest in a variety of ways. In most instances the rough lava has been moved aside resulting in a pathway 0.3 m wide. The rocks that remain are relatively small (< 20 cm) giving the impression that the pathway has been paved. Alternatively, the rough homogeneity of the pathway stones may be a byproduct of years of use by many people. The Kanikū ‘a‘ā is brittle, and use over time could easily have broken down the *in situ* lava within the trail alignment into pieces. In this case, rather than bringing in small lava pieces to pave the path, it is more likely that the trail surface was created through use. There are, however, places where rocks were brought in to build up low areas and crevices.

There are also places along restricted trails where there are few or no stones in the pathway. The trail is visible on the bare lava as a distinctly different color and texture. The brittle Kanikū lava is broken up along a pathway. The brown color of the natural surface is removed, and the underlying rougher and darker grey color is exposed.

The characteristics of the Restricted Trails appear to relate directly to the intensity of their use. Heavily used trails are slightly broader, have more areas that have been filled, and show more underlying dark grey lava than do Restricted Trails that have been traversed less. There are many places on the Kanikū flow with ephemeral Restricted Trails, or where more obvious Restricted Trails end in the middle of nowhere. This can be interpreted as direct indication of infrequent use, which may be the result of a change in the composition of the ground surface or landscape allowing for unrestricted travel, rather than an indication that travel to these areas did not occur.

Unrestricted Trails

The precise pathway for Unrestricted Trails is not indicated by any direct macroscopically available data. Rather, the pathway is identified by the intermittently and strategically placed stone *ahu*. Stone *ahu* mark the direction to proceed, but do not necessarily restrict the traveler to a precise or particular pathway. Any unrestricted pathway could be traversed as long as the traveler continued in the direction marked by the *ahu*. The Unrestricted Trails within the western portion of the study area (near Queen Kaʻahumanu Highway) are on the flows that predate the Kanikū. These flows are smooth, light brown, ropey pāhoehoe with a relatively level surface. This type of surface facilitates walking. There are no large crevices, thus no need to create filled-in stone pathways. This surface does not show signs of alteration as a result of pedestrian travel. Consequently, there is no identifiable pathway on these older flows. Unlike the Restricted Trails on the Kanikū flow, the lack of a visible pathway on the surface precludes the ability to interpret the intensity of use on the Unrestricted Trails.

TRAIL CONFIGURATION

Trails in the western portion of the study area are situated on the landscape in several ways (see Figure 19). Trails are oriented: 1) *mauka-makai*, 2) parallel to the ocean, and 3) in a mesh-like network.

The convergence of several trails occurs in two locations within the project area. The area of convergence furthest west is a mesh-like network of trails in an area notable for the presence of scraped areas on the smooth pāhoehoe, and one petroglyph. This nodal point is referred to as the Primary Intersection (at the abrader basin Site 24509, see Figure 9). A Secondary Intersection (at the petroglyph Site 24488, see Figure 9) is situated at the boundary of the Kanikū flow and the older pāhoehoe flow. There is a petroglyph at this intersection, also.

Mauka-Makai

There are two *mauka-makai* trails (Site 24503 and 24514) that connect the ocean to the western portion of the study area. The southernmost of these trails (Site 24503) connects the Primary Intersection to the Ahuolono Heiau. The northernmost trail connects the inland-most portion of the ‘Anaeho’omalu Bay to the uplands. Both trails are well defined Restricted Trails which exhibit high intensity use. These trails proceed to the mesh-like network of trails in the area where there are many abrader basins, pāhoehoe excavations, and ridge quarries. A third Restricted *mauka-makai* trail (Site 24512) is parallel to and between Sites 24503 and 24514. Also, they are only 50.0 m apart. This trail is more ephemeral than trail Sites 24513 and 24514, suggesting less use.

Trail morphology changes from Restricted to Unrestricted at the Secondary Intersection where the rugged Kanikū flow meets the older, smoother pāhoehoe flow. There are two known trails and a suspected third trail which extend into the uplands from the Secondary Intersection.

The southernmost trail is only inferred. The entrance to the refuge cave is over 2,500 feet further upslope from the Secondary Intersection. There is no Restricted Trail from the intersection to the cave entrance. In addition, there is no obviously marked Unrestricted Trail either. It is conceivable that a trail to a refuge cave was purposely not marked; a marked trail would defeat the purpose of keeping a place of refuge during wartime hidden. This proposition is supported with the presence of a clearly marked Unrestricted Trail (Site 24515) from the Secondary Intersection across the smooth pāhoehoe into the rugged Kanikū flow a short distance to the north.

Five *ahu* mark an Unrestricted Trail from the Secondary Intersection to the Kanikū flow. The *ahu* on the pāhoehoe are spaced from 45.0 to 65.0 m apart, with a much larger gap (200.0 m) to the large easternmost *ahu*, easily seen from a distance on the high Kanikū flow. There is no clear indication as to how the trail proceeds once it reaches the Kanikū flow. There is a notable rise several hundred meters in the same direction, where Site 24495 ridge quarry is located. *Ahu* markers would not be necessary if that was the destination/pathway of the trail, and that may explain the absence of *ahu* here. The absence of an identifiable Restricted Trail along this way suggests one of two (not mutually exclusive) things: 1) few people may have walked out in this area, or 2) once in the rugged Kanikū flow people meandered across the landscape in search of the one resource in the area: dense basalt (at ridge quarries). It should be noted that the direction of this pathway (established by Site 24515) is oriented in line with the group of potential burial platforms that are approximately 3 km (2 miles) further upslope. These 15 platforms (referred to as the "Archaeological Preserve" in Figure 1) have not been tested to confirm that burials are present, but their shape and context have been interpreted as burial features (Jensen and Burgett 1991ab). This pathway would have provided the most direct route between those features and ʻAnaehoʻomalu Bay.

Parallel to the Ocean

There is only one trail in the western portion of the study area that is oriented parallel to the ocean (Site 24499). It is a well defined Restricted Trail on the Kanikū flow. The trail is relatively straight, with mild meanders around difficult terrain, and limited areas where rocks have been placed in crevices for the pathway. There is a short Unrestricted portion of the trail on the older flow north of the Kanikū flow that is marked with three *ahu* in this lower elevation and smoother surface. The trail is not evident in the smooth older flow or the Kanikū flow further to the north. The significance of this is unclear. It is possible that the trail did not proceed in a northerly direction. Perhaps the trail angled on the older flow and continued in a more easterly direction. Alternatively, the trail may have continued on a northward course, but has subsequently been destroyed by the quarry activity in the area. Further investigations in these areas may identify additional portions of the trail.

Mesh-like Network

There are an unspecified number of ephemeral Restricted Trails in the Kanikū flow to the east and south of the Primary Intersection. There is a direct correlation between clarity of definition of these trails with their proximity to the Primary Intersection. In other words, the closer to the Primary Intersection the more well defined the trails are. This is interpreted as indicating that travelers heading into the Kanikū flow to the east and south started from several main trails connecting to the Primary Intersection, then spread out into the Kanikū flow as the distance from the Primary Intersection increased.

A similar phenomenon to a lesser degree occurs at the Secondary Intersection. A Restricted Trail connects the Secondary Intersection to the Kanikū flow to the south. The trail is moderately well-defined for a few meters then cannot be traced further. This is interpreted as indicating that all travelers from the Secondary Intersection into the Kanikū flow to the south began at the intersection, traveled the same southerly route for a few meters, then spread out into the Kanikū flow in an unrestricted fashion.

This phenomenon occurs to a lesser degree in association with the Restricted Trail oriented parallel to the ocean (Site 24499). There are an unspecified number of extremely ephemeral Restricted Trails in the Kanikū flow east of Site 24499. The trail locations cannot be identified solely on the basis of their pathway morphology. Rather, the trails are inferred to have existed in these locations, because there is direct evidence of people working within the Kanikū flow away from the main trail. Basalt quarries are widely distributed in the Kanikū flow. In addition, two large opihi shells were observed and collected away from the main trail. There are no observable trails to the quarries or the opihi shells. There are several short segments of ephemeral Restricted Trails that do not connect to any obvious culturally used or modified areas.

Further Inland

There are several *ahu* distributed in the higher elevations of the study area (Sites 24493, 24494, 24517, 24518, and at Site 24465). They are distributed far apart from one another, too far to be certain that they represent markers for one or more Unrestricted Trails in the area. However, the lack of a clear pattern is probably more a function of the limited survey sample. The presence of *ahu* in the area suggests that systematic inspection of the areas beyond the APE would reveal more *ahu*. In other words, the study area sample of the uplands is sufficient enough to confidently propose that there are more *ahu* beyond the sampled area.

Trails in the uplands were probably designed to facilitate movement from the ocean to the upland resources such as forests and even to the mountains. More locally, the numerous caves were also probably destinations reached via the trails. The features and burials in some of the caves around the APE indicate that people did pass this way. The *ahu* at the northern edge of Site 24465, the multiple enclosures, suggests that the enclosures were along a prehistoric trail, providing additional support for the proposition that the enclosures were built and used during prehistory.

DESTINATIONS: PATTERNS OF TRAIL USE IN THE AREA

Trail morphology and orientation provides data that can be used to interpret how the trails were used. The network of trails in the western end of the study area appears to have been designed to serve a variety of purposes.

Two trails connect the shoreline to the western end of the study area at the Primary Intersection. Travelers at the Primary Intersection could turn east and south into the Kanikū flow, following main trails for a short distance before spreading out into the Kanikū flow in random places. The quarry sites in the Kanikū flow indicate that the lava in this area was a desired resource and destinations for these pathways.

From the Primary Intersection travelers could proceed further inland, or turn south into the Kanikū flow and spread out into the lava beyond restricted pathways. A concentration of abrader basins (Site 24509) is at the intersection.

At the Secondary Intersection travelers would choose between four major pathways. ① Turning south, travelers would move into the Kanikū flow and spread out into the lava beyond restricted pathways. ② Proceeding eastward from the Secondary Intersection, travelers would cross the old flow on an unmarked trail to the refuge cave (Site 24470). ③ Proceeding northeast, travelers would cross the old flow on a marked Unrestricted Trail. That trail connects to the Kanikū flow at a place marked with a large *ahu* at the crest of the higher Kanikū flow. The largest basalt quarry in the area (Site 24495, a ridge quarry) is located along the pathway's orientation, but there is no observable trail to that quarry. This suggests that the quarry was used infrequently, or that the travelers to that destination created their own unspecified path to and from that quarry. This same pathway (Site 24515) is along an alignment that directs the traveler to the complex of burials 4.8 km further inland. There is no direct evidence to indicate that this trail once continued all the way (or beyond) that burial complex, but the lack of an obvious trail there does not necessarily mean that people did not use this route to get to the burials. The data from this investigation clearly indicates that infrequently used trails leave ephemeral evidence of their existence. It may be that the burials were infrequently visited, and that the trail leading there is barely, if at all, discernible. ④ Proceeding north from the Secondary Intersection, travelers would traverse the well defined Restricted Trail that parallels the ocean (Site 24499) and crossed the Kanikū flow. This trail would have been use to gain access to the basalt quarries on the Kanikū flow in this area, and to move rapidly northward inland from the ocean.

This well-defined trail (Site 24499) was heavily used. It may have been a major pathway for long distance travelers. Unfortunately the northern route of the trail cannot currently be identified, and the precise orientation is not known. The trail may have provided a link between coastal villages north of ʻAnaehoʻomalu to the Kanikū flow and its resources. Or the trail may angle to the east and upland, and connect with communities further inland. These propositions can be tested with additional investigations.

GROUPS OF AHU

There are several places where *ahu* occur in groups of pairs (Site 24497) or triplets (Site 24467, 24468, 24469, 24496, 24498, 24504). One of these is clearly associated with an Unrestricted Trail pathway (Site 24498), but the others may have functioned in another fashion. Rather than marking places to proceed, they may have marked thresholds not to exceed. The line of three *ahu* at the convergence of two tubes within the Bat Cave at Site 24496 might be such a "boundary" marker. Another cave somewhat similar cave context is deeper into the Bat Cave with two *ahu* at Site 24497. The three *ahu* at the terminus of the Refuge Cave (Site 24469) are associated with a place that cannot be exceeded: the cave ends there.

Sets of three *ahu* also occur on the surface in the uplands (Site 24467), at a ridge quarry (Site 24468), and an ephemeral Unrestricted Trail (Site 24504). These three sites do not have anything in common functionally, but all three may share a locational trait: they are relatively close to the border between Kona and Kohala. The limited set of data described above suggests that these triplets of *ahu* could represent boundary markers. This hypothesis cannot be confirmed based on the limited data collected in the relatively small and biased survey sample from this study. It is a testable hypothesis, however. Systematic investigation of the boundary area, and comparison of the results to patterns of *ahu* in non-boundary contexts would supply data sufficient to examine this proposition.

ABRADER MANUFACTURING: QUARRIES AND BASINS

Several types of basalt extraction and processing sites have been identified on a large area of the Kanikū flow (Ching 1971; Clark and Kirch 1983; Rosendahl 1972). Basalt extraction and processing sites were first documented by Ching (1971) and were described as abrader production sites characterized by basin-shaped depressions worn into the smooth pāhoehoe during the production of basalt abraders and saws, from locally available scoriaceous basalt cobbles. It was assumed based on blanks and partially produced abraders found at these sites, that the unprocessed basalt was gathered from the broken pāhoehoe surrounding the abrader production areas.

The raw material most often used for the production of abrader tools at these sites is characterized as a black cindery pāhoehoe containing a high concentration of olivine crystals. The flow itself is rolling and broken up in many places, allowing for easy extraction. The surface of the flow tends to break up without much effort into platy cobbles from 5.0 to 15.0 cm in thickness and overlays a loose conglomerate of softer loosely packed basalt pebbles and cobbles.

The largest abrader production site was designated by Ching (1971) as Area Omega (Rosendahl 1972 lists this site as 1385). This area is just south of the Saddle Road Extension study area, and contained over 1,000 depressions within a 2,000 square foot area of flat to uneven rolling pāhoehoe (Ching 1971:241). They are roughly oval, round, oblong, elliptical, or grooved, and average 20.0 by 40.0 cm, and are from 2.0 to 2.5 cm deep.

Partially manufactured blanks found at the site were found in the hundreds and range from rectangular to triangular and from rounded to pointed. Numerous faint foot worn trails connected clusters of production depressions and also lead to a *mauka-makai* trail and the Māmalahoa Trail. Except for a single *ahu* located on a promontory within the site, habitation features such as U-shapes, C-shapes, L-shapes, and cave shelters were all located on the fringes surrounding the abrader production area. Similar features have been documented along the north of ʻAnaehoʻomalu Bay from Makaīwa Bay to Pauoa Bay (Kirch 1979). Midden is scarce at these sites and the majority of shelters associated with them appear to be temporary and related to abrader manufacture. Over 180 quarry features and more than 330 individual abrader manufacturing work stations have been documented within ʻAnaeho'omalu and Waikoloa *ahupua'a* (Landrum et al. 1992). In addition to pan-shaped basins, there were also basalt quarrying stations in the pāhoehoe surface, in pressure blisters, and on the surface of large boulders.

Pāhoehoe excavation areas (50 pits in 16 sites) and abrader basins (38 basins in 2 sites) were observed within the Saddle Road Extension study area. They are concentrated in the lower elevations near the trail convergence areas. The pāhoehoe excavation farthest inland is at the 200 foot elevation. All of the pāhoehoe excavations are located in the older, smooth Mauna Loa flow, or, in two instances (Sites 24521 and 24522), in small outcrops of smoother pāhoehoe within the Kanikū flow. The bias towards using the smoother pāhoehoe suggests that the extraction technique that creates the pāhoehoe excavation characteristics is designed to retrieve a denser, fine grained basalt. This type of basalt is commonly used in manufacture of adzes. Excavations in the rougher Kanikū flow appear to be designed to extract scoriaceous material that is rough, and porous with olivine crystals. This material is used to create abraders.

While removal of scoriaceous material appears to be clearly related to abrader manufacture, the function of the pāhoehoe excavations in denser pāhoehoe lava is not as clear. Pāhoehoe excavations at higher elevations have been interpreted as having been built to encourage and support nesting of petrels (Glidden et al. 1997). Petrels would nest in these locations, and their offspring could be easily procured. The presence of petrel bones in the Refuge Cave (Site 24470), and possibly in the Bat Cave (with medium procellariid) lends some support to the notion that petrels were actively procured in the area, perhaps at these pāhoehoe excavations, especially since several pāhoehoe excavations are near the Refuge Cave.

The older, smooth Mauna Loa flow is not the only source for dense basalt, however. The ridge quarries scattered throughout the rough Kanikū flow produce a very dense, fine grained basalt. Although the rugged Kanikū flow is an ʻaʻā flow, there are many places scattered across that flow where wave-like shapes of basalt emanate upward from the ʻaʻā. These are often in channels along the ʻaʻā, and may be associated with a differential flow pace or composition relative to the surrounding area. These wave-like shapes rise upward, and bend over exposing roughly convex sheets of basalt standing from 1.0 to 3.0 m above the bottom of the channels. The tops of the basalt sheets are thin (from 0.2 to 0.8 m thick) and show signs of natural cracking associated with cooling. Displacement of cracked basalt some meters away from its source suggests human action in the extraction and possible selection of the quarried basalt.

Seven ridge quarries (at 5 sites) were identified in this study. These are distributed further inland than the pāhoehoe excavations. Sites 24468, 24480, and 24481 are 3.0 km from the shoreline and up to 820 feet amsl. This kind of resource was important enough to travel notable distances over difficult terrain to obtain. This level of effort suggests that the raw material taken from these ridge quarries was a desired and valuable resource.

REFUGE CAVE CHRONOLOGY AND FUNCTION

The massive architecture creating a constricted entrance in the eastern opening of Site 24470 suggests that the cave was used for refuge. The one radiocarbon date from a small feature near the eastern end suggests that the cave was used at least around AD 1400. However, the data does not conclusively indicate that the refuge function was conducted at AD 1400.

The early occupation of this part of the island was probably directly related to fishing pursuits (Kirch 1979). The cache of fishing gear in nearby Site 24486 is another example of that focus. Permanent habitation may not have occurred until the 1500s. A refuge cave would not have been necessary if there were no one inhabiting the area that would need to take refuge.

The AD 1400 date may reflect short term occupation of the cave during fishing excursions to the Kohala coast (Jensen 1989abcd; Kirch 1975, 1979). The date was recovered from material near the eastern entrance, and would have been lit by sunlight prior to the building of the massive architecture to constrict the entrance.   There are few features near this eastern entrance, which may also reflect a short and temporary use of this area. The higher density of features under the lit western opening is more similar to refuge cave morphology, where terraces and platforms for groups of people hiding and under during duress are more common seems plausible.

HISTORIC PROPERTIES SIGNIFICANCE ASSESSMENT

Site significance evaluations for all sites documented in this report were based on eligibility criteria for listing on the Hawaiʻi State Register of Historic Places and the National Register of Historic Places.

HAWAIʻI REGISTER OF HISTORIC PLACES SIGNIFICANCE EVALUATION

The ten archaeological sites identified during this project were assessed for significance in accordance with eligibility for listing on the Hawaiʻi State Register of Historic Places as outlined in Hawaiʻi Administrative Rules §13-275-6 (Table 32). To be significant, a historic property shall possess integrity of location, design, setting, materials, workmanship, feeling, and association and shall meet one or more of the following criteria [§13-275-6(b)]:

(a) It must be associated with events that have made a significant contribution to the broad patterns of our history [§13-275-6(b)(1)].

(b) It must be associated with the lives of persons significant in the past property [§13-275-6(b)(2)].

(c) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction property [§13-275-6(b)(3)].

(d) It must have yielded or may be likely to yield, information important in prehistory or history property [§13-275-6(b)(4)].

(e) Have an important value to native Hawaiian people or to another ethnic group of the State due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events, oral accounts-- these associations being important to the group's history and cultural identity property [§13-275-6(b)(5)].

Table 32: Hawai‘i Register Significance Evaluations and Recommended Treatments.

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
24466	Out	Historical survey marker	d	No Further Work
24467	In	Pre-Contact to Early Post-Contact Era trail markers	d	No Further Work
24468	Partially in	Pre-Contact to Early Post-Contact Era resource extraction, trail markers	d	Data Recovery
24469	Out	Pre-Contact and Historic era markers	d	No Further Work
24470	Partially in	Pre-Contact to Early Post-Contact Era refuge cave	d	Data Recovery
24471	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24472	In	Pre-Contact to Early Post-Contact Era c resource extraction	d	Data Recovery
24473	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24474	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24475	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24476	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24477	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24478	Partially in	Pre-Contact to Early Post-Contact Era marker	d	No Further Work
24479	Partially in	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24482	Out	Pre-Contact to Early Post-Contact Era resource extraction and shelter	d	No Further Work
24483	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24484	Out	Pre-Contact to Early Post-Contact Era resource extraction	d	No Further Work
24485	Out	Pre-Contact to Early Post-Contact Era resource extraction	d	No Further Work
24486	Out	Pre-Contact to Early Post-Contact Era tool	d	No Further Work

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
		manufacture cache		
24487	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24488	Out	Pre-Contact to Early Post-Contact Era image	d	No Further Work
24489	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24490	Out	Pre-Contact to Early Post-Contact Era marker	d	Data Recovery
24491	Out	Pre-Contact to Early Post-Contact Era resource extraction	d	No Further Work
24492	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24494	In	Pre-Contact to Early Post-Contact Era marker	d	No Further Work
24495	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery
24496	Out	Pre-Contact to Early Post-Contact Era shelter	d	No Further Work
24497	Out	Pre-Contact to Early Post-Contact Era shelter	d	No Further Work
24498	Out	Pre-Contact to Early Post-Contact Era markers	d	No Further Work
24499	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24502	Out	Pre-Contact to Early Post-Contact Era quarry	d	No Further Work
24503	Partially in	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24504	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24505	Partially in	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24506	Partially in	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24507	Out	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24508	In	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24509	Out	Pre-Contact to Early Post-Contact Era tool manufacture	d	No Further Work
24510	In	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
24511	In	Pre-Contact to Early Post-Contact Era tool manufacture	d	Data Recovery
24512	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24513	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24514	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24515	Partially in	Pre-Contact to Early Post-Contact Era transportation	d	Data Recovery
24516	Out	Pre-Contact to Early Post-Contact Era transportation	d	No Further Work
24517	In	Pre-Contact to Early Post-Contact Era marker	d	No Further Work
24518	In	Pre-Contact to Early Post-Contact Era marker	d	No Further Work
24521	Out	Pre-Contact to Early Post-Contact Era resource extraction	d	No Further Work
24522	In	Pre-Contact to Early Post-Contact Era resource extraction	d	Data Recovery

Based on cultural informant interviews and consultation; a review of oral histories, ethnographic documentation, written accounts of traditional legends and history, Māhele records and maps, previous archaeological studies conducted in the region; and the results of field survey, all sites documented in this report are eligible for listing on the National Register of Historic Places under Criterion "d" (see Table 32). All of the sites have and are likely to yield information important in prehistory and history. The archaeological sites outside of the APE will not be affected by the proposed Saddle Road Extension undertaking.

NATIONAL REGISTER SIGNIFICANCE EVALUATION

Sites identified during this project were assessed for their eligibility for listing on the National Register of Historic Places (NRHP) Criteria for Evaluation, as outlined in 36 CFR 60 (Table 33). To be assessed as significant a site must possess integrity of location, design, setting, materials, workmanship, feeling, and association and must be characterized by one or more of the following four criteria:

(A) It must be associated with events that have made a significant contribution to the broad patterns of our history, or be considered a traditional cultural property.

(B) It must be associated with the lives of persons significant in the past.

(C) It must embody distinctive characteristics of a type, period, or method of construction, or represent a significant and distinguishable entity whose components may lack individual distinction.

(D) It must have yielded or may be likely to yield, information important in prehistory or history.

Based on cultural informant interviews and consultation; a review of oral histories, ethnographic documentation, written accounts of traditional legends and history, Māhele records and maps, previous archaeological studies conducted in the region; and the results of field survey, all sites documented in this report are eligible for listing on the National Register of Historic Places under Criterion "D" (see Table 33). All of the sites have and are likely to yield information important in prehistory and history. The archaeological sites outside of the APE will not be affected by the proposed Saddle Road Extension undertaking.

Table 33: National Register Significance Evaluations and Recommended Treatments.

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
24466	Out	Historical survey marker	D	No Further Work
24467	In	Pre-Contact to Early Post-Contact Era trail markers	D	No Further Work
24468	Partially in	Pre-Contact to Early Post-Contact Era resource extraction, trail markers	D	Data Recovery
24469	Out	Pre-Contact and Historic era markers	D	No Further Work
24470	Partially in	Pre-Contact to Early Post-Contact Era refuge cave	D	Data Recovery
24471	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24472	In	Pre-Contact to Early Post-Contact Era c resource extraction	D	Data Recovery
24473	In	Pre-Contact to Early Post-Contact Era	D	Data Recovery

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
		resource extraction		
24474	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24475	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24476	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24477	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24478	Partially in	Pre-Contact to Early Post-Contact Era marker	D	No Further Work
24479	Partially in	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24482	Out	Pre-Contact to Early Post-Contact Era resource extraction and shelter	D	No Further Work
24483	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24484	Out	Pre-Contact to Early Post-Contact Era resource extraction	D	No Further Work
24485	Out	Pre-Contact to Early Post-Contact Era resource extraction	D	No Further Work
24486	Out	Pre-Contact to Early Post-Contact Era tool manufacture cache	D	No Further Work
24487	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24488	Out	Pre-Contact to Early Post-Contact Era image	D	No Further Work
24489	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24490	Out	Pre-Contact to Early Post-Contact Era marker	D	Data Recovery
24491	Out	Pre-Contact to Early Post-Contact Era resource extraction	D	No Further Work
24492	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24494	In	Pre-Contact to Early Post-Contact Era marker	D	No Further Work
24495	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery
24496	Out	Pre-Contact to Early Post-Contact Era shelter	D	No Further Work

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
24497	Out	Pre-Contact to Early Post-Contact Era shelter	D	No Further Work
24498	Out	Pre-Contact to Early Post-Contact Era markers	D	No Further Work
24499	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24502	Out	Pre-Contact to Early Post-Contact Era quarry	D	No Further Work
24503	Partially in	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24504	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24505	Partially in	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24506	Partially in	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24507	Out	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24508	In	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24509	Out	Pre-Contact to Early Post-Contact Era tool manufacture	D	No Further Work
24510	In	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24511	In	Pre-Contact to Early Post-Contact Era tool manufacture	D	Data Recovery
24512	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24513	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24514	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24515	Partially in	Pre-Contact to Early Post-Contact Era transportation	D	Data Recovery
24516	Out	Pre-Contact to Early Post-Contact Era transportation	D	No Further Work
24517	In	Pre-Contact to Early Post-Contact Era marker	D	No Further Work
24518	In	Pre-Contact to Early Post-Contact Era marker	D	No Further Work
24521	Out	Pre-Contact to Early Post-Contact Era	D	No Further Work

Site #	Relation to APE	Site Type	Criteria for Significance	Recommended Mitigation
		resource extraction		
24522	In	Pre-Contact to Early Post-Contact Era resource extraction	D	Data Recovery

RECOMMENDED TREATMENTS

Of the total of 50 sites identified, many (n=24, 44%) are not within the proposed study area (see Table 32), and will not be impacted by the project. No data recovery is recommended for any of those sites outside of the APE as a condition of project completion since the proposed undertaking will not impact sites outside of the APE. Data recorded during the current AIS study, including site location, site age, formal site and feature type, feature construction, site and feature dimension, and formal site and feature function, is sufficient to make significance assessments for all sites documented in the AIS report. No additional work is recommended for sites outside of the APE as they will not be impacted by the proposed road construction undertaking. continuity of cultural landscape .. ?

Of the 28 sites within the APE, no further work is recommended for seven (identified as "none" in Table 32 for Mitigation Treatment), because the significant data contained within these sites has been collected in the form of measurements, photographs, descriptions, figures, documentary research, oral interview, and historical research. The appropriate research has been conducted for these sites, and further study would not contribute new information.

Treatments for 25 sites that are recommended for data recovery work are outlined below. This section is designed to provide general suggestions for research topics to pursue for each site. A detailed mitigation plan will be required prior to implementing these propositions.

Site 24470: Origins of refuge cave

Based on the limited investigations conducted in this inventory survey, it appears that the cave may have been used during different times for different purposes. The early date of AD 1400 may be associated with early intermittent use of the cave during fishing forays to this part of the island. Refuge activity may have been concentrated elsewhere in the cave, and have been conducted at different times. Data recovery excavations should be designed to investigate several different parts of the cave to examine potential multiple functions and chronology of the archaeology in the cave. Recommendation for additional excavations reiterates a previous recommendation to do so (Bevacqua 1972:14). Cave sites recommended for data recovery are listed in Table 32.

Trail sites

Trails were mapped in relative to the station markers for the alignments. This provided a relatively accurate location for the trails, and was sufficient for determining the extent of potential impact that the road might have on these resources. Data recovery should be conducted for all trails that will be impacted by road construction. Two kinds of data should be recovered: precise locations, and morphology. Precise locations can be generated by walking all trails with GPS equipment. Recorded locational data should include changes in lava flows and elevation. Data on the morphology should be collected to examine intensity of use. For instance, it was evident in the inventory survey that some trails were "well-worn" while others were ephemeral and difficult to observe. Detailed observations of this kind of data may provide insights into how the area was used. Why is there an apparently heavily used trail that runs parallel to the ocean yet is so far from the ocean? Did one or more trail link the shoreline habitation to the refuge cave, and if so, what does that say about the relationship of the refuge area to the settlement(s)? Trail sites recommended for data recovery are listed in Table 32.

Quarry sites

There are two kinds of quarry sites: pāhoehoe excavations and ridge quarries. It can be expected that materials from these quarries were used locally in settlements at the nearby shoreline. They may also have been moved, traded, or given to people to use in places further afield in the ahupuaʻa (at Waimea for instance), with neighboring *ahupuaʻa*, across the island, or with other islands. Research into the use and distribution of raw materials can be enhanced with mineralogical studies of raw material composition. Currently all of the rough ʻaʻā is identified as the Kanikū flow. However, by walking the flow it is clear that there are several different flow events that are lumped into this label. Different flows will have different mineralogical signatures. Materials for quarry sites from different parts of the Kanikū flow should be collected and examined for distinguishing mineralogical markers. These can be compared with materials collected and identified from other archaeological sites in Hawaiʻi. Quarry sites recommended for data recovery are listed in Table 32.. The data recovery plan should choose strategically from these to achieve the goals outlined above.

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