APPENDIX A

Pre-Consultation Comments

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Deputy Director
BRUCE Y. MATSUI
LINDEN H. JOESTING
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

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

May 28, 2004

Dear Waimanalo Neighbor:

The State Department of Transportation (DOT) is preparing a Draft Environmental Assessment (EA) for the Kalanianaole Highway Improvements project and would appreciate your input. A Public Informational Meeting (PIM) is planned on Wednesday, June 30, 2004 from 7:00 pm to 9:00 pm at the Waimanalo Public and School Library (41-1320 Kalanianaole Highway). The purpose of the PIM is to discuss present the conceptual plans which the design will be based on and to allow the public an opportunity to provide comments for inclusion in the Draft EA. The purpose of the Draft EA is to address the environmental, social, and economic consequences of the proposed project before granting permits that allow construction to begin. Additionally, the EA process provides an opportunity for public involvement in planning projects that affect the community.

The DOT is planning to improve traffic operations on Kalanianaole Highway between Olomana Golf Course and Waimanalo Beach Park by making improvements within the existing highway right-of-way. The project location is shown on the opposite side of this page. Improving the highway will make the highway operate more efficiently and also make it safer and friendlier to pedestrians and other highway users.

Proposed improvements to the highway include left turning lanes at Flamingo Road, Kumuhau Street, Humuniki Street, Mekia Street, Moole Street (both directions), Inoaole Street, and Aloiloi Street. The left turning lanes will improve the through traffic along Kalanianaole Highway and provide for safer conditions. Shelter lanes are proposed for left turning vehicles entering Kalanianaole Highway from side streets to make it safer for those drivers and to help improve traffic flow along Kalanianaole Highway. Where space is available, bus pullouts are proposed to alleviate queuing and improve traffic flow. The bus pullouts will also allow vehicles to pass by the bus instead of going around the bus and crossing double yellow solid pavement markings.

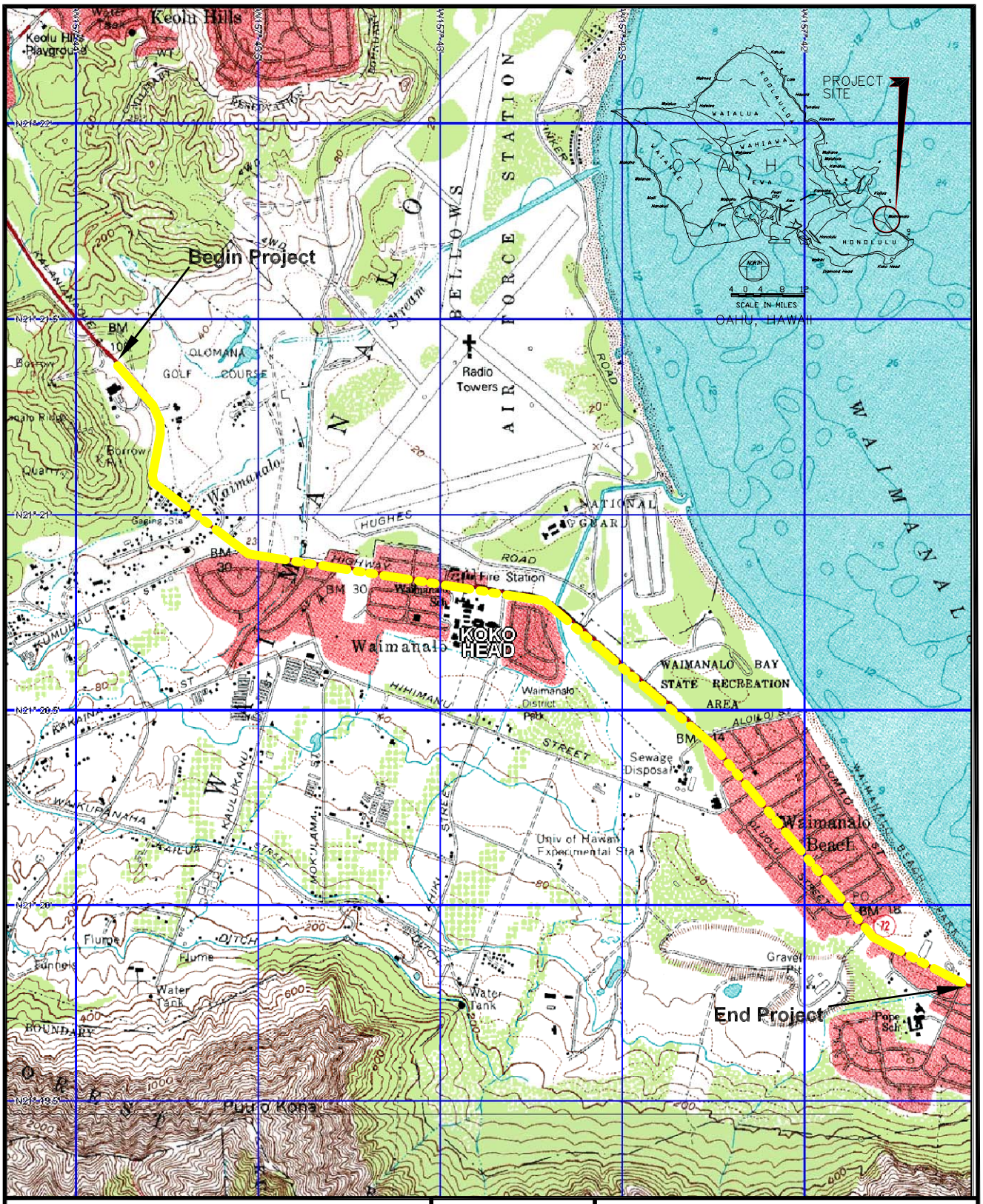
The plans also call for the existing concrete sidewalk on the mauka-side of the highway from Kumuhau Street to Inoaole Street to be reconstructed with a new ADA (Americans with Disabilities Act) accessible concrete sidewalk. The replacement will also include new ADA accessible driveways and curb ramps. This portion of the highway has been designated by the community as being one of the primary routes used by school children traveling to and from the Waimanalo Elementary and Intermediate School. Remaining areas along Kalanianaole Highway that do not have concrete sidewalks will have an asphalt concrete paved shoulder. Also, in locations identified by the community, a shared use grassed path (where available) is proposed to allow equestrian riders to traverse along Kalanianaole Highway to designated locations along the project.

We would greatly appreciate any questions, concerns or comments pertaining to the Kalanianaole Highway improvements. If you are interested in participating in preparation of the Draft EA, please send a letter with your questions, concerns or comments to:

State of Hawaii, Department of Transportation
Highways Division, Design Branch, Technical Design Services Office
601 Kamokila Blvd., Rm. 688
Kapolei, Hawaii 96707
Attn: Vincent Llorin

Fax: 692-7555

e-mail: vincent.llorin@hawaii.gov



Project Location

0 2000 4000

Scale In Feet

N

Reference: 3-D TopoQuads, Delorme, 1999
Source Map: USGS Topographic Map (1983)
Koko Head Quadrangle

Project:	03058-001
Approved by:	JKH
Drawn by:	LMS
Date:	October 2003
Scale: 1"=2000' Approximately	

Figure 1
Site Vicinity Map
Kalanianaole Highway Improvements
Olomana Golf Course to Waimanalo Beach Park
Waimanalo, Oahu, Hawaii

Mountain Edge Environmental, Inc.
Hydrogeological & Environmental Consulting

LINDA LINGLE
GOVERNOR

RODNEY K. HARAGA
DIRECTOR

Deputy Director
BRUCE Y. MATSUI
LINDEN H. JOESTING
BRIAN H. SEKIGUCHI

IN REPLY REFER TO:

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

May 28, 2004

SUBJECT: Draft Environmental Assessment Consultation and Public Informational Meeting (PIM)
Kalanianaole Highway Improvements
Between Olomana Golf Course and Waimanalo Beach Park
Waimanalo, Oahu, Hawaii

The State Department of Transportation (DOT) is preparing a Draft Environmental Assessment (EA) for the Kalanianaole Highway Improvements project and would appreciate your input. A Public Informational Meeting (PIM) is planned on Wednesday, June 30, 2004 from 7:00 pm to 9:00 pm at the Waimanalo Public and School Library (41-1320 Kalanianaole Highway). The purpose of the PIM is to present the conceptual plans which the design will be based on and to allow the public an opportunity to provide comments for inclusion in the Draft EA.

The DOT is planning to improve traffic operations on Kalanianaole Highway between Olomana Golf Course and Waimanalo Beach Park by making improvements within the existing highway right-of-way. The project location is shown on the attached figure. Improving the highway will make the highway operate more efficiently and also make it safer and friendlier to pedestrians and other highway users.

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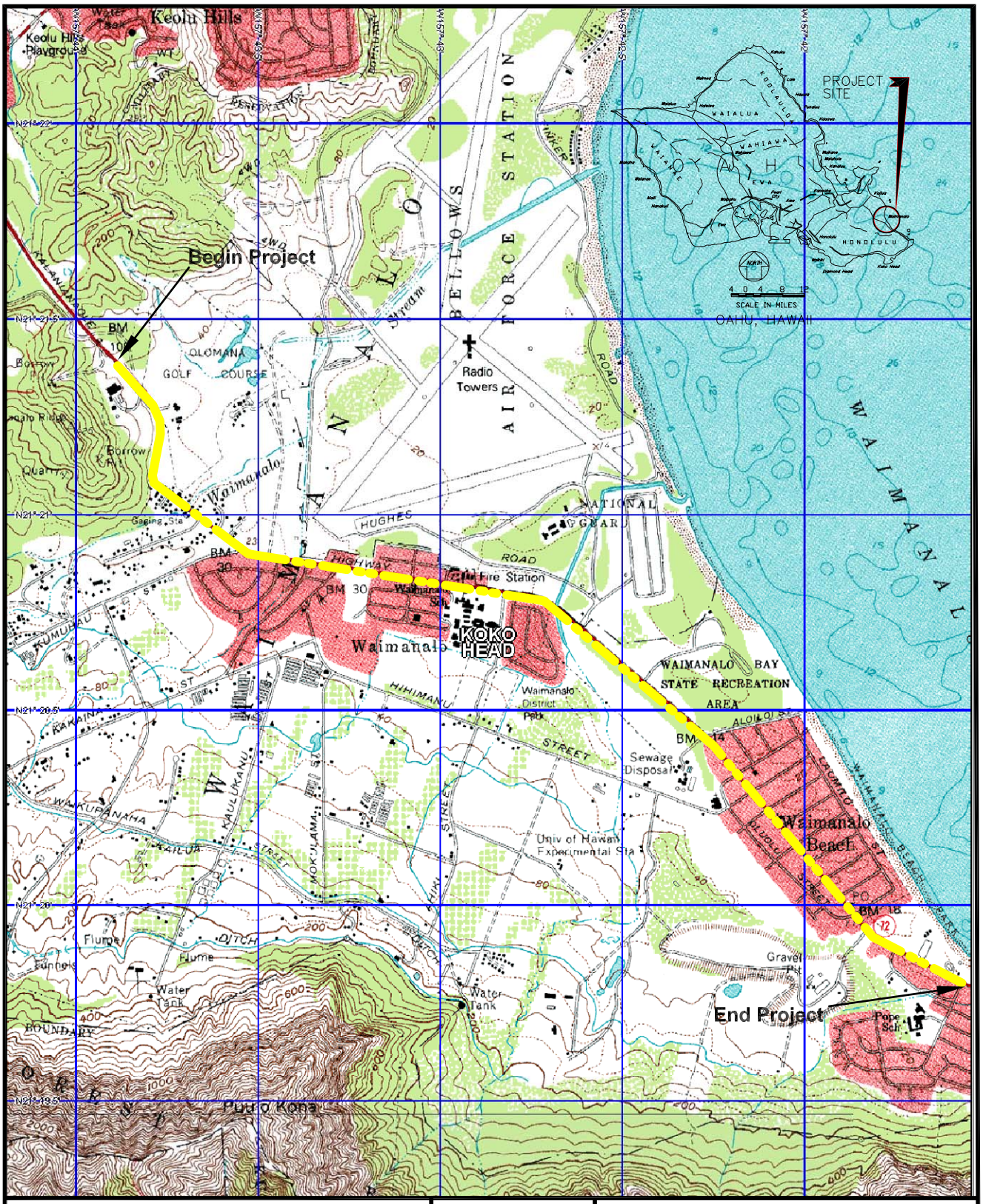
The plans also call for the existing concrete sidewalk on the mauka-side of the highway from Kumuhau Street to Inoaole Street to be reconstructed with a new ADA (Americans with Disabilities Act) accessible concrete sidewalk. The replacement will also include new ADA accessible driveways and curb ramps. This portion of the highway has been designated by the community as being one of the primary routes used by school children traveling to and from the Waimanalo Elementary and Intermediate School. Remaining areas along Kalanianaole Highway that do not have concrete sidewalks will have an asphalt concrete paved shoulder. Also, in locations identified by the community, a shared use grassed path (where available) is proposed to allow equestrian riders to traverse along Kalanianaole Highway to designated locations along the project.

If you would like to be a consulted party in preparation of the Draft EA, please send a letter with your questions, comments or concerns to:

State of Hawaii, Department of Transportation
Highways Division, Design Branch, Technical Design Services Office
601 Kamokila Blvd., Rm. 688
Kapolei, Hawaii 96707
Attn: Vincent Llorin

Fax: 692-7555

e-mail: vincent.llorin@hawaii.gov



Project Location

0 2000 4000

Scale In Feet

N

Reference: 3-D TopoQuads, Delorme, 1999
Source Map: USGS Topographic Map (1983)
Koko Head Quadrangle

Project:	03058-001
Approved by:	JKH
Drawn by:	LMS
Date:	October 2003
Scale: 1"=2000' Approximately	

Figure 1
Site Vicinity Map
Kalanianaole Highway Improvements
Olomana Golf Course to Waimanalo Beach Park
Waimanalo, Oahu, Hawaii

Mountain Edge Environmental, Inc.
Hydrogeological & Environmental Consulting

BOARD OF WATER SUPPLY

CITY AND COUNTY OF HONOLULU
630 SOUTH BERETANIA STREET
HONOLULU, HI 96843

JEREMY HARRIS, Mayor

EDDIE FLORES, JR., Chairman
CHARLES A. STED, Vice-Chairman
HERBERT S. K. KAOPUA, SR.
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Manager and Chief Engineer

DONNA FAY K. KIYOSAKI
Deputy Manager and Chief Engineer

June 14, 2004

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1 8 2004
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Mr. Vincent Llorin
Highways Division, Design Branch
Department of Transportation
State of Hawaii
Technical Design Services Office
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Subject: Your Letter of May 28, 2004 on the Draft Environmental Assessment for Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park

Thank you for the opportunity to comment on the proposed project.

The construction drawing should be submitted for our approval.

The construction schedule should be coordinated to minimize impacts to the community and the water system.

If you have any questions, please contact Joseph Kaakua at 748-5442.

Very truly yours,

for CLIFFORD S. JAMILE
Manager and Chief Engineer

DEPARTMENT OF COMMUNITY SERVICES
CITY AND COUNTY OF HONOLULU
715 SOUTH KING STREET, SUITE 311 • HONOLULU, HAWAII 96813
TELEPHONE: (808) 527-5311 • FAX: (808) 527-5498 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

MICHAEL T. AMII
DIRECTOR

JOHN R. SABAS
DEPUTY DIRECTOR

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June 15, 2004

Mr. Rodney K. Haraga, Director
State of Hawaii
Department of Transportation
Highways Division
Design Branch, Technical Design Services Office
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Attention: Mr. Vincent Llorin

Dear Mr. Haraga:

Subject: Draft Environmental Assessment Consultation and Public Information Meeting Between Olomana Golf Course and Waimanalo Beach Park Waimanalo, Oahu, Hawaii

Thank you for the opportunity to comment on the proposed project. We have no comments to offer on the project at this time.

If there are any questions please call Mr. Van Morita at 527-5314.

Sincerely,

MICHAEL T. AMII
Director

MTA:dk

DEPARTMENT OF DESIGN AND CONSTRUCTION

CITY AND COUNTY OF HONOLULU

650 SOUTH KING STREET, 11TH FLOOR
HONOLULU, HAWAII 96813
PHONE: (808) 523-4564 . FAX: (808) 523-4567
WEB SITE ADDRESS: www.co.honolulu.hi.us

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JEREMY HARRIS
MAYOR

TIMOTHY E. STEINBERGER, P.E.
DIRECTOR

CDP 04-0092

June 29, 2004

Mr. Vincent Llorin
Technical Design Services Office
Design Branch, Highways Division
State Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Subject: Draft Environmental Assessment (EA) Consultation
Kalanianaole Highway Improvements
Between Olomana Golf Course and Waimanalo Beach Park
Waimanalo, Oahu, Hawaii

We have a planning study in the subject area and would like to be a consulted party for the Draft EA.

If there are any questions, please contact Dennis Toyama at 523-4756.

Very truly yours,

TIMOTHY E. STEINBERGER, P.E.
Director

GS:dk

DEPARTMENT OF PLANNING AND PERMITTING
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4414 • FAX: (808) 527-6743 • INTERNET: www.co.honolulu.hi.us

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JEREMY HARRIS
MAYOR

ERIC G. CRISPIN, AIA
DIRECTOR

BARBARA KIM STANTON
DEPUTY DIRECTOR

KATHY SOKUGAWA
ACTING DEPUTY DIRECTOR

2004/ELOG-1212 (RR)

July 2, 2004

Mr. Vincent Llorin
State of Hawaii, Department of Transportation
Highways Division, Design Branch, Technical Design Services Office
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Draft Environmental Assessment Pre-Assessment Consultation
Kalanianaole Highway Improvements, Waimanalo, Oahu, Hawaii

In response to your request regarding the pre-assessment consultation for Kalanianaole Highway Improvements, we have reviewed the proposal and offer the following comments:

1. The Draft Environmental Assessment (DEA) should include a section with discussions on how the proposed project is consistent with the objectives and policies of the City and County of Honolulu's General Plan.

2. The DEA should also include a section, which discusses how the proposed project is consistent with the Koolaupoko Sustainable Communities Plan.

3. The DEA should provide a listing of required approvals.

4. Portions of the project appear to be within the Special Management Area and may require a Special Management Area Permit. Please provide additional project information to our department for a formal determination.

Should you have any questions, please contact Robert Reed of our staff at 523-4402.

Sincerely yours,

for ERIC G. CRISPIN, AIA
Director of Planning and Permitting

EGC:mo
P:\Planning\DivFunction\Ea-eis\2004\elog-1212.doc

cc: Office of Environmental Quality Control

DEPARTMENT OF PARKS AND RECREATION
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 10TH FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4182 • FAX: (808) 527-5725 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

WILLIAM D. BALFOUR, JR.
DIRECTOR

EDWARD T. "SKIPPA" DIAZ
DEPUTY DIRECTOR

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DESIGN BR
HIGHWAYS DIVISION
DEPT. OF TRANSPORTATION

June 8, 2004

Mr. Vincent Llorin
State of Hawaii
Department of Transportation, Highways Division
Design Branch, Technical Design Services Office
601 Kamokila Blvd., Room 688
Kapolei, Hawaii 96707

Dear Mr. Lloren:

Subject: Draft Environmental Assessment Consultation and Public Informational Meeting (PIM) Kalanianaole Highway Improvements Waimanalo, Oahu, Hawaii

Thank you for the notice of the Draft Environmental Assessment Consultation and Public Informational Meeting (PIM) relating to the proposed Kalanianaole Highway improvements between Olomana Golf Course and Waimanalo Beach Park.

The Department of Parks and Recreation has no comments on the project, but we do wish to remain as a consulted party in the preparation of the Draft EIS.

Should you have any questions, please contact Mr. John Reid, Planner, at 692-5454.

Sincerely,

W. D. Balfour Jr.

WILLIAM D. BALFOUR, JR.
Director

WDB:mk
(63973)

DEPARTMENT OF TRANSPORTATION SERVICES
CITY AND COUNTY OF HONOLULU
650 SOUTH KING STREET, 3RD FLOOR • HONOLULU, HAWAII 96813
TELEPHONE: (808) 523-4529 • FAX: (808) 523-4730 • INTERNET: www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

CHERYL D. SOON
DIRECTOR

GEORGE "KEOKI" MIYAMOTO
DEPUTY DIRECTOR

TP6/04-64550R

July 21, 2004

Mr. Vincent Llorin
Highways Division, Design Branch,
Technical Design Services Office
Department of Transportation
State of Hawaii
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Subject: Kalanianaole Highway Improvements between Olomana Golf Course and Waimanalo Beach Park

In response to your May 28, 2004 letter, this is to request consulted party status in the preparation of the draft environmental assessment (EA) for the subject project.

We reviewed the information provided and submit the following comments for your consideration as you prepare the draft EA:

1. A traffic impact study should be conducted for this project. This study should also address public transit and pedestrian access issues.

2. Bus stop/bus bay planning should be coordinated with the Public Transit Division of this department.

3. The draft EA should discuss the expected duration of the project and any plans for road closures and detours. Every effort should be made to not detour traffic onto residential City streets.

4. Construction work should be done during off-peak hours to minimize the impact of the project on the surrounding neighborhood. The possibility of night work should be explored.

5. The area neighborhood board, as well as area residents, businesses, emergency personnel, bus personnel, etc., should be kept apprised of the details of the proposed project and the impacts of the project on the surrounding area.

We look forward to reviewing the draft EA. Should you have any questions regarding these comments, please contact Faith Miyamoto of the Transportation Planning Division at 527-6976.

Sincerely,

CHERYL D. SOON
Director

FIRE DEPARTMENT
CITY AND COUNTY OF HONOLULU
3375 KOAPAKA STREET, SUITE H425 • HONOLULU, HAWAII 96819-1869
TELEPHONE: (808) 831-7761 • FAX: (808) 831-7750 • INTERNET: www.honolulufire.org

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JEREMY HARRIS
MAYOR

ATTILIO K. LEONARDI
FIRE CHIEF

JOHN CLARK
DEPUTY FIRE CHIEF

June 21, 2004

Mr. Vincent Llorin
Bicycle and Pedestrian Coordinator
Design Branch, Technical Design Services Office
State of Hawaii
Department of Transportation
Highways Division
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Subject: Draft Environmental Assessment (DEA) Consultation and Public Information Meeting
Kalanianaole Highway Improvements Between the Olomana Golf Links and Waimanalo Beach Park
Waimanalo, Oahu, Hawaii

We received your letter dated May 28, 2004, requesting our review and comments on the above-mentioned DEA.

The Honolulu Fire Department requires that the following be complied with for the duration of the project:

1. Maintain fire apparatus access throughout the construction site.

2. Notify the Fire Communication Center at 523-4411 regarding any interruption of the existing fire hydrant system.

Should you have any questions, please call Battalion Chief Lloyd Rogers of our Fire Prevention Bureau at 831-7778.

Sincerely,

ATTILIO K. LEONARDI
Fire Chief

AKL/SK:bh

POLICE DEPARTMENT

CITY AND COUNTY OF HONOLULU

801 SOUTH BERETANIA STREET

HONOLULU, HAWAII 96813 - AREA CODE (808) 529-3111

http://www.honolulupd.org

www.co.honolulu.hi.us

JEREMY HARRIS
MAYOR

LEE D. DONOHUE
CHIEF

GLEN R. KAJIYAMA
PAUL D. PUTZULU
DEPUTY CHIEFS

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DEPT. OF TRANSPORTATION

OUR REFERENCE CS-KP

June 7, 2004

Mr. Vincent Llorin, Design Branch
Highways Division
Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment Consultation for the Kalanianaole Highway Improvements project.

During the construction phase, we are concerned about traffic flow and pedestrian and vehicular safety in the area as they will have a negative impact on calls for police service. We would like to recommend that traffic safety measures be in place during this time. However, after the improvements are completed, this project should have a positive impact on our concerns mentioned.

If there are any questions, please call Captain Michael Correa of District 4 at 247-2166 or Ms. Carol Sodetani of the Support Services Bureau at 529-3658.

Sincerely,

LEE D. DONOHUE
Chief of Police

By
KARL GODSEY
Assistant Chief of Police
Support Services Bureau

LINDA LINGLE
GOVERNOR

RUSS K. SAITO
COMPTROLLER

KATHERINE H. THOMASON
DEPUTY COMPTROLLER

STATE OF HAWAII

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

(P)1194.4

JUN 10 2004

RECEIVED
'04 JUN 15 A10:23

MEMORANDUM

TO: Mr. Vincent Llorin
Design Branch, Technical Design Services Office
Highways Division
Department of Transportation

FROM: Russ K. Saito
State Comptroller

SUBJECT: Draft Environmental Assessment Consultation and Public Informational Meeting for Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Waimanalo, Oahu, Hawaii

We have reviewed the information provided in your May 28, 2004, letter (copy attached for your reference) and offer the following comments:

1. Three State facilities near Kalanianaole Highway could be affected by the proposed improvements: Pope Elementary School; Waimanalo Elementary and Intermediate School; and the Waimanalo Public and School Library.

2. Because we service the Department of Education (DOE) and the Hawaii State Public Library System (HSPLS), our major concerns are:

   a. Proper bus, car, and pedestrian access must be maintained for these facilities.

   b. Interruption to normal operations of these facilities must be minimized during construction of the Kalanianaole Highway improvements.

We support the Department of Transportation's efforts to improve traffic flow on the highway and look forward to working with your staff to address these concerns. Accordingly, we request to be a consulted party, along with the DOE and HSPLS, during the preparation of the draft environmental assessment.

Thank you for this opportunity to comment on the proposed improvements to Kalanianaole Highway. If you have any questions, please call me or have your staff call Mr. Lance Maja of the Public Works Division at 586-0483.

Attachment
c: Mr. Raynor Minami, DOE-FSSB w/attachment
Mr. Keith Fujio, HSPLS w/attachment
Mr. James Richardson, DAGS-CSD w/attachment

LINDA LINGLE
GOVERNOR

STEPHANIE AVEIRO
EXECUTIVE DIRECTOR

PAMELA Y. DODSON
EXECUTIVE ASSISTANT

STATE OF HAWAII

DEPARTMENT OF HUMAN SERVICES
HOUSING AND COMMUNITY DEVELOPMENT CORPORATION OF HAWAII
677 QUEEN STREET, SUITE 300
Honolulu, Hawaii 96813
FAX: (808) 587-0600

IN REPLY REFER TO:
04:PEO/109

June 14, 2004

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JUN 1 8 2004
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DEPT. OF TRANSPORT.

TO: Department of Transportation
Highways Division, Design Branch, Technical Design Services Office

ATTN: Vincent Llorin

FROM: Stephanie Aveiro
Executive Director

SUBJECT: Draft Environmental Assessment Consultation for Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park

Thank you for your letter of May 28, 2004 informing the public of the preparation of a draft Environmental Assessment (EA) for the Kalanianaole Highway Improvements project.

The Housing and Community Development Corporation of Hawaii manages several housing developments in the Waimanalo area. As such, we would appreciate being a consulted party in the preparation of the draft EA.

LINDA LINGLE
GOVERNOR OF HAWAII

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JUN 1 8 2004
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PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 16, 2004
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LD-NAV

Mr. Vincent Llorin
State of Hawaii, Department of Transportation
Highways Division, Design Branch
Technical Design Services Branch
601 Kamokila Blvd., Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

SUBJECT: Department of Transportation (SOH) Pre-Assessment Consultation for Preparation of a Draft Environmental Assessment for the Proposed Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Island of Oahu, Hawaii

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 letter dated May 28, 2004 pertaining to the subject matter to the following DLNR Divisions for their review and comment:

- Division of Aquatic Resources
- Division of Forestry and Wildlife
- Division of State Parks
- Engineering Division
- Commission on Water Resource Management
- Office of Conservation and Coastal Lands
- Land-Oahu District Land Offices

Based on the attached responses, the Department of Land and Natural Resources has no comment to offer on the subject matter. Should you have any questions, please feel free to contact Nicholas A. Vaccaro of the Land Division Support Services Branch at 808-587-0384.

Very truly yours,

DIERDRE S. MAMIYA
Administrator

LINDA LINGLE
GOVERNOR OF HAWAII

RECEIVED
LAND DIVISION

2004 JUN 14 A 10: 00

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

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
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BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
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CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2004
LD/NAV
DOTKKALANIANAOLEHWY.CMT

L-3046
Suspense Date: 6/14/04

MEMORANDUM:

TO: XXX Division of Forestry & Wildlife
XXX Division of Aquatic Resources
XXX Division of State Parks
XXX Engineering Division
XXX Commission on Water Resource Management
XXX Office of Conservation and Costal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment Consultation and Public Information Meeting Pertaining to the Department of Transportation (SOH) Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Island of Oahu, Hawaii

Please review the attached letter with attachment (map) pertaining to subject matter and submit your comments (if any) on Division letterhead by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

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

Name: Robert M. Ing

Signed:

Date: 6/10/2004

LINDA LINGLE
GOVERNOR OF HAWAII

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LAND DIVISION
2004 JUN 10 A 10: 27
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

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2004
LD/NAV
DOTKKALANIANAOLEHWY.CMT

L-3046
Suspense Date: 6/14/04

MEMORANDUM:

TO: XXX Division of Forestry & Wildlife
XXX Division of Aquatic Resources
XXX Division of State Parks
XXX Engineering Division
XXX Commission on Water Resource Management
XXX Office of Conservation and Costal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment Consultation and Public Information Meeting Pertaining to the Department of Transportation (SOH) Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Island of Oahu, Hawaii

Please review the attached letter with attachment (map) pertaining to subject matter and submit your comments (if any) on Division letterhead by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

(X) We have no comments.

( ) Comments attached.

Name: _____

Signed: MICHAEL G. BUCK, ADMINISTRATOR
DIVISION OF FORESTRY AND WILDLIFE

Date: _____ JUN - 7 2004

45539

TO:
___ ADMINISTRATOR
___ ASST ADMIN
___ DEV BR
___ PLAN BR
___ RES MGT BR
___ CLERICAL
___ ADMIN ASST
___ INTERP BR

FOR:
___ CIRC/POST/STAFF RM
___ COMMENTS & REC
___ DRAFT REPLY
___ FILE
___ FOLLOW UP
___ INFO
___ RUN COPIES _____
___ RUSH DUE _____
___ SEE ME
___ FAX/SEND COPY TO _____

LINDA LINGLE
GOVERNOR OF HAWAII

Department of Land and Natural Resources
State of Hawaii

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED
DIVISION OF
STATE PARKS
JUN 7 3 04 PM '04

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

June 4, 2004
LD/NAV
DOTKKALANIANAOLEHWY.CMT

L-3046
Suspense Date: 6/14/04

RECEIVED
LAND DIVISION
2004 JUN 15 P 3:56
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

MEMORANDUM:

TO: XXX Division of Forestry & Wildlife
XXX Division of Aquatic Resources
XXX Division of State Parks
XXX Engineering Division
XXX Commission on Water Resource Management
XXX Office of Conservation and Costal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

SUBJECT: Draft Environmental Assessment Consultation and Public Information Meeting Pertaining to the Department of Transportation (SOH) Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Island of Oahu, Hawaii

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If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

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

Name: Daniel S. Quinn

Signed: [signature]

Date: 6/14/04

LINDA LINGLE
GOVERNOR OF HAWAII

PETER T. YOUNG
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DAN DAVIDSON
DEPUTY DIRECTOR - LAND

YVONNE Y. IZU
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
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CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 4, 2004
LD/NAV
DOTKKALANIANAOLEHWY.CMT

L-3046
Suspense Date: 6/14/04

MEMORANDUM:

TO: XXX Division of Forestry & Wildlife
XXX Division of Aquatic Resources
XXX Division of State Parks
XXX Engineering Division
XXX Commission on Water Resource Management
XXX Office of Conservation and Costal Lands
XXX Oahu District Land Office

FROM: Dierdre S. Mamiya, Administrator
Land Division

RECEIVED
LAND DIVISION
2004 JUN 14 P 4:30
DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

SUBJECT: Draft Environmental Assessment Consultation and Public Information Meeting Pertaining to the Department of Transportation (SOH) Kalanianaole Highway Improvements Between Olomana Golf Course and Waimanalo Beach Park, Island of Oahu, Hawaii

Please review the attached letter with attachment (map) pertaining to subject matter and submit your comments (if any) on Division letterhead by the suspense date.

Should you need more time to review the subject matter, please contact Nick Vaccaro at 587-0384.

If this office does not receive your comments on or before the suspense date, we will assume there are no comments.

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

Name: _____

Signed: _____

Date: _____

Vincent Loehr
692-7555

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LA/NAV

Ref.: DOTKKANIANAOLEHWY.CMT

COMMENTS

( ) We confirm that the project site, according to the Flood Insurance Rate Map (FIRM), is located in Flood Zone ___.

(X) Please take note that the project sites, according to the Flood Insurance Rate Map (FIRM), are located in Zones X and X (Shaded). The National Flood Insurance Program (NFIP) does not have any regulations for development within these areas.

( ) 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. Robert Sumimoto at (808) 523-4254 or Mr. Mario Siu Li at (808) 523-4247 of the City and County of Honolulu, Department of Planning and Permitting.

( ) Mr. Kelly Gomes at (808) 961-8327 (Hilo) or Mr. Kiran Emler at (808) 327-3530 (Kona) of the County of Hawaii, Department of Public Works.

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

( ) Mr. Mario Antonio at (808) 241-6620 of the County of Kauai, Department of Public Works.

( ) The applicant should include project water demands and infrastructure required to meet water demands. Please note that the implementation of any State-sponsored projects requiring water service from the Honolulu Board of Water Supply system must first obtain water allocation credits from the Engineering Division before it can receive a building permit and/or water meter.

( ) The 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 Mr. Andrew Monden of the Planning Branch at 587-0229.

Signed: Andrew M. Monden
for ERIC T. HIRANO, CHIEF ENGINEER

Date: 6/10/04

[redacted]
LINDA LINGLE
GOVERNOR

PATRICIA HAMAMOTO
SUPERINTENDENT

STATE OF HAWAI'I
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAI'I 96804

OFFICE OF THE SUPERINTENDENT

RECEIVED
JUN 24 2004
TECHNICAL DESIGN SVCS OFC
DEPT. OF TRANSPORTATION

June 17, 2004

Mr. Vincent Llorin
Highways Division, Design Branch, Technical Design Services Office
Department of Transportation
601 Kamokila Boulevard, Room 688
Kapolei, Hawaii 96707

Dear Mr. Llorin:

SUBJECT: Pre-Assessment Consultation for
Kalanianaole Highway Improvements
Waimanalo, Oahu, Hawaii

The Department of Education has no specific comment or concern with the proposed improvements to Kalanianaole Highway at this time. However, we will be interested in the plans proposed for work on the sidewalks leading to Waimanalo Elementary and Intermediate School.

Thank you for the opportunity to offer comment at this early stage of the project. If you have any questions, please call Rae M. Loui, Assistant Superintendent of the Office of Business Services, at 586-3444 or Heidi Meeker of the Facilities and Support Services Branch at 733-4862.

Very truly yours,

Patricia Hamamoto
Superintendent

PH:jmb

c: Rae Loui, Asst. Supt.,OBS
Louise Wolcott, CAS, Kailua/Kalaheo Complexes

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EPO-04-130

June 4, 2004

Mr. Vincent Llorin
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Llorin:

SUBJECT: Kalanianaole Highway Improvements
Waimanalo, O'ahu, Hawaii

Thank you for allowing us to review and comment on the subject document. We have the enclosed standard comments to offer. If there are any questions about these standard comments please contact Ryan Davenport with the Environmental Planning Office at 586-4346.

Sincerely,

June F. Harrigan-Lum

JUNE F. HARRIGAN-LUM, MANAGER
Environmental Planning Office

Enclosure

c. SDWB
EPO
SHWB
NRAIQ
CWB
WWB
CAB
HEER

Standard Comments

Environmental Planning Office Dated 3/2/04

The Environmental Planning Office (EPO) is responsible for several surface water quality management programs mandated by the federal Clean Water Act or dictated by State policy . (http://www.state.hi.us/doh/eh/epo/wqm/wqm.htm). Among these responsibilities, EPO:

- maintains the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* (http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf);
- develops and establishes Total Maximum Daily Loads (TMDLs) for listed waters (suggesting how much existing pollutant loads should be reduced in order to attain water quality standards, please see http://www.epa.gov/owow/tmdl/intro.html);
- writes TMDL Implementation Plans describing how suggested pollutant load reductions can be achieved; and
- conducts assessments of stream habitat quality and biological integrity.

To facilitate TMDL development and planning, and to assist our assessment of the potential impact of proposed actions upon water quality, pollutant loading, and biological resources in receiving waters, we suggest that environmental review documents, permit applications, and related submittals include the following standard information and analyses:

Waterbody type and class

1. Identify the waterbody type and class, as defined in Hawaii Administrative Rules Chapter 11-54 (http://www.state.hi.us/doh/rules/11-54.pdf), of all potentially affected water bodies[1].

Existing water quality management actions

2. Identify any existing National Pollutant Discharge Elimination System (NPDES) permits and related connection permits (issued by permittees) that will govern the management of water that runs off or is discharged from the proposed project site or facility. Please include NPDES and other permit numbers; names of permittees, permitted facilities, and receiving waters (including waterbody type and class as in 1. above); diagrams showing drainage/discharge pathways and outfall locations; and note any permit conditions that may specifically apply to the proposed project.

3. Identify any planning documents, groups, and projects that include specific prescriptions for water quality management at the proposed project site and in the potentially affected waterbodies. Please note those prescriptions that may specifically apply to the proposed project.

Pending water quality management actions

4. Identify all potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)* including the listed waterbody, geographic scope of listing, and pollutant(s) (See Table 7 at http://www.state.hi.us/doh/eh/epo/wqm/303dpcfinal.pdf).

5. If the proposed project involves potentially affected water bodies that appear on the current *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*, identify and quantify expected changes in the following site and watershed conditions and characteristics:
   - surface permeability
   - hydrologic response of surface (timing, magnitude, and pathways)
   - receiving water hydrology
   - runoff and discharge constituents
   - pollutant concentrations and loads in receiving waters
   - aquatic habitat quality and the integrity of aquatic biota

Where TMDLs are already established they include pollutant load allocations for the surrounding lands and point source discharges. In these cases, we suggest that the submittal specify how the proposed project would contribute to achieving the applicable load reductions.

Where TMDLs are yet to be established and implemented, a first step in achieving TMDL objectives is to prevent any project-related increases in pollutant loads. This is generally accomplished through the proper application of suitable best management practices in all phases of the project and adherence to any applicable ordinances, standards, and permit conditions. In these cases we suggest that the submittal specify how the proposed project would contribute to
reducing the polluted discharge and runoff entering the receiving waters, including plans for
additional pollutant load reduction practices in future management of the surrounding lands and drainage/discharge systems.

Proposed Action and Alternatives Considered

We suggest that each submittal identify and analyze potential project impacts at a watershed scale by considering consider the potential contribution of the proposed project to cumulative, multi-project watershed effects on hydrology, water quality, and aquatic and riparian ecosystems.

We also suggest that each submittal broadly evaluate project alternatives by identifying more than one engineering solution for proposed projects. In particular, we suggest the

consideration of "alternative," "soft," and "green" engineering solutions for channel modifications that would provide a more environmentally friendly and aesthetically pleasing channel environment and minimize the destruction of natural landscapes.

If you have any questions about these comments or EPO programs, please contact Ryan Davenport at 586-4346.

[1]"Potentially affected waterbodies" means those in which proposed project activity would take place and any that could receive water discharged by the proposed project activity or water flowing down from the proposed project site. These waterbodies can be presented as a chain of receiving waters whose top link is at the project site upslope and whose bottom link is in the Pacific Ocean, and can be named according to conventions established by Chapter 11-54 and the *List of Impaired Waters in Hawaii Prepared under Clean Water Act §303(d)*. For example, a recent project proposed for Nuhelewai Stream, Oahu might potentially affect Nuhelewai Stream, Kapalama Canal, and Honolulu Harbor and Shore Areas.
[OTHER EXAMPLES OR DIAGRAM??]

Solid and Hazardous Waste Branch Dated 3/2/04

1)
The OSWM recommends the development of a solid waste management plan that encompasses all project phases including demolition, construction, and occupation/operation of the completed project.

Specific examples of elements that the plan should address include:

- The recycling of green-waste during clear and grub activities;
- Recycling construction and demolition wastes, if appropriate;
- The use of locally produced compost in landscaping;
- The use of recycled content building materials;
- The provision of recycling facilities in the design of the project.

- -

2)
The developer shall ensure that all solid waste generated during project construction is directed to a Department of Health permitted solid waste disposal or recycling facility.

- -

3)
The developer should consider providing space in the development for recycling activities. The provision of space for recycling bins for paper, glass, and food/wet waste would help to encourage the recycling of solid waste(s) generated by building occupants.

- -

4)
The discussion of solid waste issues contained in the document is restricted to activities within the completed project. The OSWM recommends the development of a solid waste management plan that encompasses all project phases, from construction (and or demolition) to occupation of the project.

Specific examples of plan elements include: the recycling of green-waste during clear and grub activities; maximizing the recycling of construction and demolition wastes; the use of locally produced compost in the landscaping of the project; and the provision of recycling facilities in the design of the project.

- -

5)
Hawaii Revised Statutes Chapter 103D-407 stipulates that all highway and road construction and improvement projects funded by the State or a county or roadways that are to be accepted by the State or a county as public roads shall utilize a minimum of ten per cent crushed glass aggregate as specified by the department of transportation in all base-course (treated or untreated) and sub-base when the glass is available to the quarry or contractor at a price no greater than that of the equivalent aggregate.

If you have any questions, please contact the Solid and Hazardous Waste Branch at (808) 586-4240.

Noise, Radiation & Indoor Air Quality Branch Dated 3/2/04

"Project activities shall comply with the Administrative Rules of the Department of Health:

- Chapter 11-39 Air Conditioning and Ventilating.
- Chapter 11-45 Radiation Control.
- Chapter 11-46 Community Noise Control.
- Chapter 11-501 Asbestos Requirements.
- Chapter 11-502 Asbestos-Containing Materials in Schools.
- Chapter 11-503 Fees for Asbestos Removal and Certification
- Chapter 11-504 Asbestos Abatement Certification Program

Should there be any questions, please contact Russell S. Takata, Environmental Health Program Manager, Noise, Radiation and Indoor Air Quality Branch, at 586-4701."

Clean Water Branch Dated 3/2/04

1. The Army Corps of Engineers should be contacted at (808) 438-9258 to identify whether a Federal license or permit (including a Department of Army permit) is required for this project. Pursuant to Section 401(a)(1) of the Federal Water Pollution Act (commonly known as the "Clean Water Act"), a Section 401 Water Quality Certification is required for "[a]ny applicant for Federal license or permit to conduct any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters...."

2. A National Pollutant Discharge Elimination System (NPDES) general permit coverage is required for the following activities:

a. Storm water associated with industrial activities, as defined in Title 40, Code of Federal Regulations, Sections 122.26(b)(14)(i) through 122.26(b)(14)(ix) and 122.26(b)(14)(xi).

b. Construction activities, including clearing, grading, and excavation, that result in the disturbance of equal to or greater than one (1) acre of total land area. The total land area includes a contiguous area where multiple separate and distinct construction activities may be taking place at different times on different schedules under a larger common plan of development or sale. **An NPDES permit is required before the commencement of the construction activities.**

c. Discharges of treated effluent from leaking underground storage tank remedial activities.

d. Discharges of once through cooling water less than one (1) million gallons per day.

e. Discharges of hydrotesting water.

f. Discharges of construction dewatering effluent.

g. Discharges of treated effluent from petroleum bulk stations and terminals.

h. Discharges of treated effluent from well drilling activities.

i. Discharges of treated effluent from recycled water distribution systems.

j. Discharges of storm water from a small municipal separate storm sewer system.

k. Discharges of circulation water from decorative ponds or tanks.

The CWB requires that a Notice of Intent (NOI) to be covered by a NPDES general permit for any of the above activities be submitted at least 30 days before the commencement of the respective activities. The NOI forms may be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/genl-index.html.

3. The applicant may be required to apply for an individual NPDES permit if there is any type of activity in which wastewater is discharged from the project into State waters and/or coverage of the discharge(s) under the NPDES general permit(s) is not permissible (i.e. NPDES general permits do not cover discharges into Class 1 or Class AA receiving waters). An application for the NPDES permit is to be submitted at least 180 days before the commencement of the respective activities. The NPDES application forms may also be picked up at our office or downloaded from our website at http://www.state.hi.us/health/eh/cwb/forms/indiv-index.html.

4. Hawaii Administrative Rules, Section 11-55-38, also requires the owner to either submit a copy of the new NOI or NPDES permit application to the State Department of Land and Natural Resources, State Historic Preservation Division (SHPD), or demonstrate to the satisfaction of the DOH that the project, activity, or site covered by the NOI or application has been or is being reviewed by SHPD.

Please submit a copy of the request for review by SHPD or SHPD's determination letter for the project.

If you have any questions, please contact the CWB at 586-4309.

Waste Water Branch Dated 3/2/04

All wastewater plans must conform to applicable provisions of the Department of Health's Administrative Rules, Chapter 11-62, "Wastewater Systems". We do reserve the right to review the detailed wastewater plans for conformance to applicable rules.

Should you have any questions, please contact the Planning & Design Section of the Wastewater Branch at 586-4294.

Clean Air Branch Dated 3/2/04

Construction/Demolition Involving Asbestos:

Since the proposed project would entail renovation/demolition activities which may involve asbestos, the applicant should contact the Asbestos Abatement Office in the Noise, Radiation and Indoor Air Quality Branch at 586-5800.

Control of Fugitive Dust:

A significant potential for fugitive dust emissions exists during all phases of construction. Proposed construction activities will occur in proximity to **existing residences, businesses, public areas and thoroughfares**, thereby exacerbating potential dust problems. It is recommended that a dust control management plan be developed which identifies and addresses all activities that have a potential to generate fugitive dust. Implementation of adequate dust control measures during all phases of development and construction activities is warranted.

Construction activities must comply with the provisions of Hawaii Administrative Rules, §11-60.1-33 on Fugitive Dust.

The contractor should provide adequate measures to control dust from the road areas and during the various phases of construction. These measures include, but are not limited to, the following:

a) Plan the different phases of construction, focusing on minimizing the amount of dust-generating materials and activities, centralizing on-site vehicular traffic routes, and locating potential dust-generating equipment in areas of the least impact;
b) Provide an adequate water source at the site prior to start-up of construction activities;
c) Landscape and provide rapid covering of bare areas, including slopes, starting from the initial grading phase;
d) Minimize dust from shoulders and access roads;

e) Provide adequate dust control measures during weekends, after hours, and prior to daily start-up of construction activities; and

f) Control dust from debris being hauled away from the project site.

Hazard Evaluation and Emergency Response Office(HEER) Dated 3/2/04

1. A phase I Environmental Site Assessment (ESA) should be conducted for developments or redevelopments. If the investigation shows that a release of petroleum, hazardous substance, pollutants or contaminants occurred at the site, the site should be properly characterized through an approved Hawaii State Department of Health (DOH)/Hazard Evaluation and Emergency Response Office (HEER) soil and or groundwater sampling plan. If the site is found to be contaminated, then all removal and remedial actions to clean up hazardous substance or oil releases by past and present owners/tenants must comply with chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

2. All lands formerly in the production of sugarcane should be characterized for arsenic contamination, If arsenic is detected above the US EPA Region (preliminary remediation goal (PRG) for non-cancer effects, then a removal and or remedial plan must be submitted to the Hazard Evaluation and Emergency Response (HEER) Office of the State Department of Health for approval. The plan must comply with Chapter 128D, Environmental Response Law, HRS, and Title 11, Chapter 451, HAR, State Contingency Plan.

3. If the land has a history of previous releases of petroleum, hazardous substances, pollutants, or contaminants, we recommend that the applicant request a "no further action" (NFA) letter from the Hawaii State Department of Health (DOH)/ Hazard Evaluation and Emergency Response (HEER) Office prior to the approval of the land use change or permit approval.

Safe Drinking Water Branch Dated 3/11/04

The Safe Drinking Water Branch administers programs in the areas of: 1) public water systems; 2) underground injection control; and 3) groundwater protection. Our general comments on projects are as follows.

Public Water Systems

- Federal and state regulations define a public water system as a system that serves 25 or more individuals at least 60 days per year or has at least 15 service connections. All public water system owners and operators are required to comply with Hawaii Administrative Rules, Title 11, Chapter 20, titled Rules Relating to Potable Water Systems.

- All new public water systems are required to demonstrate and meet minimum capacity requirements prior to their establishment. This requirement involves demonstration that the system will have satisfactory technical, managerial and financial capacity to enable the system to comply with safe drinking water standards and requirements.

- Projects that propose development of new sources of potable water serving or proposed to serve a public water system must comply with the terms of Section 11-20-29 of Chapter 20. This section requires that all new public water system sources be approved by the Director of Health prior to its use. Such approval is based primarily upon the submission of a satisfactory engineering report which addresses the requirements set in Section 11-20-29.

- The engineering report must identify all potential sources of contamination and evaluate alternative control measures which could be implemented to reduce or eliminate the potential for contamination, including treatment of the water source. In addition, water quality analyses for all regulated contaminants, performed by a laboratory certified by the State Laboratories Division of the state of Hawaii, must be submitted as part of the report to demonstrate compliance with all drinking water standards. Additional parameters may be required by the Director for this submittal or additional tests required upon his or her review of the information submitted.

- All sources of public water system sources must undergo a source water assessment which will delineate a source water protection area. This process is preliminary to the creation of a source water protection plan for that source and activities which will take place to protect the source of drinking water.

- Projects proposing to develop new public water systems or proposing substantial modifications to existing public water systems must receive approval by the Director of Health prior to construction of the proposed system or modification. These projects include treatment, storage and distribution systems of public water systems. The approval authority for projects owned and operated by a County Board or Department of Water or Water Supply has been delegated to them.

- All public water systems must be operated by certified distribution system and water treatment plant operators as defined by Hawaii Administrative Rules, Title 11, Chapter 11-25 titled; Rules Pertaining to Certification of Public Water System Operators.

- All projects which propose the use of dual water systems or the use of a non-potable water system in proximity to an existing potable water system to meet irrigation or other needs must be carefully design and operate these systems to prevent the cross-connection of these systems and prevent the possibility of backflow of water from the non-potable system to the potable system. The two systems must be clearly labeled and physically separated by air gaps or reduced pressure principle backflow prevention devices to avoid contaminating the potable water supply. In addition backflow devices must be tested periodically to assure their proper operation. Further, all non-potable spigots and irrigated areas

should be clearly labeled with warning signs to prevent the inadvertent consumption on non-potable water. Compliance with Hawaii Administrative Rules, Title 11, Chapter 11-21 titled; Cross-Connection and Backflow Control is also required.

- All projects which propose the establishment of a potentially contaminating activity (as identified in the Hawai`i Source Water Assessment Plan) within the source water protection area of an existing source of water for a public water supply should address this potential and activities that will be implemented to prevent or reduce the potential for contamination of the drinking water source.

- For further information concerning the application of capacity, new source approval, operator certification, source water assessment, backflow/cross-connection prevention or other public water system programs, please contact the Safe Drinking Water Branch at 586-4258.

Underground Injection Control (UIC)

- Injection wells used for the subsurface disposal of wastewater, sewage effluent, or surface runoff are subject to environmental regulation and permitting under Hawai`i Administrative Rules, Title 11, Chapter 11-23, titled Underground Injection Control (UIC). The Department of Health's approval must be first obtained before any injection well construction commences. A UIC permit must be issued before any injection well operation occurs.

- Authorization to use an injection well is granted when a UIC permit is issued to the injection well facility. The UIC permit contains discharge and operation limitations, monitoring and reporting requirements, and other facility management and operational conditions. A complete UIC permit application form is needed to apply for a UIC permit.
- A UIC permit can have a valid duration of up to five years. Permit renewal is needed to keep an expiring permit valid for another term.

For further information about the UIC permit and the Underground Injection Control Program, please contact the UIC staff of the Safe Drinking Water Branch at 586-4258.

Groundwater Protection Program

Projects that propose to develop a golf course are asked to use the Guidelines Applicable to Golf Courses in Hawai`i (Version 6) in order to address certain groundwater protection concerns, as well as other environmental concerns

Branches and Offices in the Environmental Health Administration

Hazard Evaluation and Emergency Response Office	586-4249
Environmental Planning Office	586-4337
Clean Air Branch	586-4200
Clean Water Branch	586-4309
Safe Drinking Water Branch	586-4258
Solid & Hazardous Waste Branch	586-4226
Wastewater Branch	586-4294
Noise, Radiation, Indoor & Air Quality Branch	586-4700
Sanitation Branch	586-8000
Food and Drug Branch	586-4725
Vector Control Branch	831-6767

LINDA LINGLE
GOVERNOR OF HAWAII

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JUN 24 2004
TECHNICAL DESIGN SVCS OFC
DEPT OF TRANSPORTATION

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

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

In reply, please refer to:
EPO

July 1, 2004

To: Persons Requesting Department of Health Comments on Land Use Documents

From: June F. Harrigan-Lum, Manager
Environmental Planning Office

Our land use review coordinator position will be vacant beginning July 1, 2004. We will be filling this position as soon as possible. In the meantime, starting July 1, 2004, the Environmental Planning Office (EPO) will not be accepting any land use documents for coordinated replies.

If you would like to request to have staff in a specific branch or office to comment on your proposal, you are welcome to contact the staff directly. If a document has already been received by EPO and you wish to have us send it to a specific branch, you may call 586-4337 and ask for the clerical staff to send it to the appropriate branch. Please describe the document and the date of your cover letter.

You may call the above number and check with the clerical staff to see when coordinated responses from this office will resume.

Thank you for your cooperation and patience in this matter.

Enclosure

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DIRECTOR'S OFFICE
DEPT. OF
TRANSPORTATION

DESIGN BR
HIGHWAYS DIV
DEPT. OF TRANSP

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STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
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HONOLULU, HAWAI'I 96813

HRD04-1424

June 2, 2004

Rodney K. Haraga
Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813-5097

Subject: Draft Environmental Assessment Consultation and Public Information Meeting (PIM), Kalanianaole Highway Improvements, Between Olomana Golf Course and Waimanalo Beach Park, Waimanalo, Oahu, Hawaii (No TMKs provided)

Dear Mr. Haraga:

Thank for your letter dated May 28, 2004 regarding the Draft Environmental Assessment Consultation and Public Information Meeting (PIM), Kalanianaole Highway Improvements, located between Olomana Golf Course and Waimanalo Beach Park, Waimanalo, Oahu, Hawaii (No Tax Map Keys (TMK) provided). Your letter requests that the Office of Hawaiian Affairs (OHA) review and comment on the proposed project.

Project Description

The project involves the following: "The DOT is planning to improve traffic operations on Kalanianaole Highway between Olomana Golf Course and Waimanalo Beach Park by making improvements within the existing highway right-of-way."

Specific proposed improvements include left turning lanes at Flamingo Road, Kumuhau Street, Humuniki Street, Mekia Street, Moole Street (both directions), Ianoaole Street and Aloiloi Street, bus lane pullouts, the existing sidewalk from Kumuhau Street to Inoaole Street is to be reconstructed with a new Americans with Disabilities Act accessible sidewalk (driveways and curb ramps) and a shared use grassed path (where available) is proposed to allow equestrian riders to traverse along designated portions of Kalanianaole Highway.

OHA looks forward to your Draft EA for the proposed project, which should clarify the project scope and define the project footprint more clearly.

Please also provide TMKs for the parcels of land that the highway improvement project impacts.

If you have questions or concerns please contact Matthew Myers, Policy Advocate at 594-1945 or matthewm@oha.org.

'O wau iho nö,

Clyde W. Nämu'o
Administrator

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
FT. SHAFTER, HAWAII 96858-5440

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JUN 14 2004
TECHNICAL DESIGN SVCS OFC
DEPT OF TRANSPORTATION

REPLY TO
ATTENTION OF

June 9, 2004

Regulatory Branch

Mr. Vincent Llorin
Project Manager
Technical Design Services Office
Design Branch, Highways Division
Hawaii State Department of Transportation
601 Kamokila Bold., Room 688
Kapolei, HI 96707

Dear Mr. Llorin:

This responds to your request dated May 28, 2004 for written comments to the draft Environmental Assessment (dEA) being prepared for the Kalanianaole Highway Improvements project which addresses activities proposed along the current highway right-of-way between Olomana Golf Course and the City and County Waimanalo Beach Park, Waimanalo, Oahu Island. The information to be provided in the dEA should locate, identify, and label those waters of the United States (including intermittent and perennial streams and wetlands) within that study corridor. The dEA should note what type of construction activity will occur at each potential crossing of these waters, and that coordination will take place with the Corps on a location-by-location basis to determine whether a Department of Army (DA) permit will, or will not be, required. We look forward to being a consulted party in preparation of the dEA and to assist you with these jurisdictional determinations when specific engineering design solutions become available.

In the future, written correspondence regarding the project in general should be addressed to the Commander, U.S. Army Engineer District, Honolulu, and correspondence regarding Department of Army permit requirements in specific should be addressed to Mr. George P. Young, Chief, Regulatory Program. Please contact Mr. Farley Watanabe of my staff at 438-7701 if you have any questions or additional information. Please refer to File Number 200400352 in all future correspondence with us.

Sincerely,

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

APPENDIX B

Advance Planning Report

ADVANCE PLANNING REPORT

FOR

KALANIANAOLE HIGHWAY IMPROVEMENTS

FEDERAL AID PROJECT NO. STP-072-1(44)

TAX MAP KEY: 4-1-03 through 09,12,13,15,16,18,19,20,21,22,28,33,34

PREPARED FOR:

DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
HONOLULU, HAWAII

PREPARED BY:

AKINAKA & ASSOCIATES, LTD.
CONSULTING ENGINEERS
3049 UALENA STREET, SUITE 500
HONOLULU, HAWAII 96817

JANUARY 2006

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I. INTRODUCTION

A. Purpose and Project Scope

The objective of this project is to develop engineering concepts to improve Kalanianaole Highway from Olomana Golf Course to Waimanalo Beach Park. This study considers traffic operations, right-of-way, environmental impact, construction and cost to improve ADA accessibility, safety, usability, and highway operations within the described limits.

The scope of this advance planning project is to develop a conceptual engineering design which implements safety, roadway improvements and usability for Kalanianaole Highway from Olomana Golf Course to the east end of Waimanalo Beach Park. The conceptual engineering design will also incorporate community requested improvements compiled by the former Representative Goodenow.

In addition, the scope included the conducting of six Public Informational Meetings (PIMs) to obtain additional community comments and to obtain community “buy-in” of the proposed improvements.

The scope also included a traffic count survey, analysis of the existing traffic conditions, analysis of the proposed improvements under the projected usage, identification of the impacts as a result of the proposed improvements, and recommendations to the roadway improvements to mitigate the identified traffic impacts.

A traffic study will be performed and a report generated to present the findings and proposed improvements. The proposed improvements will be evaluated for use in the conceptual engineering design.

Recommendations to improve the drainage condition will also be provided.

An Environmental Assessment (E.A.) will be prepared and will conform to the requirements of 23 CFR Part 771, Hawaii Revised Statutes Chapter 343, Hawaii Administrative Rules Title 11, Chapter 200.

B. History

In 1980, the State Highways Division (HDOT) identified the need for an improved highway to be constructed in the Waimanalo area to accommodate future traffic growth. Alternative highway alignments were examined and were later presented to interested community

members and the Waimanalo Neighborhood Board in 1996 and 1997. As a result of these briefings, a Waimanalo Highway Improvement Task Force was formed. In a 1997 presentation to the community, residents did not support widening the existing highway from 2-lanes to 4-lanes because private land would be condemned and it would lead to speeding and more traffic accidents.

In a public meeting in September 1998, the Waimanalo Neighborhood Board informed HDOT that the community favored improving the existing highway by providing sidewalks and left turning lanes in lieu of constructing a bypass road and widening the entire highway. The Board also informed HDOT that they favored improvements to the highway over widening or constructing a by-pass.

In 1999, the former Representative Goodenow solicited recommendations and comments related to highway improvements from the Waimanalo community. A prioritized tabulation of these comments were given to HDOT in 2000, which in turn was used to develop the scope of work for this planning study. The majority of the comments related to enhancing highway operations by providing left turning lanes, moving bus stops off the travel-way, and improving the roadway shoulders and sidewalks to make it safer and ADA accessible.

Two Public Informational Meetings (PIM) were held on July 25, 2001 and August 29, 2001 to present design concepts based on the community requested improvements compiled earlier. In these PIMs, the stakeholders provided more specific information on problem areas that HDOT incorporated into the conceptual plans.

Since considerable discussions concerning horse paths and crossings occurred in the two earlier PIMs, on October 11, 2001, HDOT conducted another public meeting specifically for stakeholders with equestrian interests. In this meeting, high horse traffic areas were identified and incorporated into the plan. HDOT felt that since equestrian activities are part of the Waimanalo culture, it was important to incorporate it into this planning study.

On June 25, 2002, the fourth PIM was conducted to show the semi-final conceptual plans and layouts. Since several stakeholders felt that the community was not adequately notified, HDOT conducted another PIM on July 9, 2002. In this meeting, several community members asked if a by-pass road similar to Haleiwa could be considered in addition to the proposed Kalanianaole Highway improvements.

The fifth PIM was held on November 26, 2002 to update the community of the project status. The meeting reviewed the comments received

from the past PIM's and presented the latest conceptual plan and layout. Renderings of several locations along the project were presented to illustrate the design intent. Preliminary costs were also presented based on alternate designs. The community was updated on the upcoming schedule and was informed that the Environmental Assessment was about to begin.

On June 30, 2004, a sixth and final PIM was conducted. The Director of Transportation updated the community on the status of the project and the final conceptual plans and layout was presented. The community was informed that although the plans were final, it was still in a conceptual stage and that the design process would provide opportunities to work out detailed issues.

C. Other Projects

Kalanianaole Highway 36-Inch Transmission Main, Phase-1. The BWS is in the design stage to install a 36" waterline from the Olomana Golf Course area to Poalima Street intersection. BWS' consultant has developed pre-final plans and an Environmental Assessment has been completed for this BWS project. Since DOT's project overlaps the BWS' project limits, BWS has requested that the waterline be combined with HDOT's work and constructed concurrently. Although BWS' waterline project is at a more advanced stage than this planning study, BWS has informed HDOT that they will delay construction of the waterline so that HDOT's construction work can be done concurrently.

Inoaole Stream Bridge Replacement. The stream crossing structure at Inoaole Stream will be replaced by HDOT. The estimated construction start for this project is FY 2008.

II. EXISTING CONDITIONS

A. Project Location

The project is located on the windward side on the island of Oahu (see **EXHIBIT 1 – ISLAND MAP**)

The project begins at the Old Kalanianaole Road intersection and ends at the east entrance to the Waimanalo Beach Park (see **EXHIBIT 2 – LOCATION MAP).**

B. Existing Highway Facility

Kalanianaole Highway is the only major facility passing through the Waimanalo District and consequently is a heavily traveled route. Commuter traffic between Hawaii Kai and Kailua occurs on a regular basis and acute traffic circulation problems usually develop during weekends and holidays due to the popular local beach areas. Concerns about the safety of children walking to and from the nearby schools were raised during the Public Informational Meetings. Many sections of existing sidewalks and narrow unimproved walkways are not in compliance with current ADA guidelines.

C. Land Use and Ownership along Highway

The variation in land use along the project consists of residential, business, educational and community facilities. Larger land use includes the Olomana Golf Course, the Waimanalo Town Center, the Waimanalo Elementary and Intermediate School, the Bellows Landing Field, the Honolulu Polo Club, and the Waimanalo Beach Park.

Ownership along the project limits besides private landowners include the State of Hawaii, the City & County of Honolulu, the State of Hawaii's Department of Education, the Department of Hawaiian Home Lands and the U.S. Air Force.

The zoning and development plan classification along the project limits are shown on **EXHIBIT 3 – ZONING MAP** and **EXHIBIT 4 – DEVELOPMENT PLAN**.

D. Right-of-Way

The Right-of-way widths along the project vary from 50-feet to 100-feet.

LOCATION	RIGHT-OF-WAY WIDTH
Flamingo Road to Aloiloi Street	50-feet
Aloiloi Street to Wailea Street	100-feet
Wailea Street to Waimanalo Beach Park	80-feet

The existing Right-of-way is completely used within the 50-foot width. However, the 80- and 100-foot widths are not being fully utilized.

E. Soils

The Soils Conservations Soil Survey map of the island identified twelve soil types of varying properties. **APPENDIX A – SOIL TYPES**, lists all twelve-soil types along with its soil characteristics.

F. Flood Hazard Areas

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Map (FIRM), shows that a portion of the project resides within the special flood area subject to flooding during a 100-year flood (Zones A and AE). See **EXHIBIT 5 – FLOOD ZONE MAP**.

The Tsunami Evacuation Zone Map identifies the majority of the Makai area between the main gate of Bellows field and the Waimanalo Beach Park to border the evacuation zone.

G. Wetlands

According to the Army Corp of Engineers, the area Mauka of the Inoaole Bridge is considered to be a wetland.

H. Special Management Areas

A large portion of the project borders the Special Management Area (SMA). The project may be exempt from obtaining an SMA permit if the proposed project remains completely within public right-of-way and is not considered to be a "development". However, if the project extends beyond the right-of-way, an SMA permit would be required. For the land acquisition at the corner of Poalima Street, this area does not border the SMA and will not require an SMA permit.

I. Utilities

Existing utilities included within the project limits include a 36-inch water main, a 15-inch sewer main, and drain lines of varying sizes. Overhead electrical and telephone lines are hung from utility poles on both sides of the road. Highway streetlights are also mounted on some of the utility poles. Two intersections along Kalanianaole Highway are signalized, Poalima and Moole Street.

Water and sewer manhole and valve covers will be adjusted as needed to the new finish grade. Existing power poles will be relocated to accommodate the new roadway configuration.

The Board of Water Supply (BWS) is preparing an Environmental Assessment to install a new 36-inch water main. The Phase-1 of new transmission main would enter Kalanianaole Highway at Poalima Street and connect to the existing 36-inch main near the Olomana Golf Course. The BWS intends to defer construction of the water main project so that it will coincide with construction of this project.

Existing electric, telephone and cable television distribution systems along the highway are provided with wood utility poles and overhead distribution wires.

J. Drainage

Several drainage systems are present along Kalanianaole Highway. These systems were installed as part of the subdivision improvements.

The Waimanalo Core Development project installed drainage systems at Kumuhau, Humuniki, and Mekia Street. The discharge point for Kumuhau Street is an 18-inch outlet pipe on the Makai-side of Kalanianaole Highway. The discharge point for Humuniki (30-inch pipe) and Mekia Street (18-inch pipe) is the Kahawai Stream. The systems were designed for a 10-year storm.

The Waimanalo Village project installed a drainage system at the Moole Street intersection. A grated inlet is connected to an 8-inch pipe that traverses Makai towards a drain manhole in the intersection (topographic survey did not find the manhole cover). The 8-inch pipe then continues into the subdivision.

The Inoaole Subdivision installed a drainage system within the subdivision. No drainage structures were constructed along Kalanianaole Highway at the Inoaole Street intersection. However, a concrete thru gutter was installed to allow street runoff from the highway to by-pass the subdivision. Throughout the years as the highway has been resurfaced, the pavement elevation has increased which has created a steeper transition into the thru gutter. The steeper transition forces vehicles to a reduced speed to prevent “bottoming-out”. It is recommended that the pavement grade along Kalanianaole Highway be reduced to its original elevation to prevent the “bottoming-out” condition.

The Waimanalo Beach Lots (Makai-side - Aloiloi Street to Wailea Street) shows several drainage structures at Aloiloi and Wailea Street. The discharge location has not been determined but is assumed to be within the subdivision and not along Kalanianaole Highway.

Presently, the existing condition of the deteriorated road and shoulders has created ponding problems along Kalanianaole Highway. This report has made recommendations to provide a temporary solution to eliminate the ponding in several areas. A comprehensive drainage study is recommended to assure that the improved roadway complies to current drainage standards.

K. Highway Lights

Existing highway lights are generally mounted on wood utility poles with metal bracket arms and luminaries. Some areas have existing highway light bracket arms with luminaires mounted on metal utility poles.

III. NEED

Certain elements of Kalanianaole Highway do not meet current highway design criteria and ADA guidelines. Improving the highway will make the highway operate more efficiently and also make it friendlier for the bicyclists, pedestrians, and equestrians.

The lack of turning lanes at key intersections causes queuing when vehicles attempt to make left turning movements onto side streets. Many of the bus stops require buses to stop in the travel-way which contributes to traffic delays. It has been reported by community members that impatient drivers cross the double yellow center stripe to pass the stopped buses, and also drivers attempt to pass the buses along the roadway shoulders.

Sections of existing concrete sidewalks do not meet current ADA guidelines and are not wheelchair and pedestrian friendly. Similarly, existing shoulders are narrow in many locations which causes wheelchair and pedestrian traffic to move close to the travel-way, thus causing potential conflicts which results in undesirable conditions.

Several areas have drainage problems that result in ponding of storm runoff that is not only unsightly but may cause vector control concerns if left un-addressed.

IV. TRAFFIC STUDIES

A traffic study was prepared by The Traffic Management Consultant (see **APPENDIX B – TRAFFIC ENGINEERING REPORT**).

The report confirmed that the morning and afternoon peak hour traffic produced unsatisfactory conditions for vehicles exiting side streets onto Kalanianaole Highway.

Through traffic for vehicles on Kalanianaole Highway also experienced delayed travel times during the peak hours. Vehicles trying to make left turns into the side streets and buses stopping at the bus stops block the through travel lane and prevent vehicles from continuing through. In some instances,

through vehicles pass the turning vehicles or buses by driving on the unpaved shoulders or cross the double solid line.

With the proposed improvements, the traffic study showed that the turning movements out of the side streets and the vehicle travel time for through traffic will improve considerably.

Although not specifically mentioned in the report, it is highly anticipated that the improvements will produce a favorable condition for motorists, pedestrians, and other users traveling along the Highway. Vehicles turning onto Kalanianaole Highway will have a refuge lane on the highway to merge into the through traffic. Where available, buses will be able to move out of the travel lane into bus pull-outs and will allow the through traffic to continue on. Pedestrians will also benefit by using the ADA accessible walkways. Other users such as equestrian riders will have a grass strip (where available) to use.

A traffic study addendum was also prepared by The Traffic Management Consultant (see **APPENDIX C – TRAFFIC ENGINEERING REPORT ADDENDUM**).

The addendum report studied three intersections and provided recommendations and conclusions for each intersection.

Olomana Golf Course Driveway Intersection
Provide a left turn pocket lane to turn into the golf course driveway. An exclusive right turn lane into the golf course driveway is not recommended.

Kumuhau Street Intersection
A signalized intersection is not recommended at this time.

Moole Street Intersection
A signalized intersection is not recommended at this time.

Several traffic safety analyses were performed as part of the Highway Safety Improvement Program (HSIP) under Title 23, United States Code, Section 152. The analyses can be found in **APPENDIX D – HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP).**

V. DESIGN CRITERIA

A. Design Considerations

Highway Functional Classification – Major Arterial
Posted Speed Limit – Varies from 25 to 45 mph

Design Speed – Varies from 35 to 55 mph (10 mph above the posted speed limit)

B. Storage Lane Length

The length of the storage lane was provided by the traffic study. This 'exclusive left-turn lane' would provide storage for vehicles turning left into the side street and would reduce the delay to the through traffic on Kalanianaole Highway. The design should consider the deceleration length when space is available.

C. Lane Width

Lane widths for through lanes are typically eleven-feet (fourteen-feet travel lanes from Ehukai Street to Nakini Street due to the larger right-of-way width). Left turn pockets and shared use lanes are ten-feet. The lane widths are constrained by the available right-of-way widths and the desired shoulder improvements.

D. Shoulder Widths

Again, widths are constrained by the available right-of-way widths and the desired shoulder improvements.

Asphalt Concrete (AC) shoulders has a minimum width of five-feet. In addition to the AC shoulder, an unpaved shoulder adjacent to the AC shoulder will allow vehicles to safely pull-off of the travel-way under emergency situations.

During community meetings, a grassed path was requested. The locations for the path (three-feet wide from Flamingo Road to Saddle City Street and six-feet wide from Aloiloi Street to Waimanalo Beach Park) were identified by the community and are not continuous throughout the project. Continuity throughout the project was not requested as the grassed path was only needed where the community felt it would best serve the equestrians normal travel pattern.

E. Concrete Sidewalk Width

The sidewalk width utilizes the available width to provide an ADA accessible route and a smooth driveway transition. Current ADA guidelines require a three-foot minimum width, provided a five-foot wide section is provided every 250 feet. A five-foot minimum width is recommended for continuous sidewalks. In this project, a five-foot minimum width is provided.

Between Kumuhau and Poalima Street, a wider sidewalk is recommended due to the existing driveways to residential homes along this area. The wider sidewalk aids drivers exiting the driveways by providing additional space to view oncoming traffic and meeting ADA guidelines.

From Poalima to Inoaole Street, the sidewalk width can be narrower since no driveways are present. However, the sidewalk must be wide enough to be ADA accessible.

F. Electric, Telephone and Cable Television System.

1. The electric utility system relocation work shall comply with the requirements of Hawaiian Electric Company.

2. The telephone utility system relocation work shall comply with the requirements of Hawaiian Telcom.

3. The cable television system relocation work shall comply with the requirements of Time Warner Oceanic Cable Company.

G. Highway Lights (see **APPENDIX E – HIGHWAY ILLUMINATION CALCULATIONS**)

1. The new highway lighting system shall comply with the following design criteria:

   a) Roadway Classification shall be Major / Residential
   b) Average minimum maintained footcandle level shall be 0.8 fc.
   c) Average to Minimum Uniformity ratio shall be 3:1.

H. Design References and Guidelines:

1. State of Hawaii's Department of Transportation Statewide Uniform Design Manual for Streets and Highways.
2. American Association of State Highway and Transportation Officials (AASHTO), 2001.
3. Roadside Design Guide, American Association of State Highway and Transportation Officials (AASHTO), 2002 Edition
4. ADAAG Manual a guide to the Americans with Disabilities Act Accessibility Guidelines, 2002
5. Manual on Uniform Traffic Control Devices (MUTCD), Federal Highways Administration (FHWA), 2003
6. Design Criteria for Highway Drainage, State of Hawaii's Department of Transportation Highways Division, updated 2001

7. Highway Capacity Manual, Special Report 209, Transportation Research Board, 2000 Edition
8. Highway Capacity Software, Federal Highways Administration, release 2001.
9. An Informational Guide for Roadway Lighting (AASHTO), 2005
10. AASHTO's Guide for the Development of Bicycle Facilities, 3rd Edition 1999

VI. <u>RECOMMENDED IMPROVEMENTS</u> (See **EXHIBIT 6 – ROADWAY PLAN** and **EXHIBIT 7 – ROADWAY ELECTRICAL PLAN**)

A. Left Turning Lanes

As indicated in the Traffic Study, the dedicated left turning lanes at Flamingo Road, Kumuhau Street, Humuniki Street, Mekia Street, Moole Street (both directions), Inoaole Street, and Aloiloi Street will improve the through traffic along Kalanianaole Highway.

In addition to improving the through traffic's travel time, the left turning lane provides for a favorable condition. The existing condition results in vehicles using the shoulder to avoid waiting behind vehicles attempting to make a left turn.

B. Shelter Lanes

Shelter lanes are provided for left turning vehicles entering Kalanianaole Highway from side streets to make it easier for those drivers and to help improve traffic flow along Kalanianaole Highway.

C. Bus Pullouts

Where space is available, Bus Pullouts are recommended to alleviate queuing and improve traffic flow.

In addition to improving traffic flow, the Bus Pullout provides for a favorable condition. The existing condition results in vehicles going around the bus at the bus stop by crossing the double yellow solid pavement markings to avoid waiting behind the bus while the bus is loading/unloading. Residents have reported that vehicles sometimes drive along the shoulders of the roadway to pass buses.

All Bus Pullouts will be made ADA accessible by providing an 8'x5' concrete landing pad where wheel chair users will board /depart the buses that have the accessible lift built into the bus.

D. Sidewalks and Shared Use Paths

The existing concrete sidewalk on the mauka-side of the highway from Kumuhau Street to Inoaole Street will be reconstructed with a new ADA accessible concrete sidewalk. The replacement will also include new ADA accessible driveways and curb ramps. This portion of the highway has been designated by the community as being one of the primary routes used by school children traveling to and from the Waimanalo Elementary and Intermediate School.

Remaining areas along Kalanianaole Highway that do not have concrete sidewalks will have an AC paved shoulder. Vehicles will be able to use the paved shoulder during emergencies. Pedestrians not wanting to use the adjacent grassed area will also be able to use the AC shoulder. From Aloiloi Street to the Waimanalo Beach Park, the existing AC sidewalk on the Mauka-side of the highway will be replaced with a new five-foot AC sidewalk.

In locations identified by the community, a grassed path will be installed to allow equestrian riders to traverse along Kalanianaole Highway to designated locations along the project. The grassed path, which varies from three-feet to eight-feet, will be wide enough to allow equestrian riders and pedestrian traffic to travel along Kalanianaole Highway.

E. Center Left-Turn Lanes

Center left-turn lanes were provided to allow vehicles to make left-turning movements into driveways along Kalanianaole Highway. Similar to a left turning lane at an intersection, the center left-turn lane improves the through traffic's travel time. In addition, the center left-turn lane would provide a beneficial condition for vehicles exiting driveways by allowing vehicles to remain in the center left-turn lane till it is clear to enter the through travel lane.

F. Drainage

The original comments provided by the community indicated that there are several locations along the project limits that experience drainage problems.

Near the Mekia Street Intersection, on the Makai-side of the highway fronting the sewer pump station, ponding on the shoulder area has

been observed. During larger storm events, the ponding encroaches onto the travel-way. To eliminate the ponding, a grated inlet is recommended in the unpaved shoulder area. A drainpipe from the inlet can be discharged into the nearby Kahawai Stream.

Other locations along the highway that experience minor ponding are a result of “patch-work” resurfacing throughout the years. Resetting the roadway elevation to its original designed profile can mitigate the minor ponding.

The proposed drainage improvements assume that no additional off-site flows are required to be managed. A comprehensive hydrologic analysis shall be performed to determine the existing hydrologic boundaries and define the new hydrologic boundaries. An increase in the hydrologic runoff is anticipated but will not have major impacts to the highway and adjacent properties. During the design phase, a hydraulic analysis would need to be performed. Based on the analysis, appropriate mitigative measures would be taken to minimize any project impacts.

Although portions of the project resides within the 100-year flood zone (Zones A and AE), the proposed improvements within this area should not cause an increase to the flooding condition. The flood zone primarily consists of the Waimanalo Polo field and Bellows Beach Park.

G. Pavement Reconstruction

Over the years, the existing pavement has been resurfaced numerous times. As a result, the existing road profile has been raised causing transition problems at several intersections.

At Moole Street and Inoaole Street, a concrete through gutter has prevented the resurfacing from extending into these side streets. As a result, the transition into and out of these side streets are steeper than desired and causes vehicles to slow excessively.

It is recommended that the existing built up pavement be removed and the profile adjusted back to its original profile.

For estimating purposes, a pavement section consisting of 2” super pave asphalt concrete over 10” of plant mix glassphalt concrete base course be used. A pavement Justification Report will need to be prepared in the design phase of this project.

H. Median Improvements

A median barrier at the Olomana Golf Course area is proposed to diminish the possibility of vehicles crossing into incoming traffic. Centerline median rumble strips will also be incorporated where possible.

I. Striping Improvements

In addition to the striping improvements to provide the left turning lanes and bus pull-outs, striping improvements are proposed near the Old Kalanianaole Road. To promote a reduction in travel speed as vehicles approach Waimanalo from Kailua, a lane taper will begin (approximately nine hundred-feet before the Old Kalanianaole Road) to reduce the travel lanes to one lane. A driver feedback speed display sign is also proposed to promote the speed reduction.

J. Electric, Telephone and Cable Television Systems

1. The existing wood utility pole locations in most of the areas along the project limits will be in conflict with the proposed improvements. The conflict can be resolved as follows:

   a) The existing wood utility pole and lines to be relocated to provide adequate roadside clearance and ADA accessibility.

   b) The existing wood utility pole and lines to be removed and converted to an underground utility distribution system.

K. Highway Lights

1. Due to the relocation or removal of the existing wood utility pole line system, the existing highway lighting system will be removed and provided with new highway lighting metal standards, bracket arms and luminaires on concrete foundations.
2. Several locations (bus stop near Olomana Golf Course & Inoaole Street intersection) were identified during the community meetings which seem to lack sufficient lighting. The proposed highway lighting system will provide adequate lighting for the entire length of the project.
3. The proposed highway lighting shall incorporate cut-off type luminaries to minimize effects to the Shearwater birds.

L. Renderings

To illustrate the proposed improvements, several renderings were prepared showing the additional turning lane, bus pull-outs and relocated utility poles. See **APPENDIX F** for renderings.

M. Permits Needed

1. National Pollutant Discharge Elimination System (NPDES) - construction activity, dewatering
2. Noise Permit
3. Land Use Permit for Construction
4. Grubbing, Grading, Excavation and Stockpiling permit
5. Discharge of Water Permit (Hydrotesting)
6. Street Usage Permit

N. Land Acquisition

Land Acquisition at the south-west corner of Poalima Street (former Chevron gas station) will be required to provide a larger turning radius to allow WB-50 trailer trucks to safely maneuver the right turn from Kalanianaole Highway into Poalima Street.

O. Landscaping

During one of the PIM's, a community member suggested utilizing native, drought tolerant, low maintenance plants where available. Recent community projects have installed this type of landscaping.

The design shall also consult a botanist to identify existing trees which may be relocated as a result of the adding of sidewalks, paved shoulders, bus pull-outs and other hardening improvements which would displace the existing trees.

P. Permanent Best Management Practices (BMP)

The Design Consultant shall verify with the Highways Division if the subject project will be required to provide permanent BMP measures. If required, the design shall incorporate permanent BMP measures such as grass swales, filter strips, or other structural devices that will minimize pollutants from being discharged into State waters.

VII. ENVIRONMENTAL ASSESSMENT

A. Based on the proposed improvements, an Environmental Assessment will be prepared to meet the requirements of the National Environmental Policy Act (NEPA); FHWA regulations (23 CFR 711, Environmental Impact and Related Procedures); Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508); Chapter 343 of the Hawaii Revised Statues (HRS); and Hawaii Administrative Rules (HAR) of the Department of Heath (Title 11, Chapter 200, Environmental Impact Statement Rules). The EA for this project will be coordinated with separate EA's prepared for the two other projects described below.

B. The Honolulu Board of Water Supply has completed an Environmental Assessment to accompany their project to install a water transmission (36-inch or smaller). The alignment will enter Kalanianaole Highway at Poalima Street and end near the Olomana Golf Course. To minimize disruption to the community, the project will be scheduled in conjunction with the construction schedule to implement the improvements proposed in this report.

C. The Department of Transportation Highways Division is also preparing an Environmental Assessment to replace Inoaole Bridge. The bridge improvements involve the widening of the bridge to allow for future roadway improvements and to upgrade the bridge railings to meet the current roadway standards. The construction schedule for this project will also be incorporated into the schedule for the roadway improvements.

VIII. COST ESTIMATE

The preliminary cost estimate for the project is presented with varying alternatives.

Alternative 1 (**TABLE 1 – ALTERNATIVE 1 COST ESTIMATE**) assumes that the existing utility poles will be relocated to provide adequate roadside clearance and ADA accessibility. Provide new highway light standards and underground highway lighting wiring system along the project limits. The alternate will reconstruct the existing pavement section to its original profile. The two traffic signals (and loop detectors) will also be replaced to current ADA criteria. The total project cost for Alternative 1 is **$16,589,663**.

Alternative 2 (**TABLE 2 – ALTERNATIVE 2 COST ESTIMATE**) assumes that the existing utility poles will be removed and all overhead utilities will be placed underground. Provide new highway light standards and underground highway

lighting wiring system along the project limits. The alternate will reconstruct the existing pavement section to its original profile. The two traffic signals (and loop detectors) will also be replaced to current ADA guidelines. The total project cost for Alternative 2 is **$51,675,218**.

Alternative 3 (**TABLE 3 – ALTERNATIVE 3 COST ESTIMATE**) assumes the existing overhead utilities where the right-of-way width is 50 feet will be placed underground so that the available space can be better utilized. In areas where the right-of-way widens to more than 50 feet, the overhead utilities will be moved outwards to accommodate the proposed improvements and to meet clear zone requirements. Provide new highway light standards and underground highway lighting wiring system along the project limits. The total project cost for Alternative 3 is **$38,761,218**.

IX. CONCLUSION AND RECOMMENDATIONS

This Advanced Planning Report developed conceptual engineering concepts to improve Kalanianaole Highway from Olomana Golf Course to Waimanalo Beach Park. The proposed improvements will bring the highway up to current design standards.

Due to the existing operating conditions as observed and reported by community members, it is recommended that improvements be done to improve operations not only for vehicular traffic, but for other users also. The construction alternatives presented provides some options for HDOT to implement based on construction funding that is available at the time of implementation.

If sufficient construction funding is available and if HDOT's Director and other concurring parties are in agreement with undergrounding of utilities, it is recommended that Alternative 3 be implemented. This alternative provides the best balance between trying to achieve the best product from a practical and cost effective standpoint.

If construction funds for undergrounding is not available, or if HDOT's Director or other participating parties is not in agreement, Alternative 1 is recommended.

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
FEDERAL AID PROJECT NO. STP - 072 - 1(44)
JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
629.1010	4-INCH PAVEMENT STRIPING (71,600 L.F.)	L.S.	L.S.	L.S.	$ 71,600.00
629.1014	8-INCH PAVEMENT STRIPING (1,890 L.F.)	L.S.	L.S.	L.S.	$ 2,835.00
629.1015	12-INCH PAVEMENT STRIPING (1,905 L.F.)	L.S.	L.S.	L.S.	$ 7,620.00
629.1020	CROSSWALK MARKING	62	LANE	$ 350.00	$ 21,700.00
629.1030	PAVEMENT ARROW SINGLE	96	EACH	$ 100.00	$ 9,600.00
629.1040	PAVEMENT WORD (ONLY)	14	EACH	$ 150.00	$ 2,100.00
629.2010	PAVEMENT MARKERS (1,520 EACH)	L.S.	L.S.	L.S.	$ 7,600.00
650.0100	CURB RAMPS	19	EACH	$ 2,000.00	$ 38,000.00
680.1001	RELOCATE UTILITY POLES SYSTEM (BY RESPECTIVE UTILITY COMPANY)	11,050	LIN. FT.	$ 150.00	$ 1,657,500.00
693.0100	TAU-II SYSTEM TERMINAL IMPACT ATTENUATOR	6	EACH	$ 40,000.00	$ 240,000.00
694.0200	MOVEABLE CONCRETE BARRIER (MCB) SYSTEM	980	LIN. FT.	$ 350.00	$ 343,000.00
	SUBTOTAL CONTRACT ITEMS				$ 12,906,780.00
	CONTINGENCY (5%)				$ 645,339.00
	SUBTOTAL				$ 13,552,119.00
	CONSTRUCTION ENGINEERING (15%)				$ 2,032,817.00
	STAFF LABOR				$ 1,882,238.00
	NON-LABOR (5% OF STAFF LABOR)				$ 94,112.00
	DESIGN SUPPORT (3% OF STAFF LABOR)				$ 56,467.00
	INDIRECT COST (51.9% STAFF LABOR)				$ 976,882.00
	TOTAL PROJECT COST				$ 16,561,818.00

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
FEDERAL AID PROJECT NO. STP - 072 - 1(44)
JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
104.0100	PARTNERING	F.A.	F.A.	F.A.	$ 25,000.00
202.0440	REMOVAL OF DEBRIS FROM DRAIN STRUCTURES (INCL. FLUSHING)	L.S.	L.S.	L.S.	$ 5,000.00
203.0100	ROADWAY EXCAVATION (12" DEPTH)	24,020	CU YD	$ 50.00	$ 1,201,000.00
209.0100	WATER POLLUTION AND EROSION CONTROL	F.A.	F.A.	F.A.	$ 200,000.00
312.1110	PLANT MIX GLASSPHALT CONCRETE BASE COURSE (10")	43,775	TON	$ 130.00	$ 5,690,750.00
402.0100	SUPER PAVE ASPHALT CONCRETE PAVEMENT (2")	8,760	TON	$ 145.00	$ 1,270,200.00
603.1006	18-INCH REINFORCED CONCRETE PIPE	35	LIN. FT.	$ 50.00	$ 1,750.00
604.2300	GRATED INLET	1	EACH	$ 5,000.00	$ 5,000.00
608.0200	CONCRETE SIDEWALK	3,000	SQ YD	$ 50.00	$ 150,000.00
608.6000	BED COURSE FOR SIDEWALK (4")	335	CU YD.	$ 35.00	$ 11,725.00
609.2725	CURB AND GUTTER, TYPE 2DG	3,980	LIN. FT.	$ 32.00	$ 127,360.00
617.0100	PLANTING SOIL (1550 CU. YD.)	L.S.	L.S.	L.S.	$ 46,500.00
617.0200	SOIL AMENDMENTS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 8,375.00
619.8001	PLANTING GRASS, COMMON BERMUDA GRASS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 12,565.00
619.9100	MAINTENANCE OF LANDSCAPING	12	MONTH	$ 2,500.00	$ 30,000.00
622.1001	NEW HIGHWAY LIGHT STANDARD, LUMINAIRE AND BRACKET ARM ON CONCRETE FOUNDATION	121	EACH	$ 5,000.00	$ 605,000.00
622.1002	NEW UNDERGROUND HIGHWAY LIGHTING WIRING	16,700	LIN. FT.	$ 50.00	$ 835,000.00
622.1003	NEW ELECTRICAL SERVICE FOR NEW HIGHWAY LIGHTING SYSTEM	1	EACH	$ 20,000.00	$ 20,000.00
623.1000	TRAFFIC SIGNAL SYSTEM (INCLUDING LOOP DETECTORS)	2	EACH	$ 130,000.00	$ 260,000.00

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
FEDERAL AID PROJECT NO. STP - 072 - 1(44)
JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
629.1010	4-INCH PAVEMENT STRIPING (71,600 L.F.)	L.S.	L.S.	L.S.	$ 71,600.00
629.1014	8-INCH PAVEMENT STRIPING (1,890 L.F.)	L.S.	L.S.	L.S.	$ 2,835.00
629.1015	12-INCH PAVEMENT STRIPING (1,905 L.F.)	L.S.	L.S.	L.S.	$ 7,620.00
629.1020	CROSSWALK MARKING	62	LANE	$ 350.00	$ 21,700.00
629.1030	PAVEMENT ARROW SINGLE	96	EACH	$ 100.00	$ 9,600.00
629.1040	PAVEMENT WORD (ONLY)	14	EACH	$ 150.00	$ 2,100.00
629.2010	PAVEMENT MARKERS (1,520 EACH)	L.S.	L.S.	L.S.	$ 7,600.00
650.0100	CURB RAMPS	19	EACH	$ 2,000.00	$ 38,000.00
680.1002	CONVERT EXISTING OVERHEAD UTILITY SYSTEM TO AN UNDERGROUND DISTRIBUTION SYSTEM INCLUDING UTILITY CHARGES	14,500	LIN. FT.	$ 2,000.00	$ 29,000,000.00
693.0100	TAU-II SYSTEM TERMINAL IMPACT ATTENUATOR	6	EACH	$ 40,000.00	$ 240,000.00
694.0200	MOVEABLE CONCRETE BARRIER (MCB) SYSTEM	980	LIN. FT.	$ 350.00	$ 343,000.00
	SUBTOTAL CONTRACT ITEMS				$ 40,249,280.00
	CONTINGENCY (5%)				$ 2,012,464.00
	SUBTOTAL				$ 42,261,744.00
	CONSTRUCTION ENGINEERING (15%)				$ 6,339,261.00
	STAFF LABOR				$ 5,869,686.00
	NON-LABOR (5% OF STAFF LABOR)				$ 293,484.00
	DESIGN SUPPORT (3% OF STAFF LABOR)				$ 176,091.00
	INDIRECT COST (51.9% STAFF LABOR)				$ 3,046,367.00
	TOTAL PROJECT COST				$ 51,647,372.00

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
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JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
104.0100	PARTNERING	F.A.	F.A.	F.A.	$ 25,000.00
202.0440	REMOVAL OF DEBRIS FROM DRAIN STRUCTURES (INCL. FLUSHING)	L.S.	L.S.	L.S.	$ 5,000.00
203.0100	ROADWAY EXCAVATION (12" DEPTH)	24,020	CU YD	$ 50.00	$ 1,201,000.00
209.0100	WATER POLLUTION AND EROSION CONTROL	F.A.	F.A.	F.A.	$ 200,000.00
312.1110	PLANT MIX GLASSPHALT CONCRETE BASE COURSE (10")	43,775	TON	$ 130.00	$ 5,690,750.00
402.0100	SUPER PAVE ASPHALT CONCRETE PAVEMENT (2")	8,760	TON	$ 145.00	$ 1,270,200.00
603.1006	18-INCH REINFORCED CONCRETE PIPE	35	LIN. FT.	$ 50.00	$ 1,750.00
604.2300	GRATED INLET	1	EACH	$ 5,000.00	$ 5,000.00
608.0200	CONCRETE SIDEWALK	3,000	SQ YD	$ 50.00	$ 150,000.00
608.6000	BED COURSE FOR SIDEWALK (4")	335	CU YD.	$ 35.00	$ 11,725.00
609.2725	CURB AND GUTTER, TYPE 2DG	3,980	LIN. FT.	$ 32.00	$ 127,360.00
617.0100	PLANTING SOIL (1550 CU. YD.)	L.S.	L.S.	L.S.	$ 46,500.00
617.0200	SOIL AMENDMENTS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 8,375.00
619.8001	PLANTING GRASS, COMMON BERMUDA GRASS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 12,565.00
619.9100	MAINTENANCE OF LANDSCAPING	12	MONTH	$ 2,500.00	$ 30,000.00
622.1001	NEW HIGHWAY LIGHT STANDARD, LUMINAIRE AND BRACKET ARM ON CONCRETE FOUNDATION	121	EACH	$ 5,000.00	$ 605,000.00
622.1002	NEW UNDERGROUND HIGHWAY LIGHTING WIRING	16,700	LIN. FT.	$ 50.00	$ 835,000.00
622.1003	NEW ELECTRICAL SERVICE FOR NEW HIGHWAY LIGHTING SYSTEM	1	EACH	$ 20,000.00	$ 20,000.00
623.1000	TRAFFIC SIGNAL SYSTEM (INCLUDING LOOP DETECTORS)	2	EACH	$ 130,000.00	$ 260,000.00

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
FEDERAL AID PROJECT NO. STP - 072 - 1(44)
JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
629.1010	4-INCH PAVEMENT STRIPING (71,600 L.F.)	L.S.	L.S.	L.S.	$ 71,600.00
629.1014	8-INCH PAVEMENT STRIPING (1,890 L.F.)	L.S.	L.S.	L.S.	$ 2,835.00
629.1015	12-INCH PAVEMENT STRIPING (1,905 L.F.)	L.S.	L.S.	L.S.	$ 7,620.00
629.1020	CROSSWALK MARKING	62	LANE	$ 350.00	$ 21,700.00
629.1030	PAVEMENT ARROW SINGLE	96	EACH	$ 100.00	$ 9,600.00
629.1040	PAVEMENT WORD (ONLY)	14	EACH	$ 150.00	$ 2,100.00
629.2010	PAVEMENT MARKERS (1,520 EACH)	L.S.	L.S.	L.S.	$ 7,600.00
650.0100	CURB RAMPS	19	EACH	$ 2,000.00	$ 38,000.00
680.1001	RELOCATE UTILITY POLES SYSTEM (BY RESPECTIVE UTILITY COMPANY)	5,440	LIN. FT.	$ 150.00	$ 816,000.00
680.1002	CONVERT EXISTING OVERHEAD UTILITY SYSTEM TO AN UNDERGROUND DISTRIBUTION SYSTEM INCLUDING UTILITY CHARGES	9,060	LIN. FT.	$ 2,000.00	$ 18,120,000.00
693.0100	TAU-II SYSTEM TERMINAL IMPACT ATTENUATOR	6	EACH	$ 40,000.00	$ 240,000.00
694.0200	MOVEABLE CONCRETE BARRIER (MCB) SYSTEM	980	LIN. FT.	$ 350.00	$ 343,000.00
	SUBTOTAL CONTRACT ITEMS				$ 30,185,280.00
	CONTINGENCY (5%)				$ 1,509,264.00
	SUBTOTAL				$ 31,694,544.00
	CONSTRUCTION ENGINEERING (15%)				$ 4,754,181.00
	STAFF LABOR				$ 4,402,019.00
	NON-LABOR (5% OF STAFF LABOR)				$ 220,101.00
	DESIGN SUPPORT (3% OF STAFF LABOR)				$ 132,061.00
	INDIRECT COST (51.9% STAFF LABOR)				$ 2,284,648.00
	TOTAL PROJECT COST				$ 38,733,373.00

ENGINEER'S PRELIMINARY DETAILED ESTIMATE
FEDERAL AID PROJECT NO. STP - 072 - 1(44)
JANUARY 10, 2006

ITEM NO.	ITEM	APPROX. QUANTITY	UNIT	UNIT PRICE	AMOUNT
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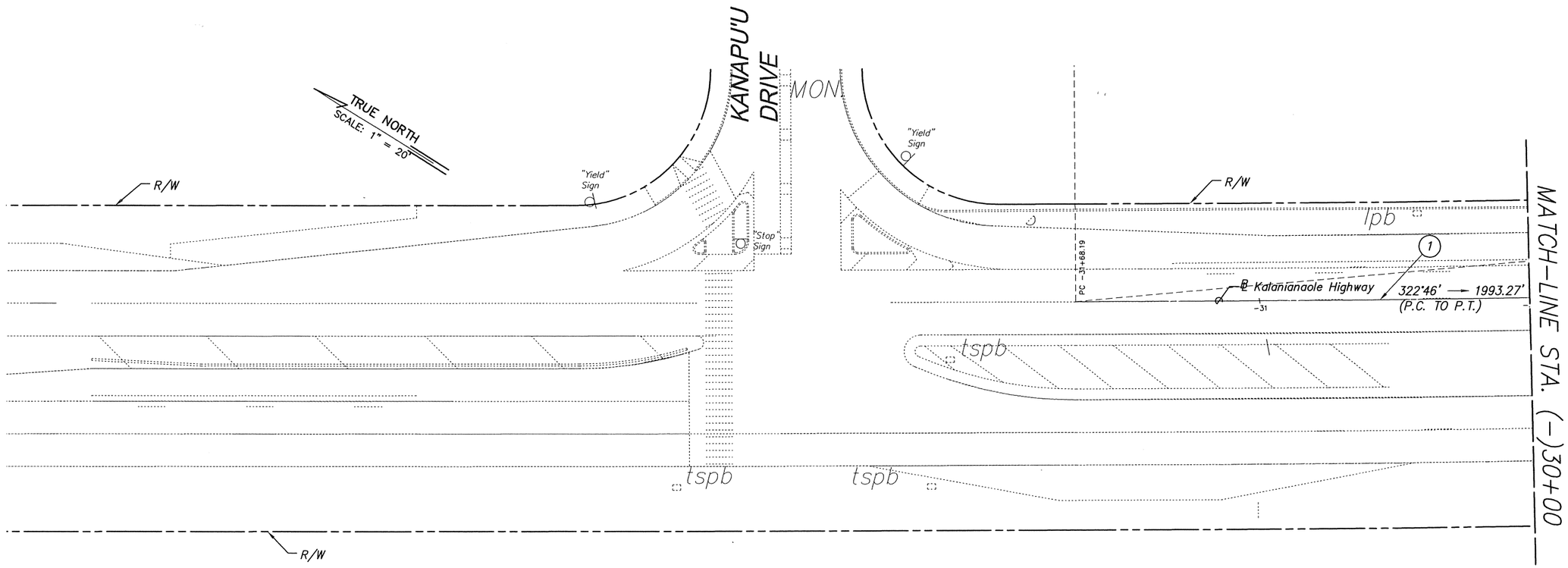
202.0440	REMOVAL OF DEBRIS FROM DRAIN STRUCTURES (INCL. FLUSHING)	L.S.	L.S.	L.S.	$ 5,000.00
203.0100	ROADWAY EXCAVATION (12" DEPTH)	24,020	CU YD	$ 50.00	$ 1,201,000.00
209.0100	WATER POLLUTION AND EROSION CONTROL	F.A.	F.A.	F.A.	$ 200,000.00
312.1110	PLANT MIX GLASSPHALT CONCRETE BASE COURSE (10")	43,775	TON	$ 130.00	$ 5,690,750.00
402.0100	SUPER PAVE ASPHALT CONCRETE PAVEMENT (2")	8,760	TON	$ 145.00	$ 1,270,200.00
603.1006	18-INCH REINFORCED CONCRETE PIPE	35	LIN. FT.	$ 50.00	$ 1,750.00
604.2300	GRATED INLET	1	EACH	$ 5,000.00	$ 5,000.00
608.0200	CONCRETE SIDEWALK	3,000	SQ YD	$ 50.00	$ 150,000.00
608.6000	BED COURSE FOR SIDEWALK (4")	335	CU YD.	$ 35.00	$ 11,725.00
609.2725	CURB AND GUTTER, TYPE 2DG	3,980	LIN. FT.	$ 32.00	$ 127,360.00
617.0100	PLANTING SOIL (1550 CU. YD.)	L.S.	L.S.	L.S.	$ 46,500.00
617.0200	SOIL AMENDMENTS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 8,375.00
619.8001	PLANTING GRASS, COMMON BERMUDA GRASS (83,750 SQ. FT.)	L.S.	L.S.	L.S.	$ 12,565.00
619.9100	MAINTENANCE OF LANDSCAPING	12	MONTH	$ 2,500.00	$ 30,000.00
622.1001	NEW HIGHWAY LIGHT STANDARD, LUMINAIRE AND BRACKET ARM ON CONCRETE FOUNDATION	121	EACH	$ 5,000.00	$ 605,000.00
622.1002	NEW UNDERGROUND HIGHWAY LIGHTING WIRING	16,700	LIN. FT.	$ 50.00	$ 835,000.00
622.1003	NEW ELECTRICAL SERVICE FOR NEW HIGHWAY LIGHTING SYSTEM	1	EACH	$ 20,000.00	$ 20,000.00
623.1000	TRAFFIC SIGNAL SYSTEM (INCLUDING LOOP DETECTORS)	2	EACH	$ 130,000.00	$ 260,000.00

CURVE	1
Δ	9°59'56"
Δ/2	4°59'58"
R	11436.39
T	1000.00
C	1993.27
Lc	1995.80

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	1	23



Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

PLAN
SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN
BEGIN TO STA. (-)30+00
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 1 OF 23 SHEETS

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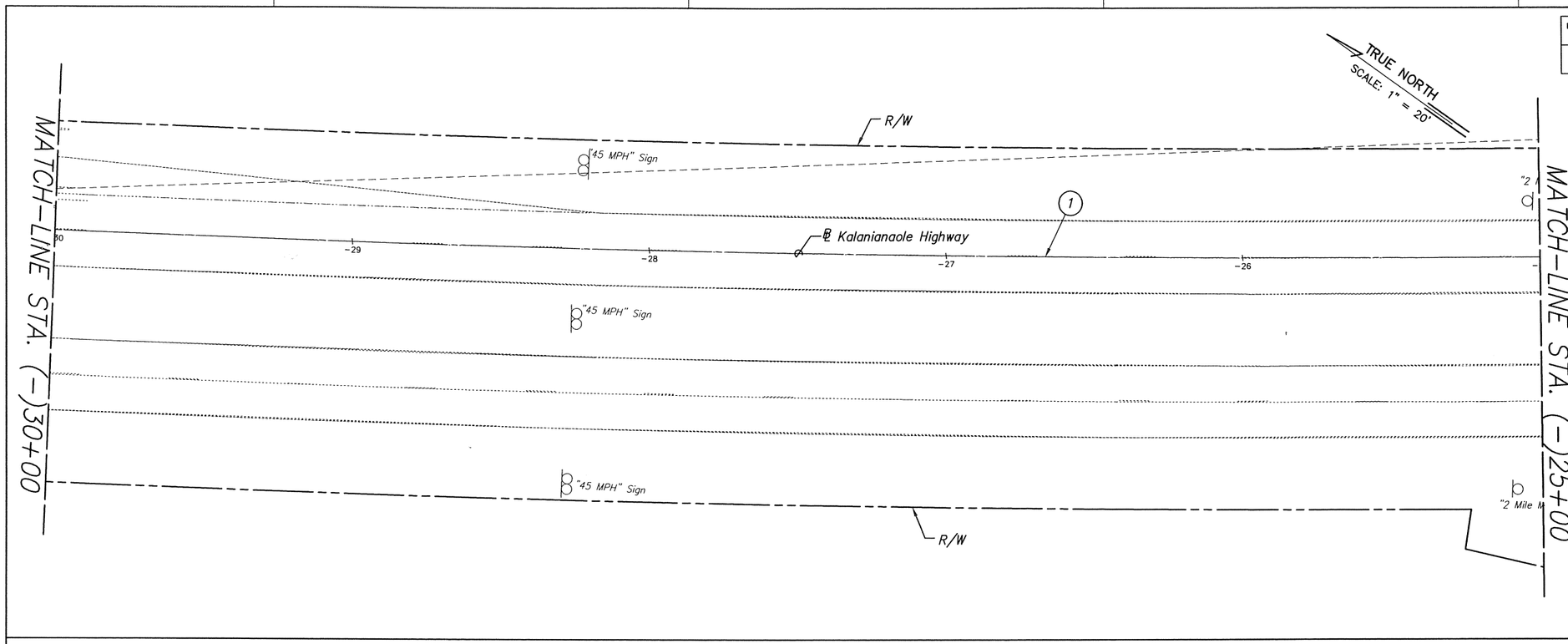
LAST MODIFIED: Wed, 10 Aug 2005 - 1:28pm

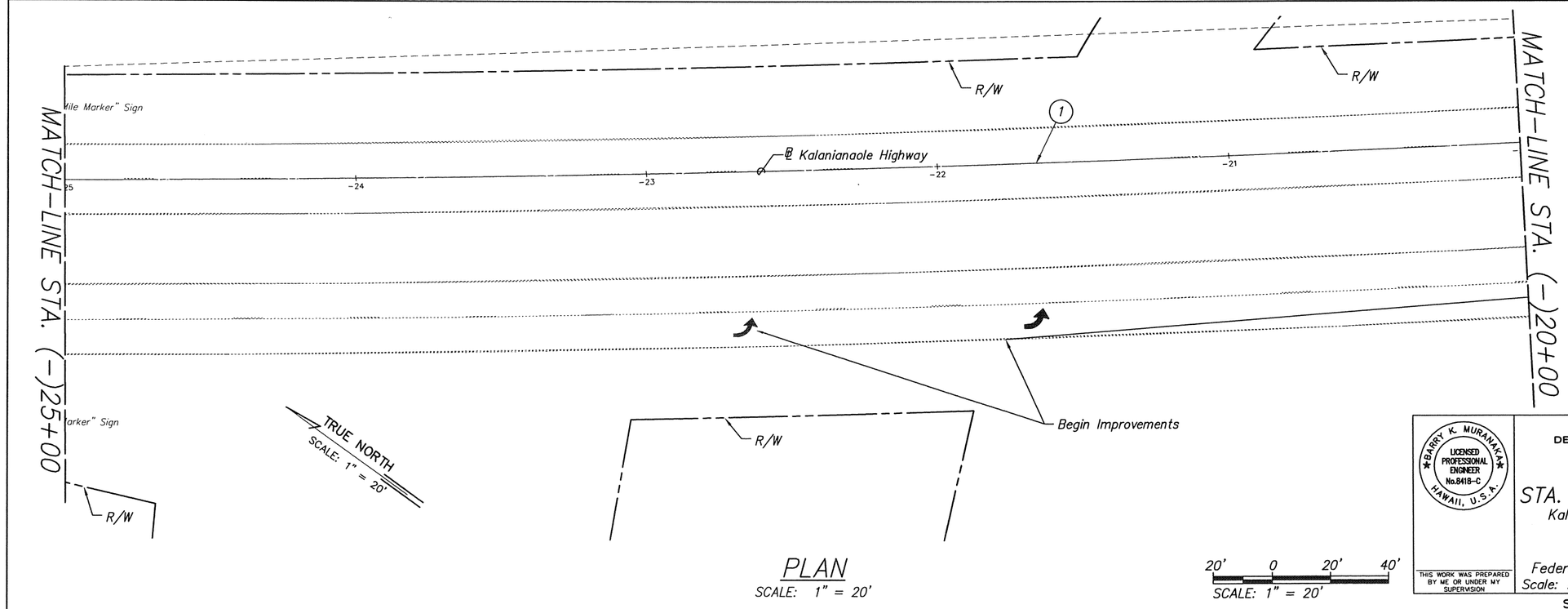
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	2	23



Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

CURVE	1
Δ	9°59'56"
Δ/2	4°59'58"
R	11436.39
T	1000.00
C	1993.27
Lc	1995.80



PLAN
SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN
STA. (-)30+00 TO (-)20+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 2 OF 23 SHEETS

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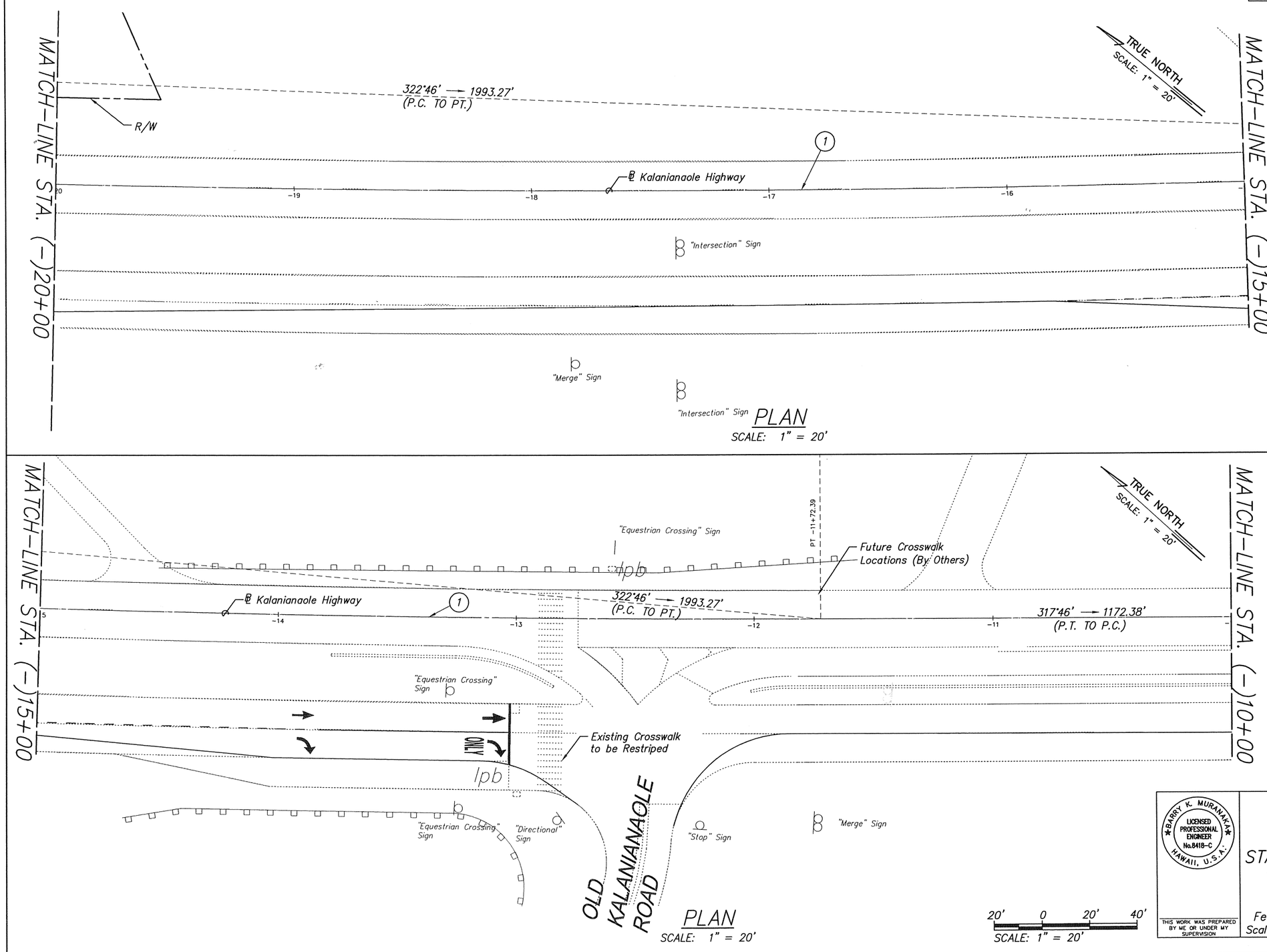
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:33am
LAST SAVED BY: rgq
LAST MODIFIED: Tue, 19 Jul 2005 - 2:47pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	3	23



PLAN
SCALE: 1" = 20'

PLAN
SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

CURVE	1
Δ	9°59'56"
Δ/2	4°59'58"
R	11436.39
T	1000.00
C	1993.27
Lc	1995.80

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN
STA. (–)20+00 TO (–)10+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

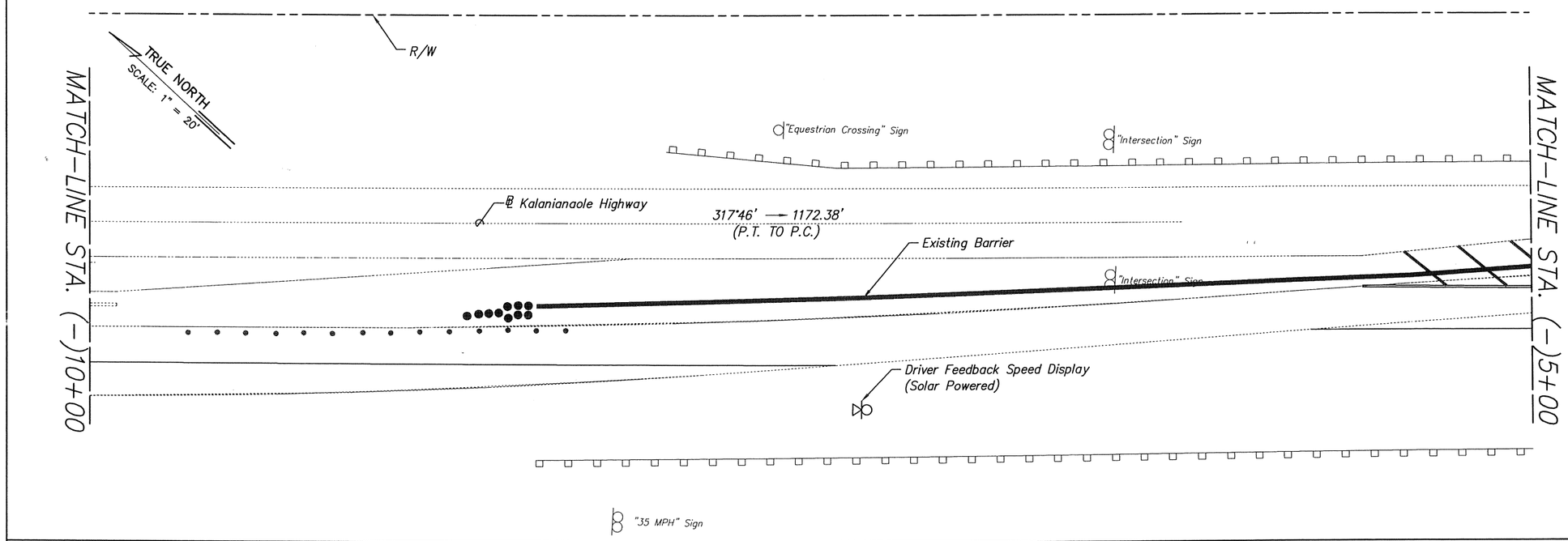
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 3 OF 23 SHEETS

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 – 11:33am
LAST SAVED BY: rgq
LAST MODIFIED: Tue, 19 Jul 2005 – 2:47pm

PREFIX: G:\dath00-01\acad\
FILE: dath0001006.dwg
BEGIN: 12/01/99
SCALE: 1=1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	4	23



Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

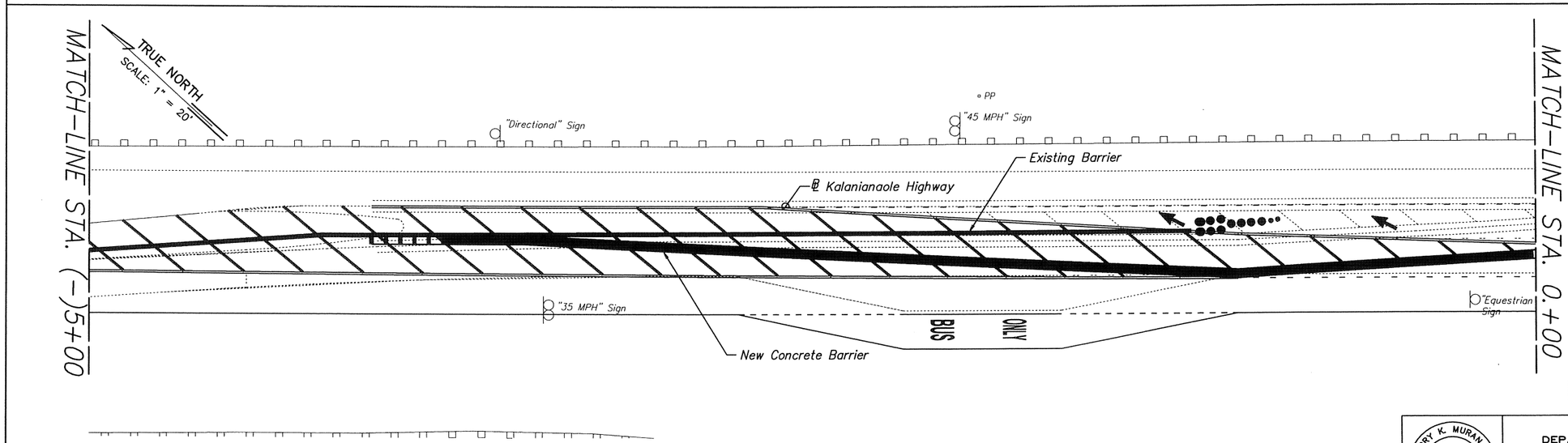


EXHIBIT 6

PLAN

SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

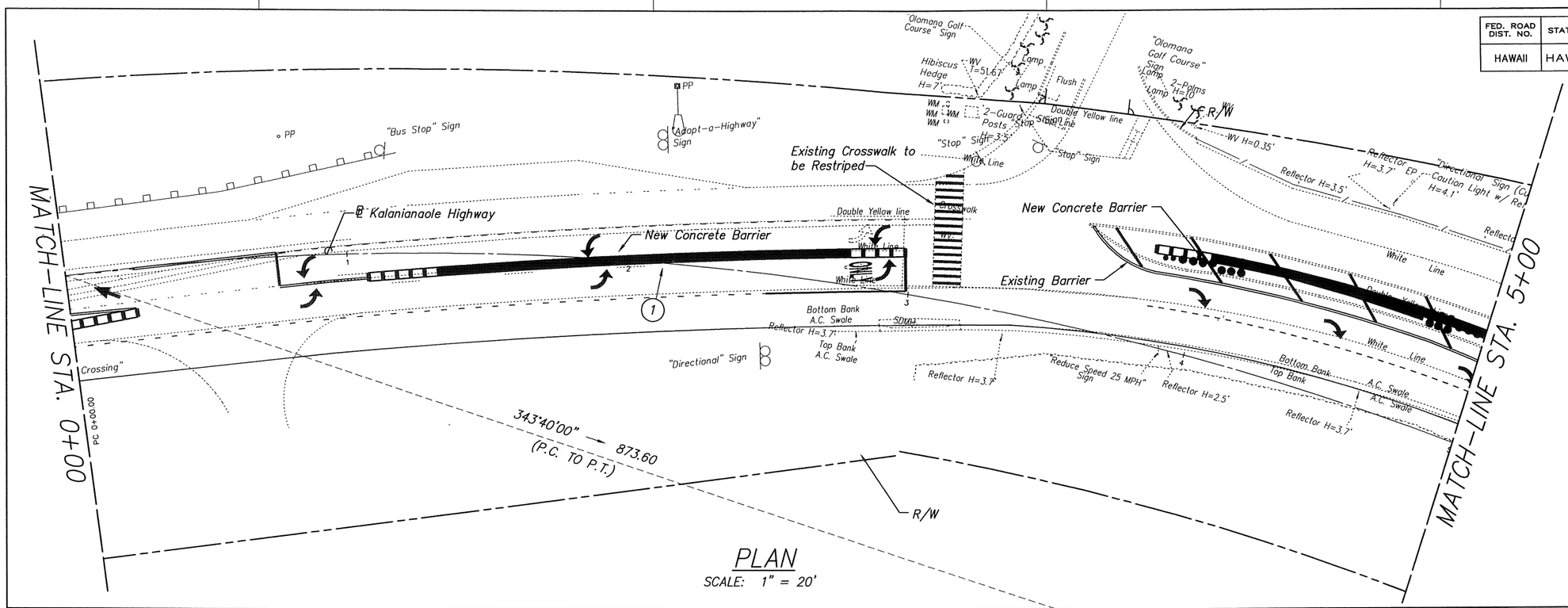
ROADWAY PLAN
STA. (-)10+00 TO 0+00
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 4 OF 23 SHEETS

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:34am
LAST SAVED BY: rgg
LAST MODIFIED: Tue, 19 Jul 2005 - 2:48pm

PREFIX: G:\doth00-01\acad\
FILE: doth0001007.dwg
BEGIN: 12/01/99
SCALE: 1=1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	5	23



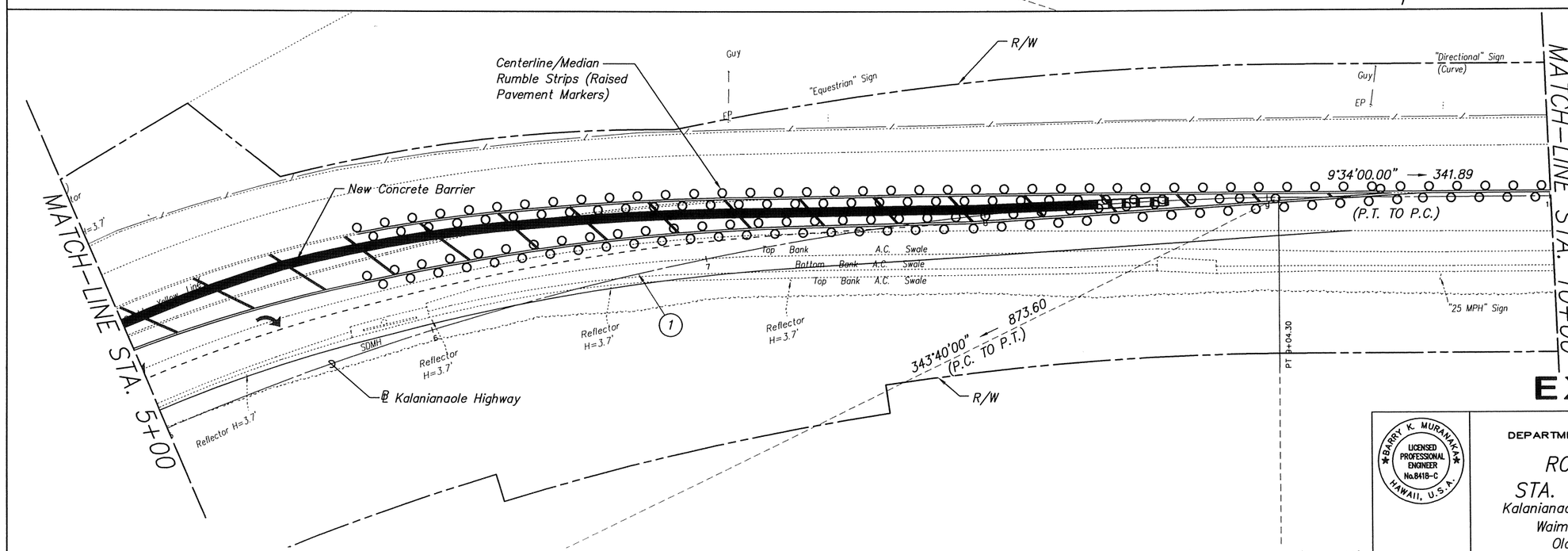
PLAN

SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

CURVE	1
Δ	51°48'00"
Δ/2	25°54'00"
R	1000.00
T	485.57
C	873.60
Lc	904.08



PLAN

SCALE: 1" = 20'

20' 0 20' 40'

SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 0+00 TO 10+00

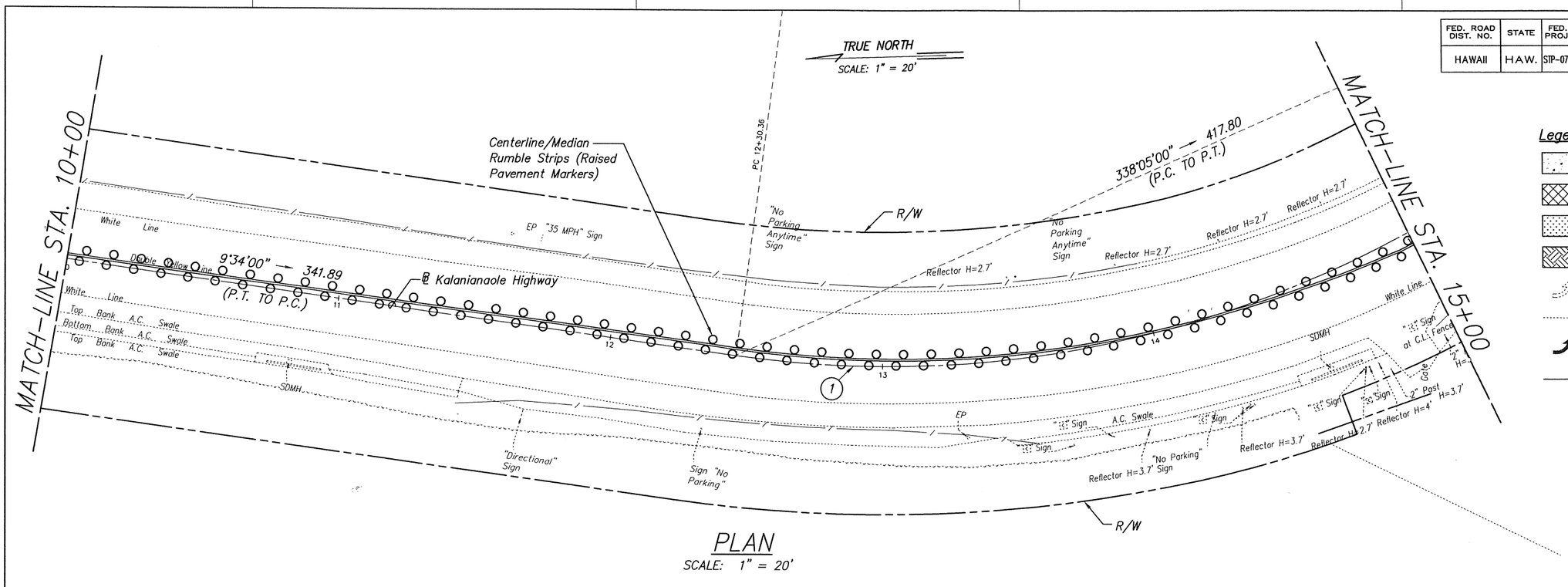
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 5 OF 23 SHEETS

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:34am
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 2:53pm

PREFIX: G:\dath00-01\acad\
FILE: dath0001008.dwg
BEGIN: 12/01/99
SCALE: 1=1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	6	23



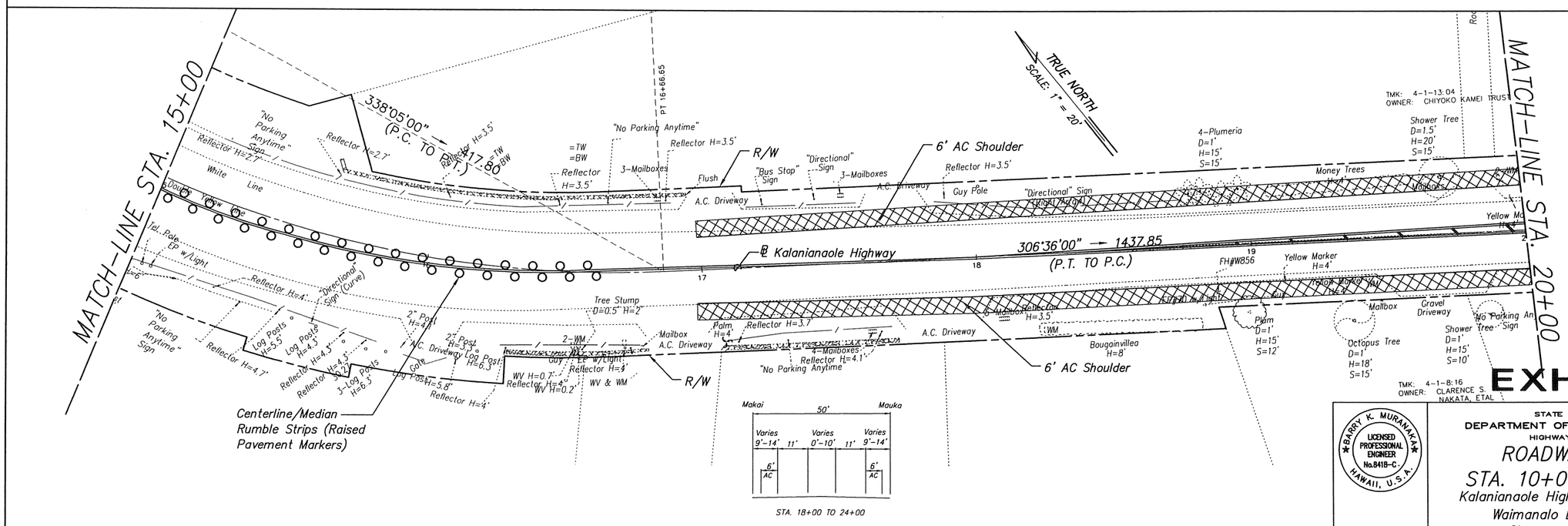
PLAN

SCALE: 1" = 20'

CURVE	1
Δ	62°58'00"
Δ/2	31°29'00"
R	400.00
T	244.96
C	417.80
Lc	439.59

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping



PLAN

SCALE: 1" = 20'

20' 0 20' 40'

SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA — LICENSED PROFESSIONAL ENGINEER No.8418-C — HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 10+00 TO 20+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

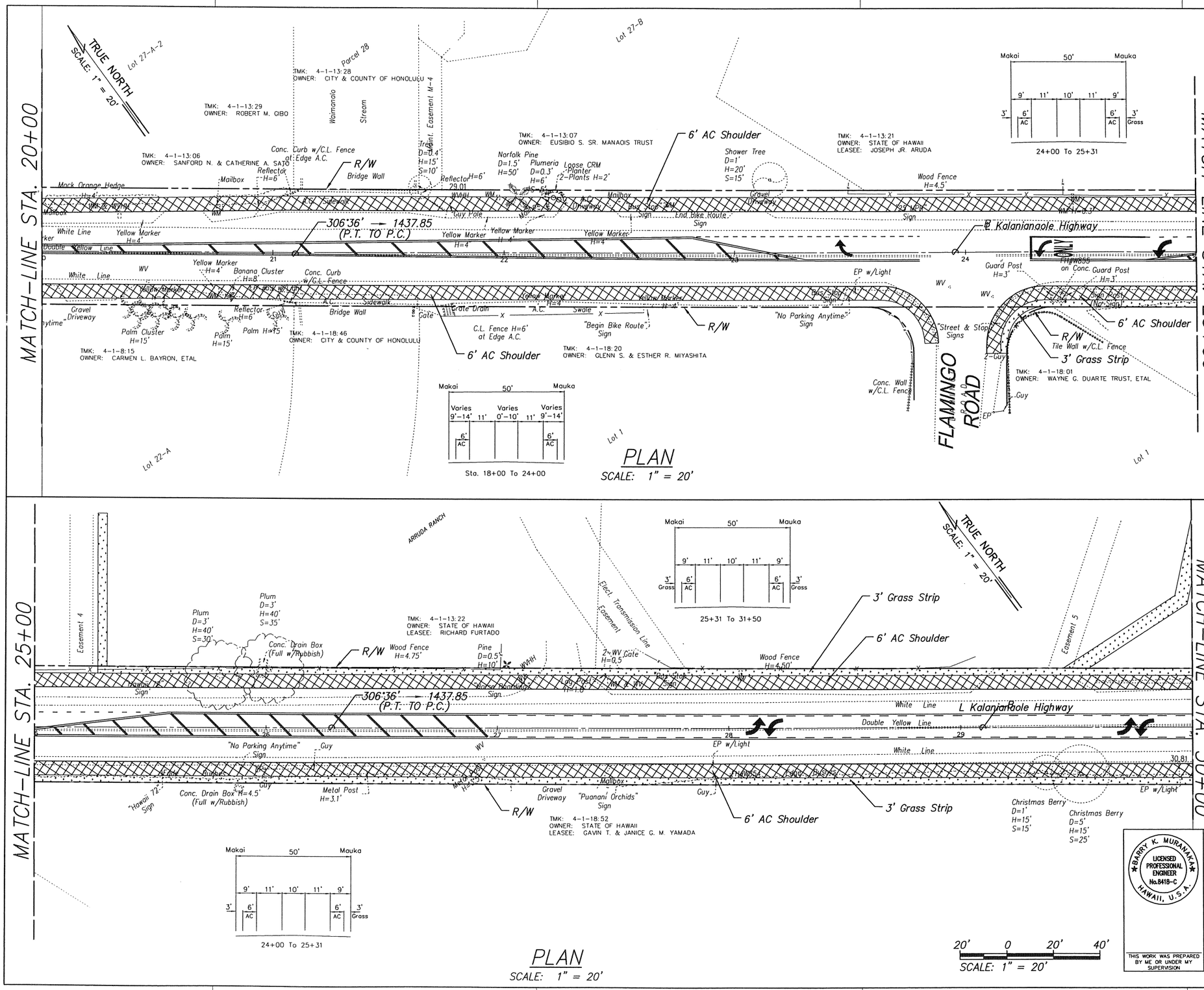
Scale: As Shown Date: July 2005

SHEET NO. 6 OF 23 SHEETS

PREFIX: G:\dath00-01\acad\
FILE: dath0001009.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:34am
LAST SAVED BY:
LAST MODIFIED: Thu, 07 Jul 2005 - 11:59am

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	7	23



P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:34am
LAST SAVED BY:
LAST MODIFIED: Wed, 10 Aug 2005 - 9:00am

PREFIX: G:\doth00-01\acad\
FILE: doth0001010.dwg
BEGIN: 12/01/99
SCALE: 1=1

EXHIBIT 6

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

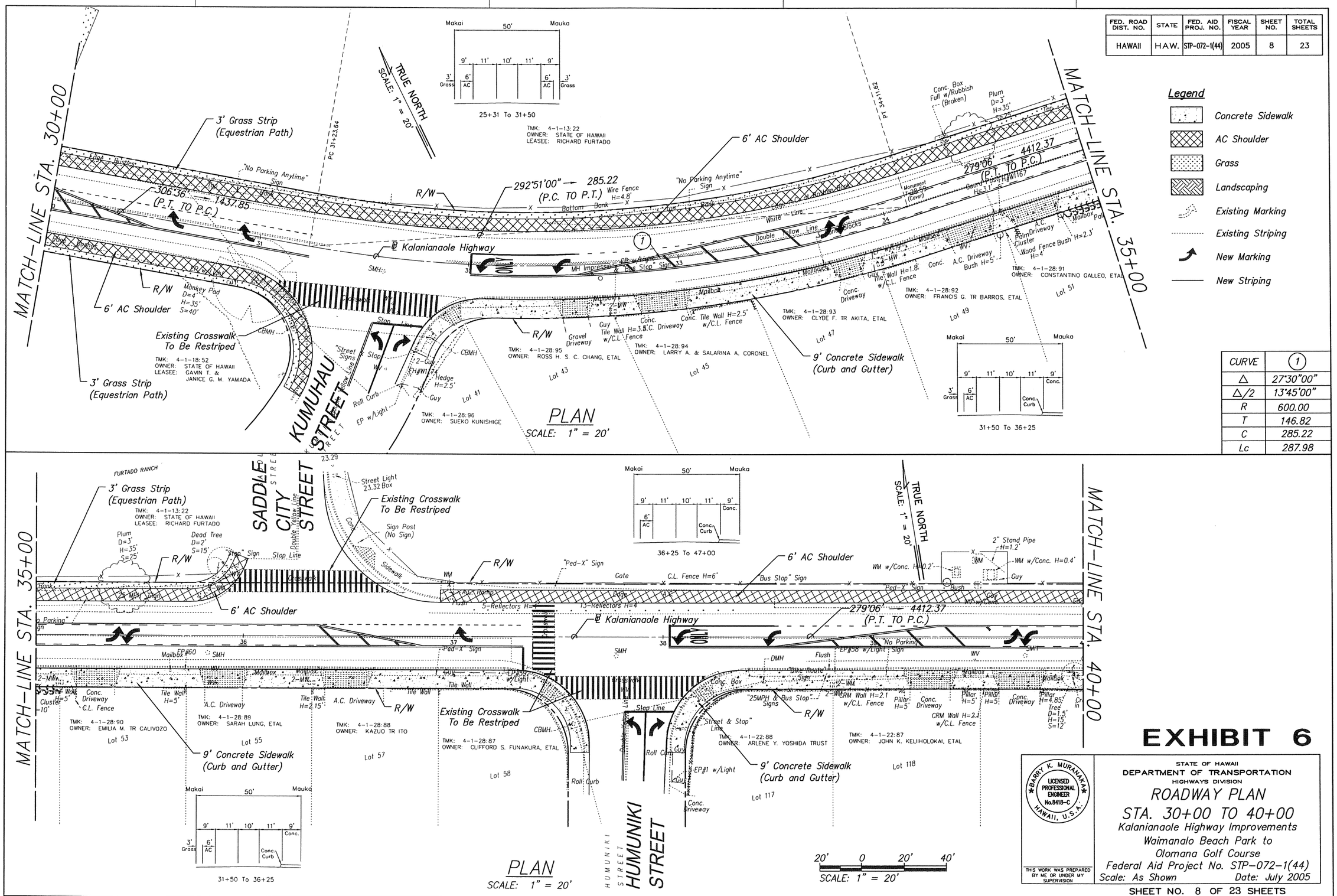
STA. 20+00 TO 30+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

Scale: As Shown Date: July 2005

SHEET NO. 7 OF 23 SHEETS

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	8	23



Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

CURVE	1
Δ	27°30"00"
Δ/2	13°45'00"
R	600.00
T	146.82
C	285.22
Lc	287.98

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 30+00 TO 40+00
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

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SHEET NO. 8 OF 23 SHEETS

PREFIX: G:\doth00-01\acad\
FILE: doth0001011.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV OPR:
CURRENT TIME: Aug 10, 2005 - 11:35am
LAST SAVED BY:
LAST MODIFIED: Thu, 07 Jul 2005 - 12:02pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	9	23

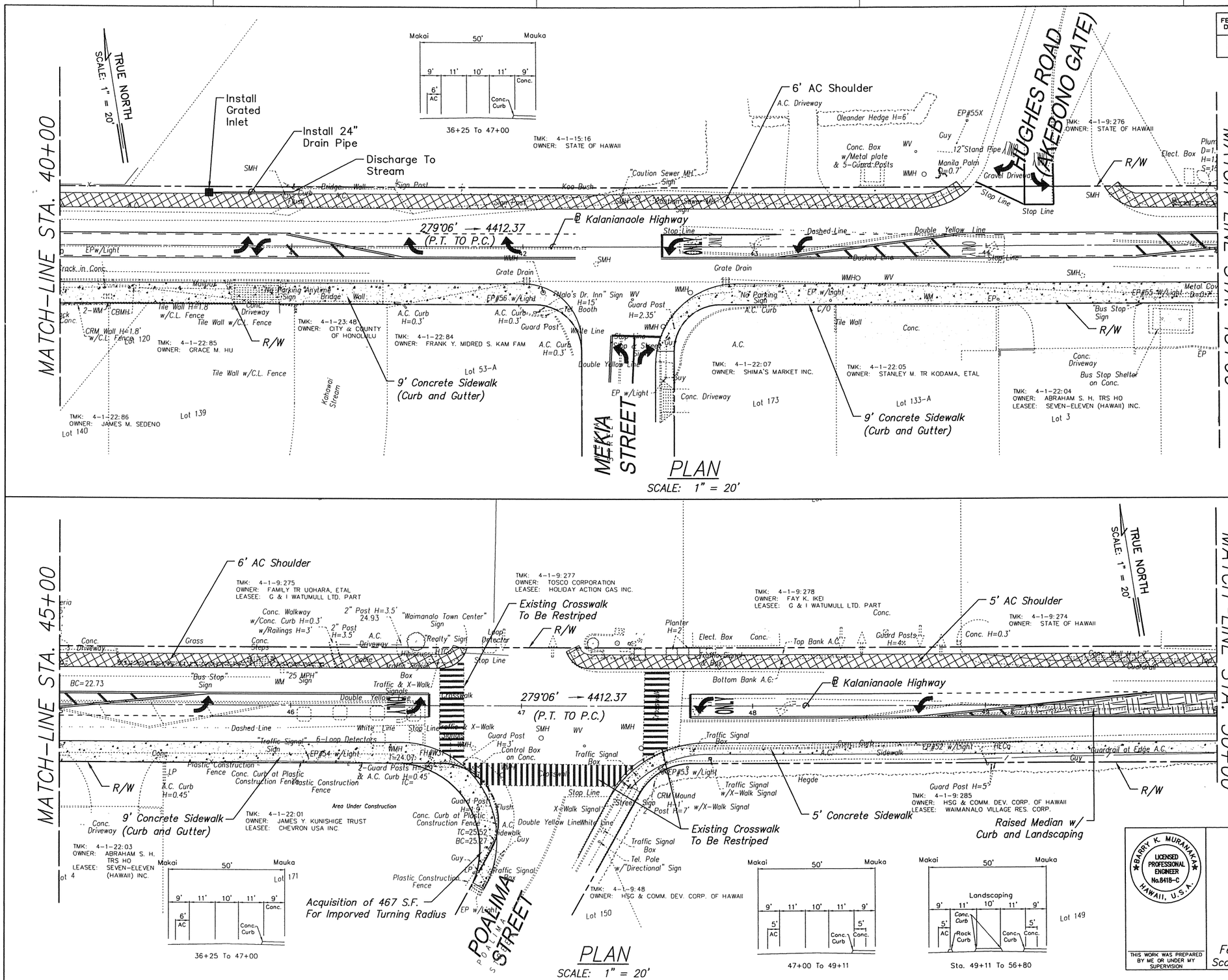

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

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ROADWAY PLAN

STA. 40+00 TO 50+00

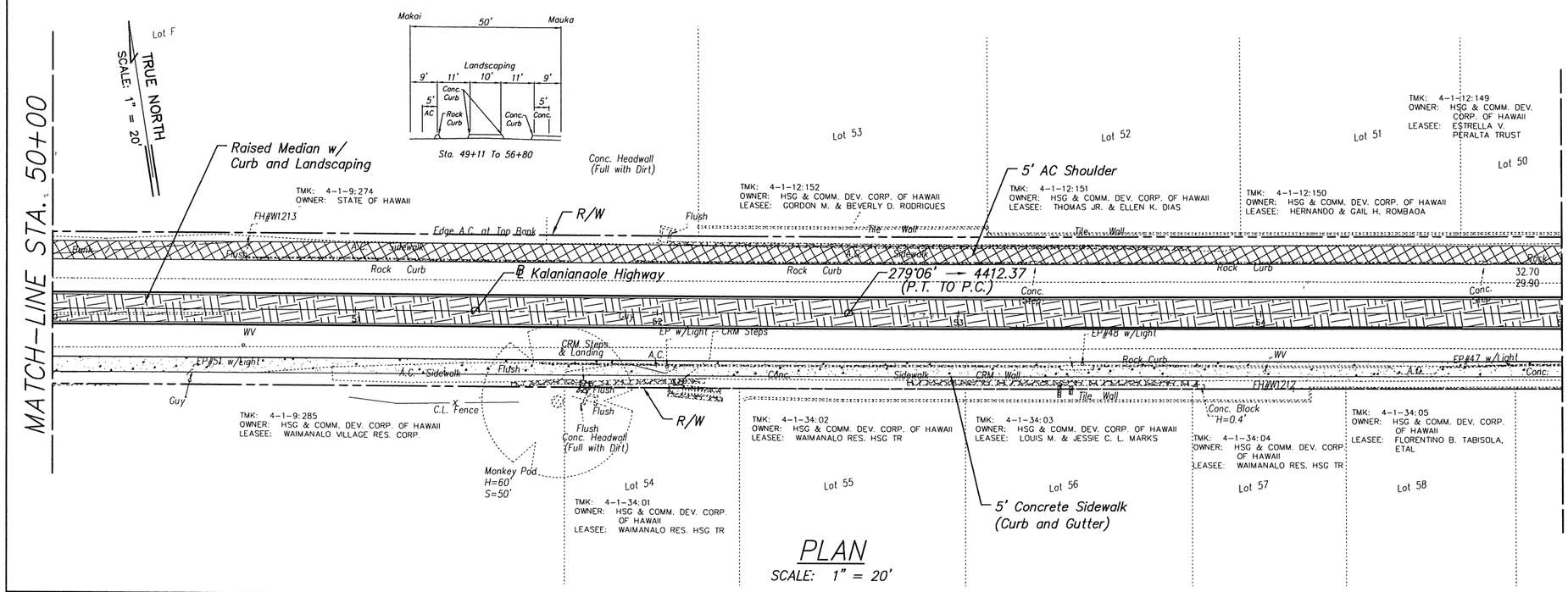
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 9 OF 23 SHEETS

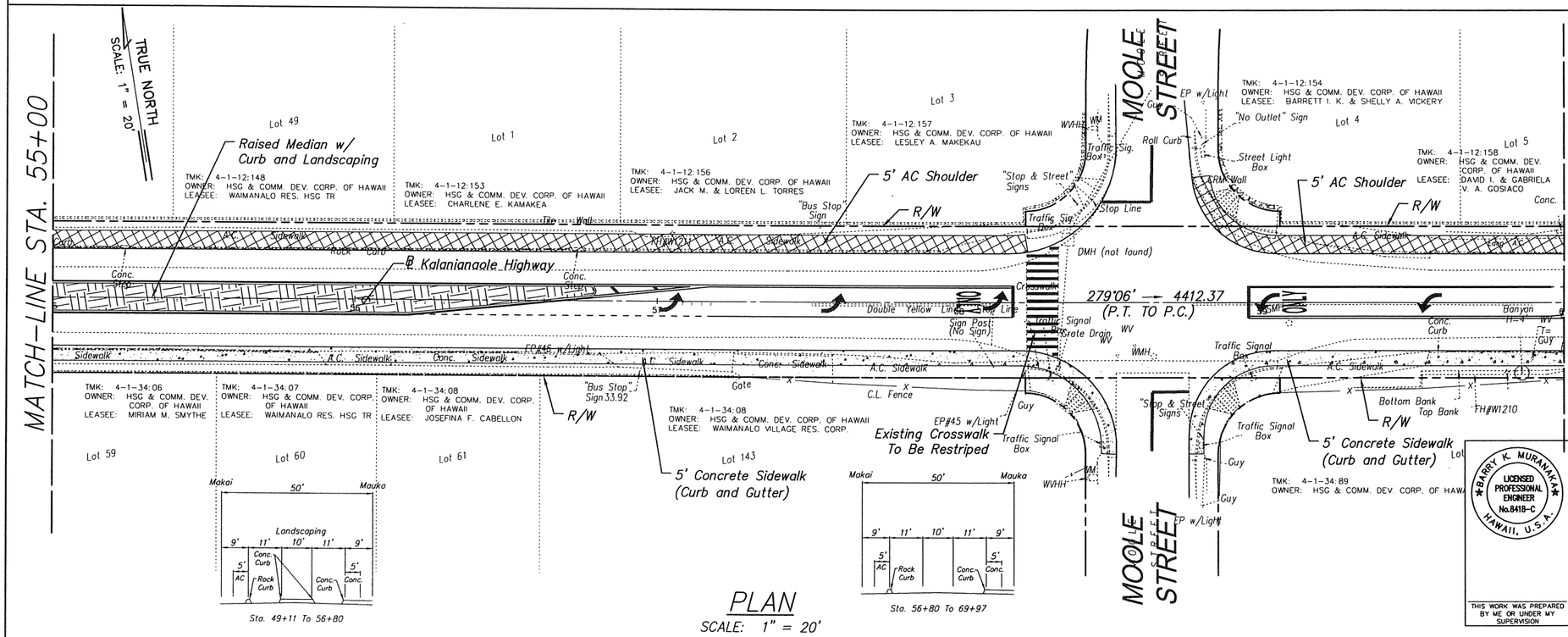
P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:35am
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:03pm

PREFIX: G:\dath00-01\acad\
FILE: dath0001012.dwg
BEGIN: 12/01/99
SCALE: 1=1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	10	23



PLAN
SCALE: 1" = 20'



PLAN
SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN
STA. 50+00 TO 60+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

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SHEET NO. 10 OF 23 SHEETS

PREFIX: G:\doth00-01\acad\
FILE: doth0001013.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 11:35am
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:09pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	11	23

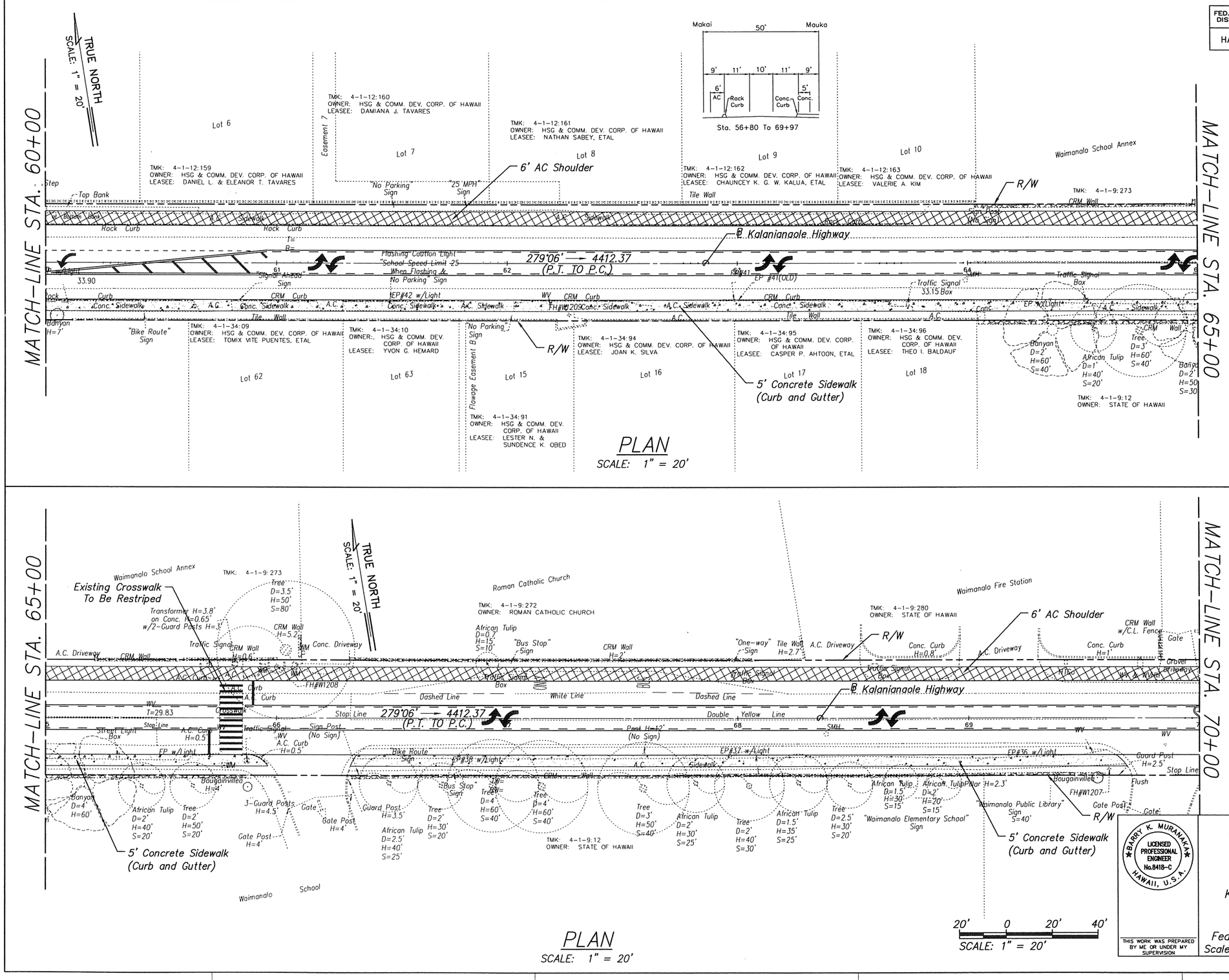

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 60+00 TO 70+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No. 8418-C
HAWAII, U.S.A.

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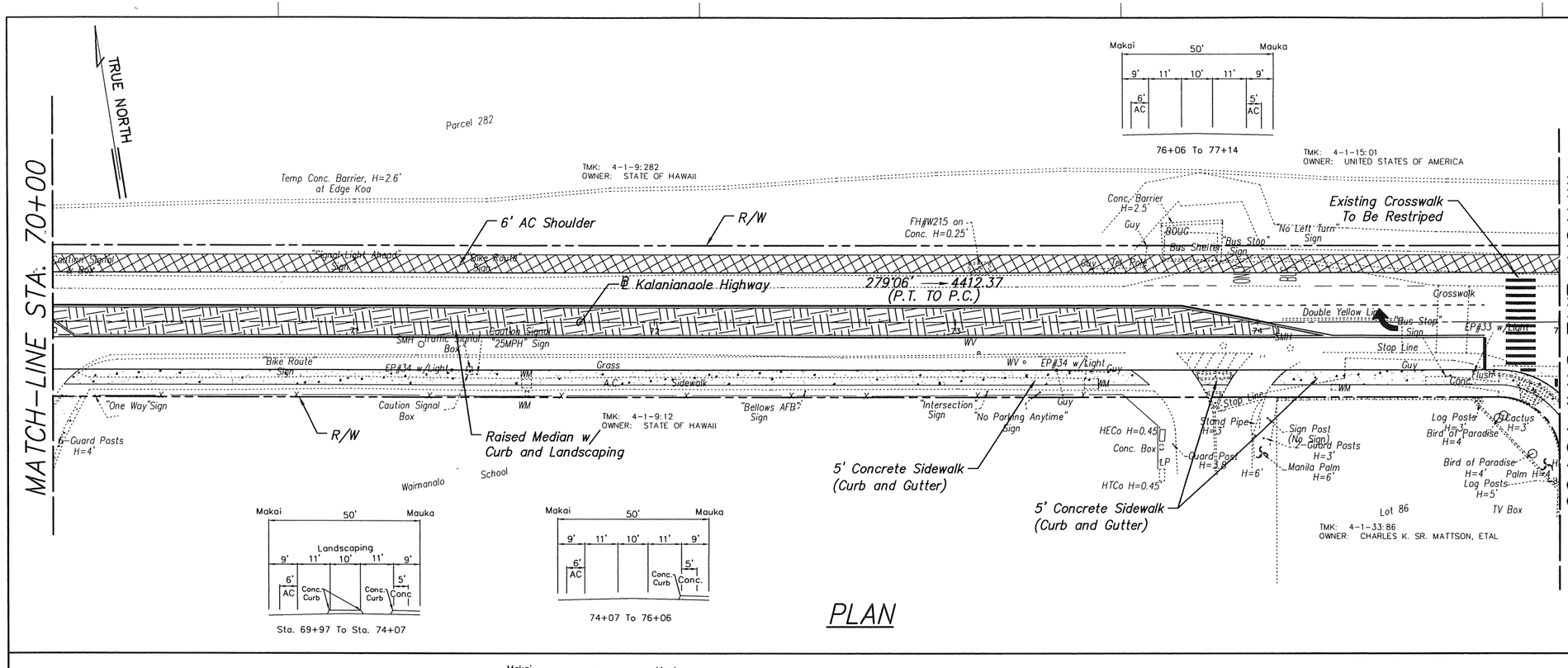
SHEET NO. 11 OF 23 SHEETS

PREFIX G:\dath00-01\acad\
FILE: dath0001014.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:14pm
LAST SAVED BY:
LAST MODIFIED: Thu, 07 Jul 2005 - 12:03pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	12	23



CURVE	1
Δ	31°30"30"
Δ/2	15°45'15"
R	800.00
T	225.69
C	434.42
Lc	439.94

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

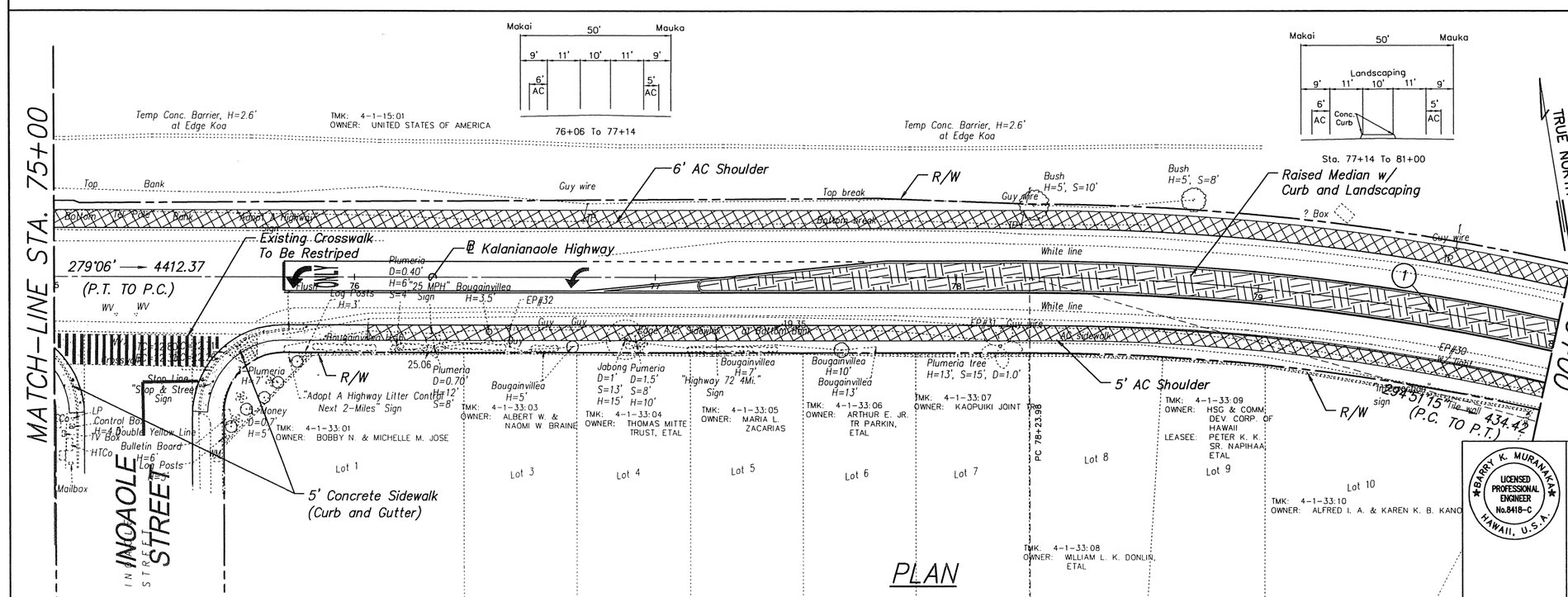


EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 70+00 TO 80+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

Scale: As Shown Date: July 2005

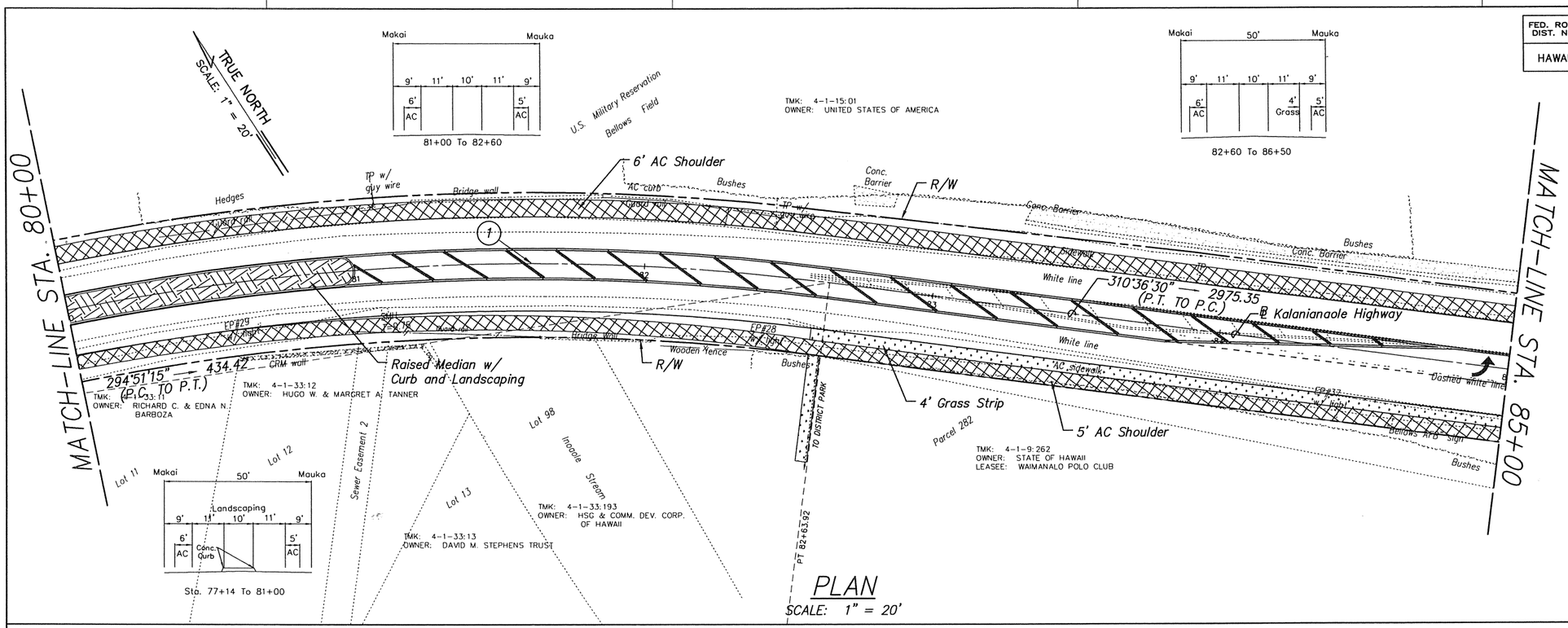
BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 12 OF 23 SHEETS

PREFIX:C:\Documents and Settings\Wkl\Local Settings\Temp\BGPlot_3744\
FILE: doth0001015.dwg CURRENT OPR: rkl
PREV. OPR:
CURRENT TIME: Dec 09, 2005 - 4:16pm
LAST SAVED BY:
LAST MODIFIED: Wed, 10 Aug 2005 - 2:07pm
BEGIN: 12/01/99
SCALE: 1=1'

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	13	23



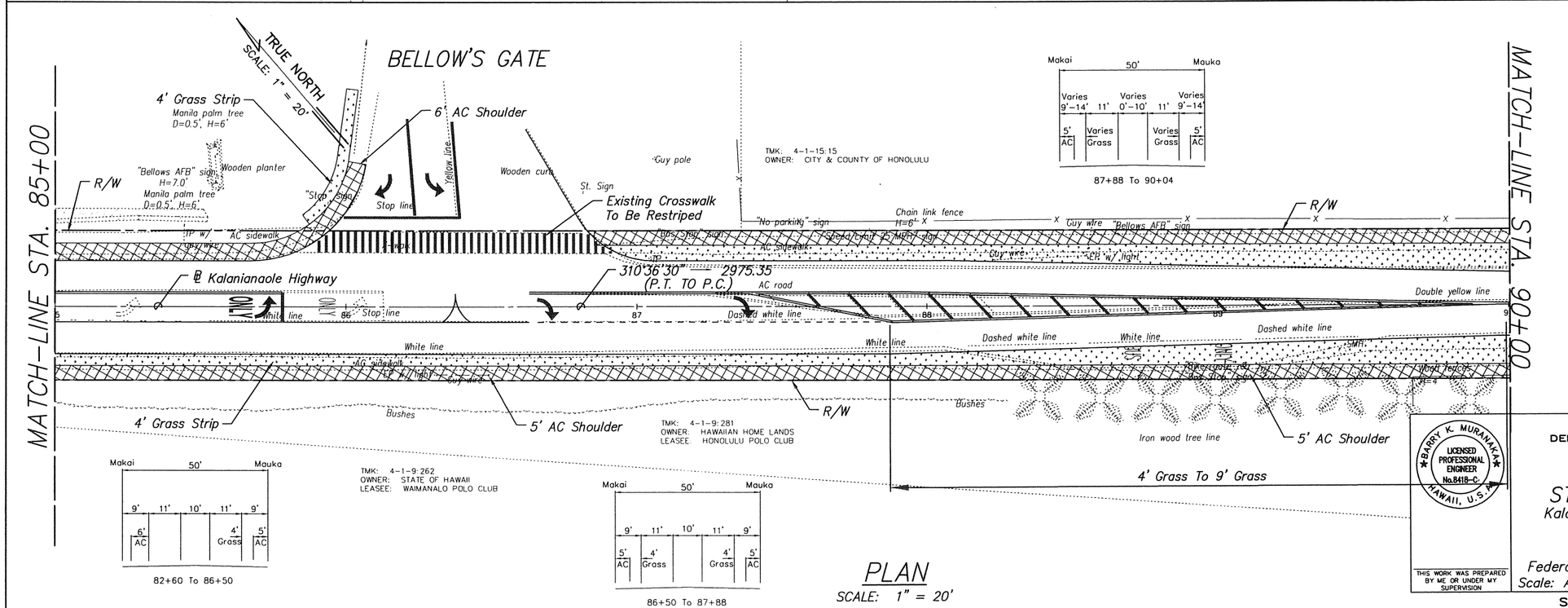
PLAN

SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping

CURVE	1
Δ	31°30"30"
Δ/2	15°45'15"
R	800.00
T	225.69
C	434.42
Lc	439.94



PLAN

SCALE: 1" = 20'

20' 0 20' 40'

SCALE: 1" = 20'

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 80+00 TO 90+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

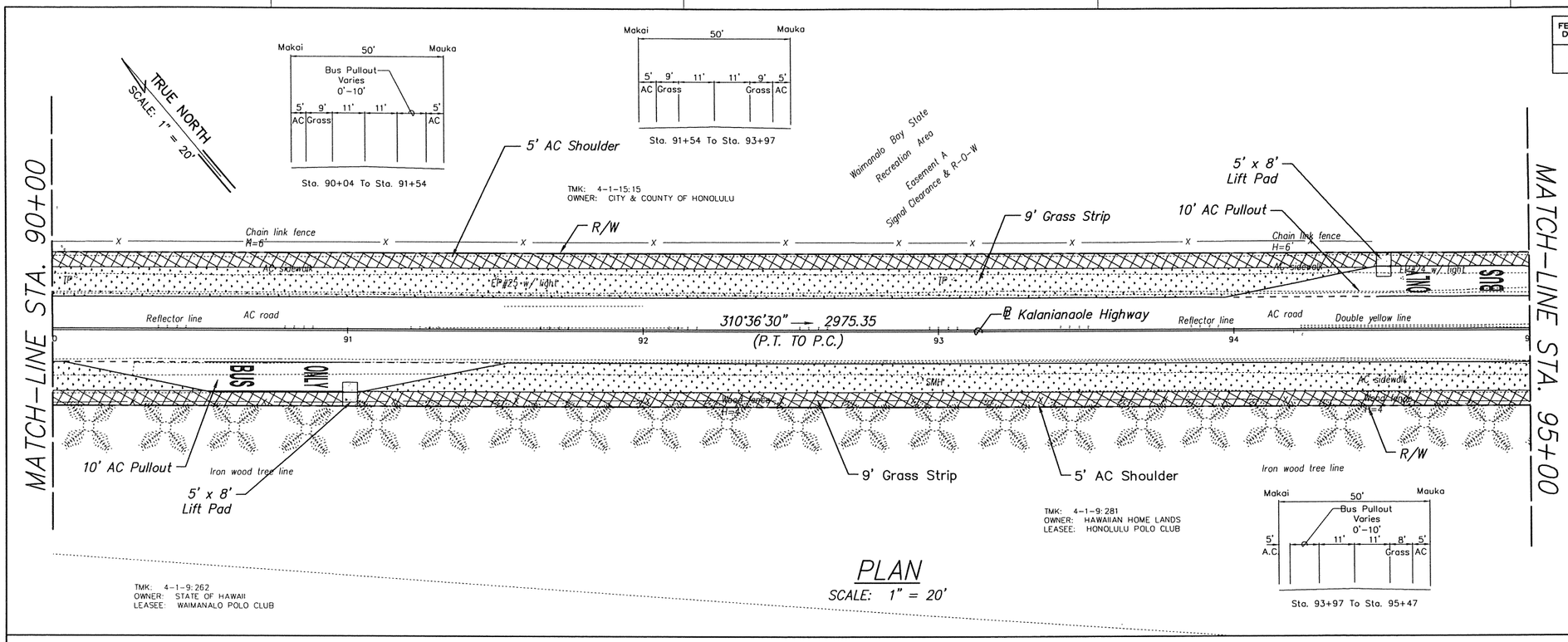
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 13 OF 23 SHEETS

PREFIX: G:\dath00-01\acad\
FILE: dath0001016.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk.3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:14pm
LAST SAVED BY:
LAST MODIFIED: Thu, 21 Jul 2005 - 8:54am

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	14	23

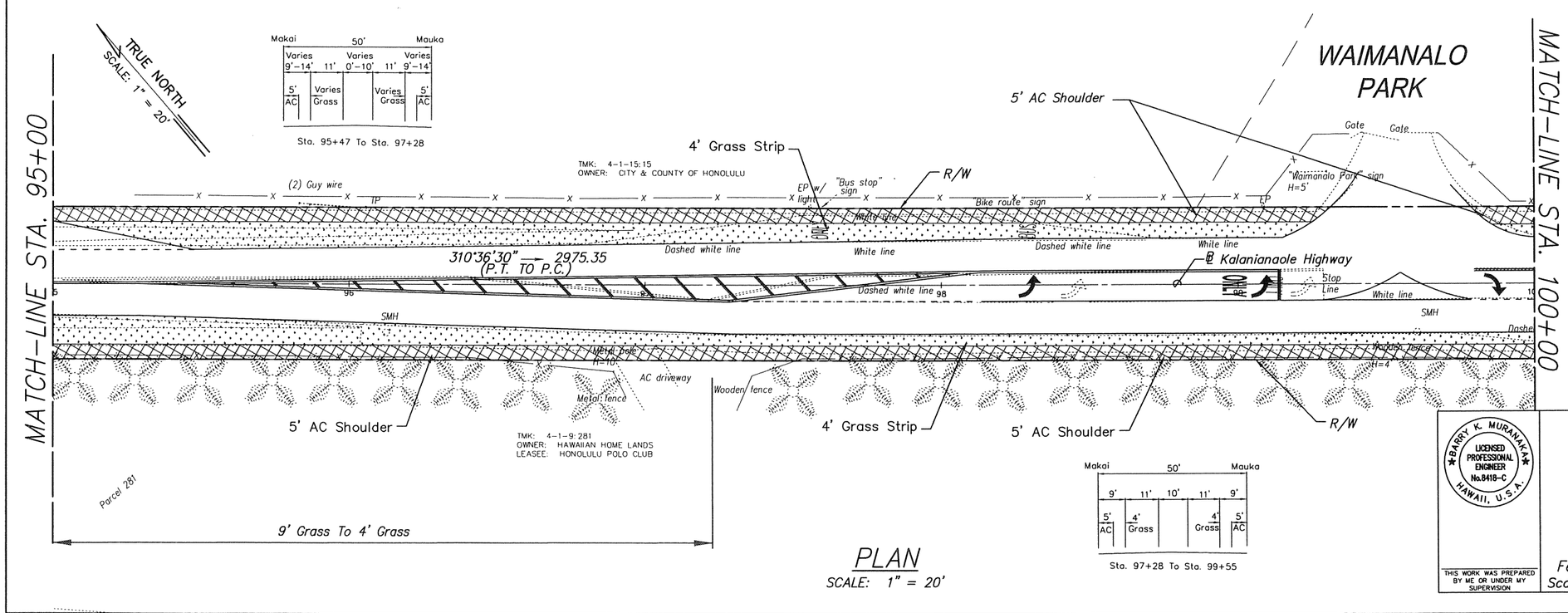


PLAN

SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping



PLAN

SCALE: 1" = 20'

20' 0 20' 40'

SCALE: 1" = 20'

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 90+00 TO 100+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No. 8418-C
HAWAII, U.S.A.

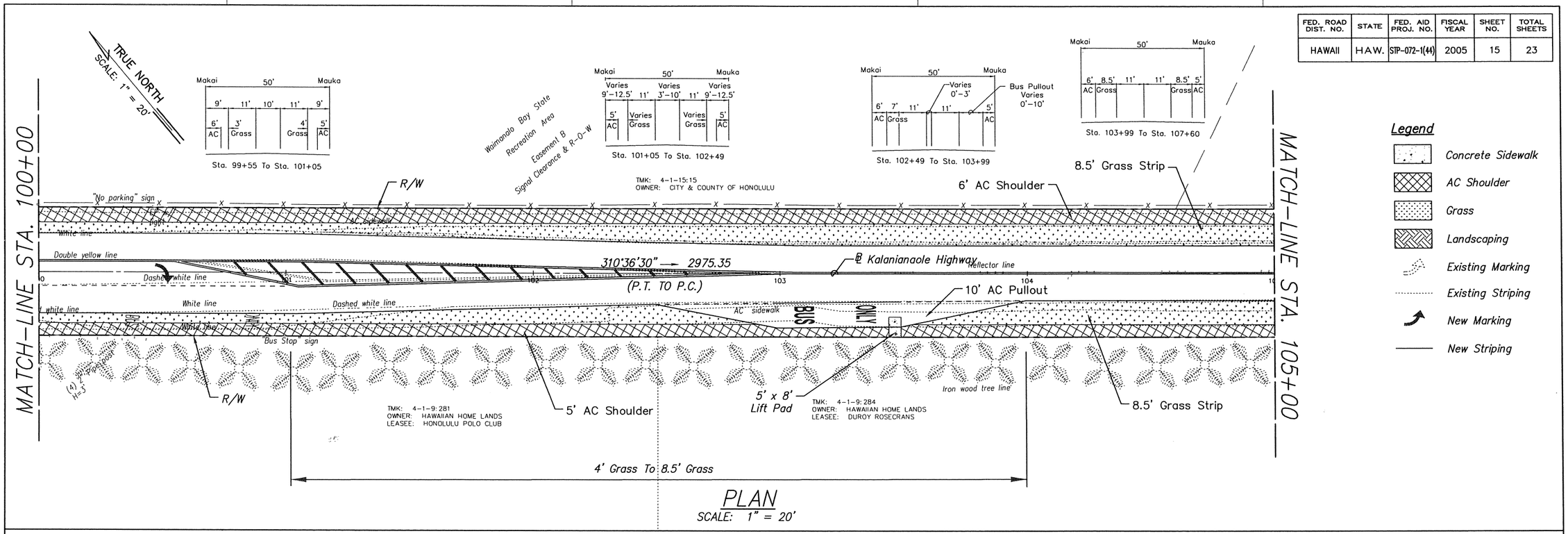
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 14 OF 23 SHEETS

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:14pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:18pm

PREFIX: G:\doth00-01\acad\
FILE: doth0001017.dwg
BEGIN: 12/01/99
SCALE: 1=1

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	15	23



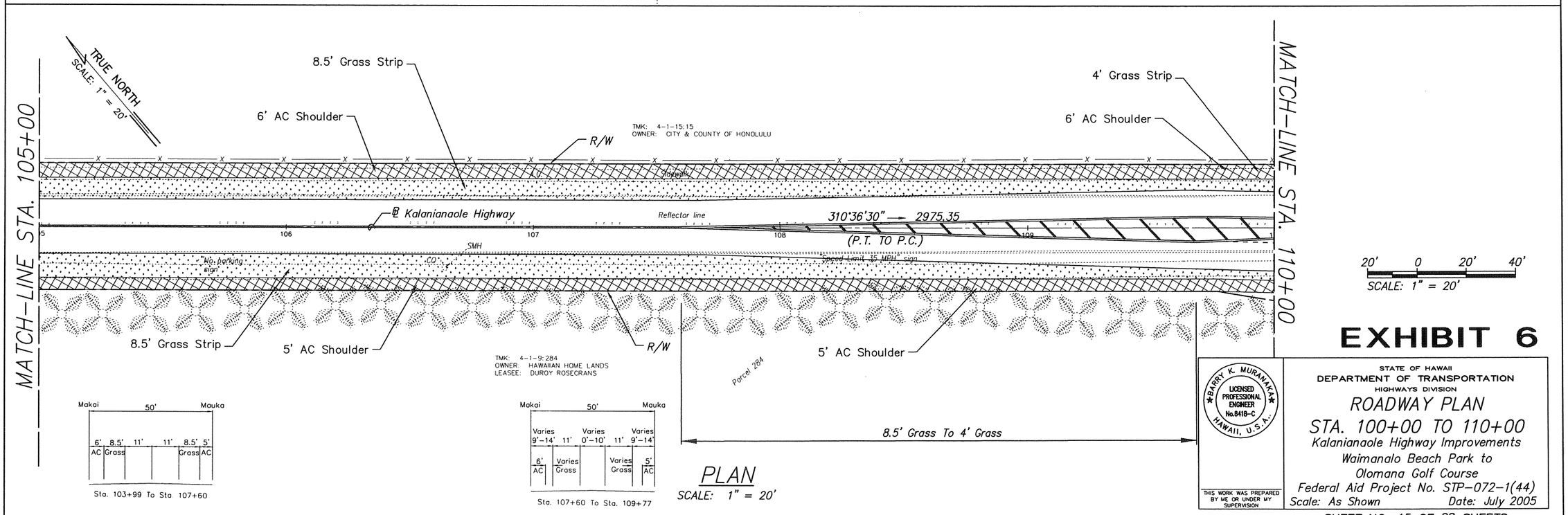


EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 100+00 TO 110+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course

Federal Aid Project No. STP-072-1(44)

Scale: As Shown Date: July 2005

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 15 OF 23 SHEETS

PREFIX: G:\dath00-01\acad\
FILE: dath0001018.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:15pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:19pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	16	23

CURVE	1
Δ	9°25'30"
Δ/2	4°42'45"
R	600.00
T	49.46
C	98.59
Lc	98.70

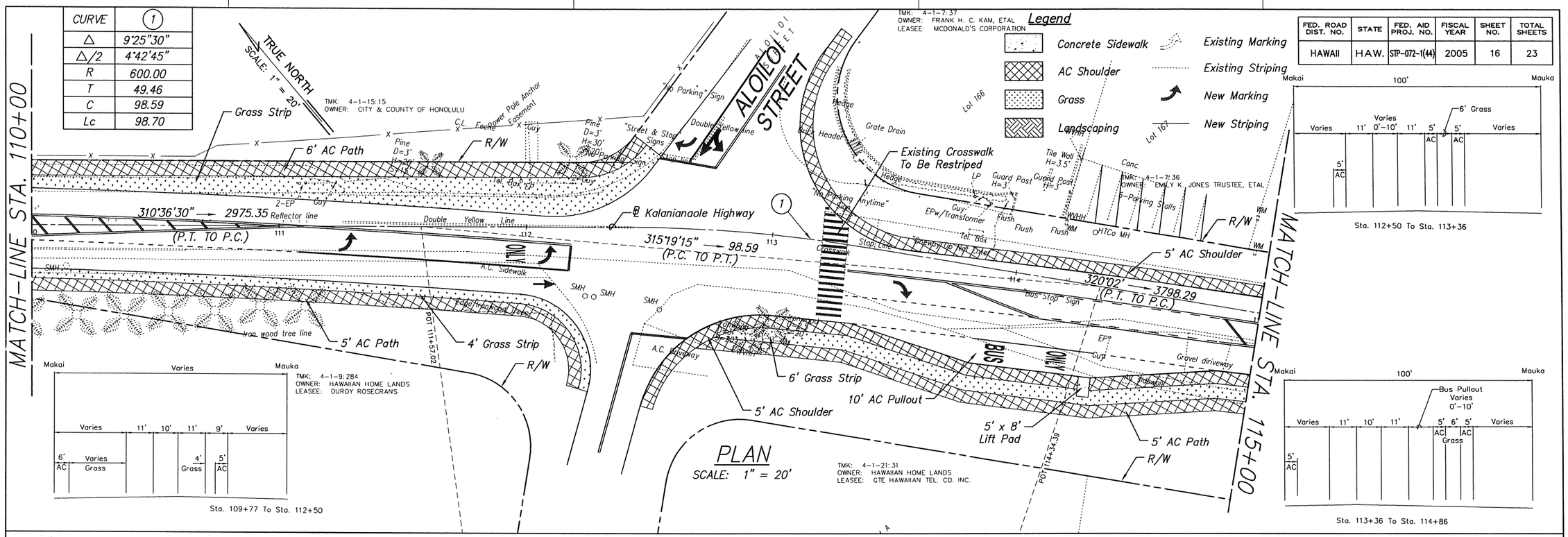


EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN
STA. 110+00 TO 120+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER No.8418-C
HAWAII, U.S.A.

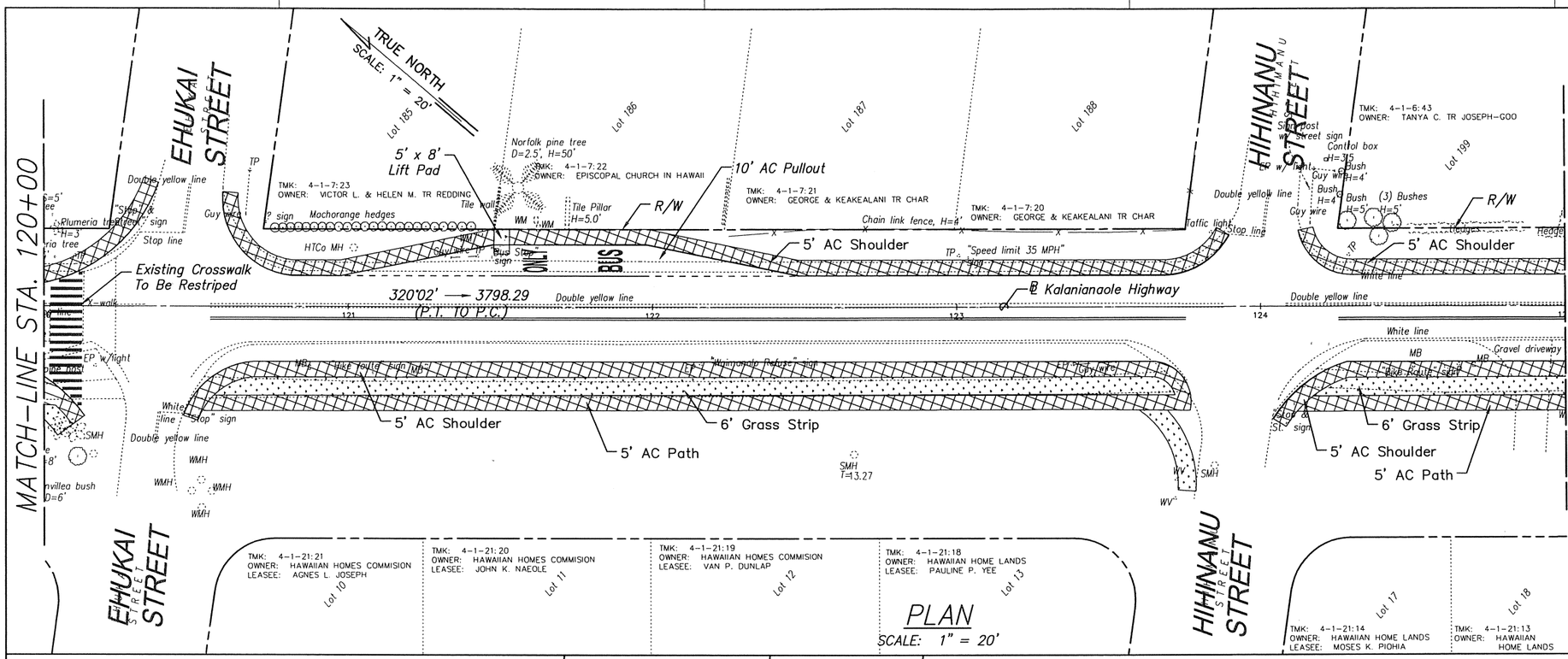
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 16 OF 23 SHEETS

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:15pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:20pm

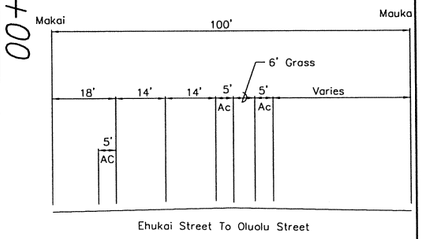
PREFIX: G:\dath00-01\acad\
FILE: dath0001019.dwg
BEGIN: 12/01/99
SCALE: 1=1

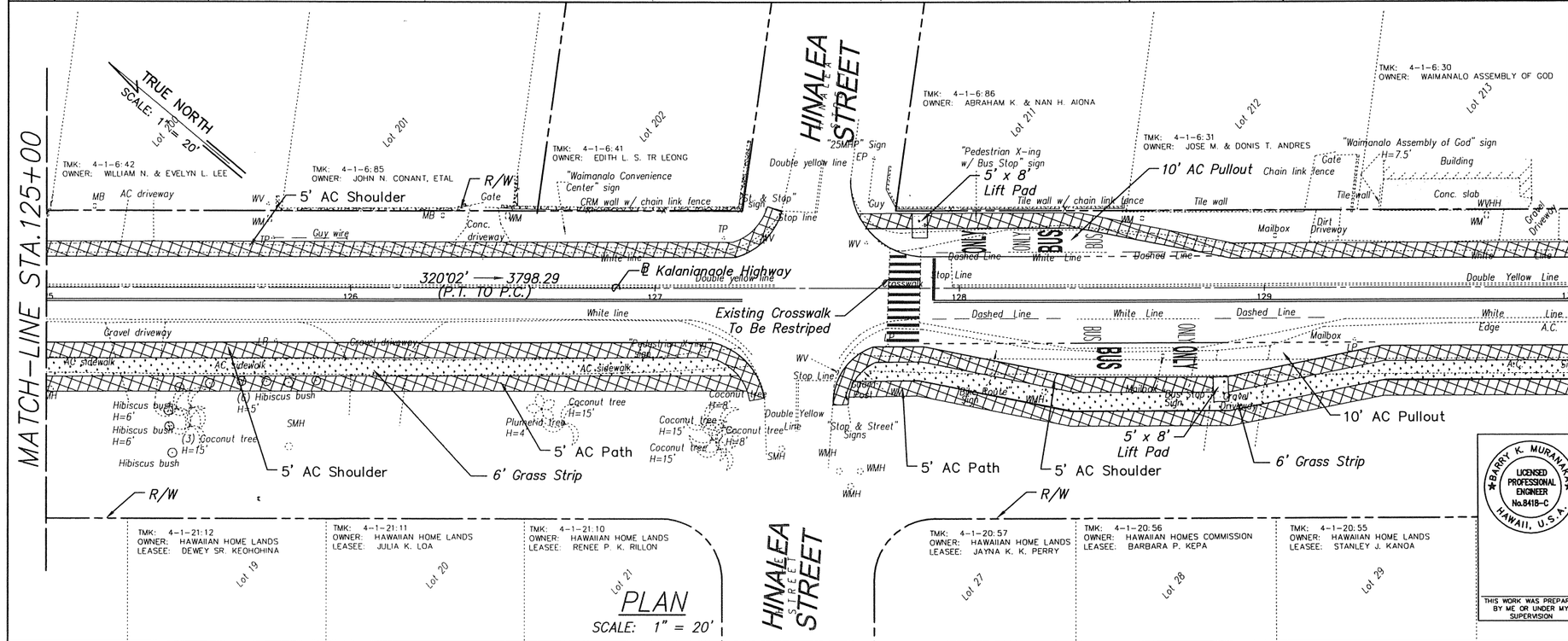
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	17	23

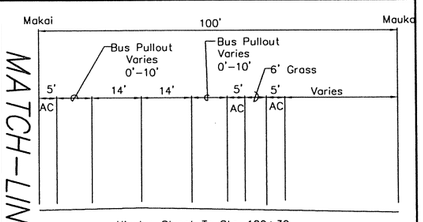


Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping







20' 0 20' 40'

SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA LICENSED PROFESSIONAL ENGINEER No.8418-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 120+00 TO 130+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course

Federal Aid Project No. STP-072-1(44)

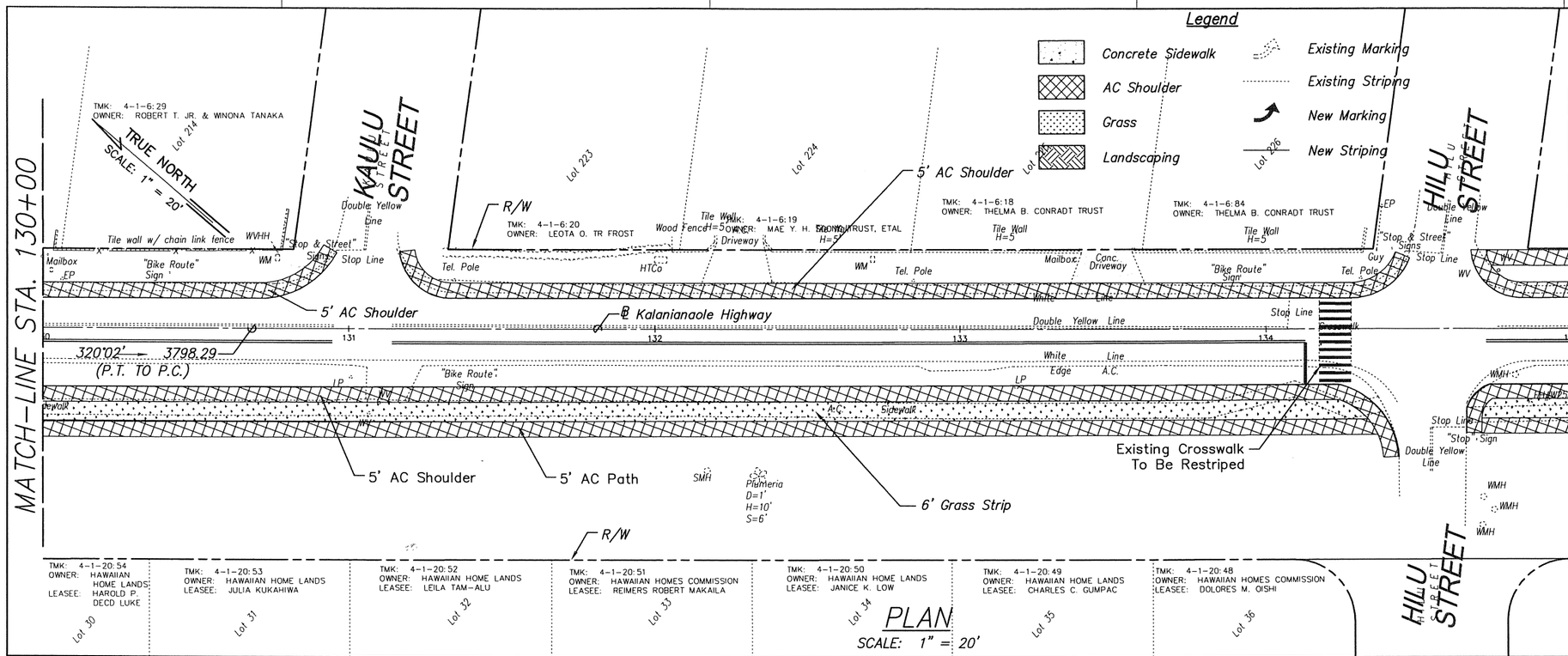
Scale: As Shown Date: July 2005

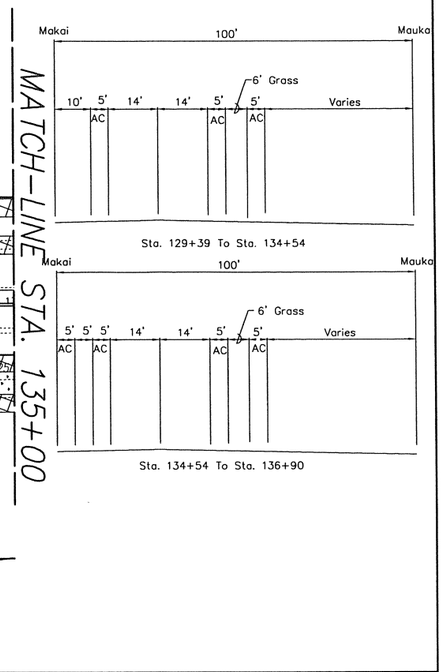
SHEET NO. 17 OF 23 SHEETS

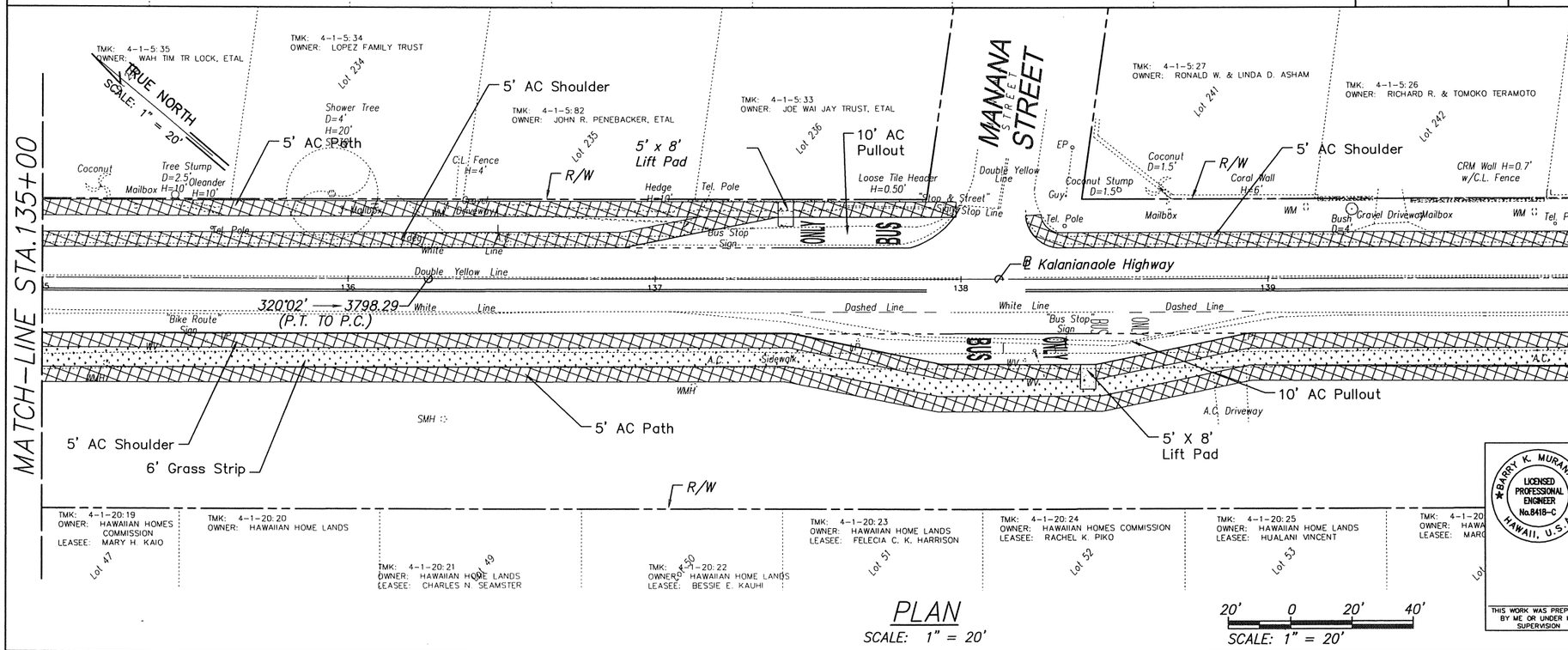
PREFIX: G:\dath00-01\acad\
FILE: dath0001020.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk.3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:15pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:22pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	18	23







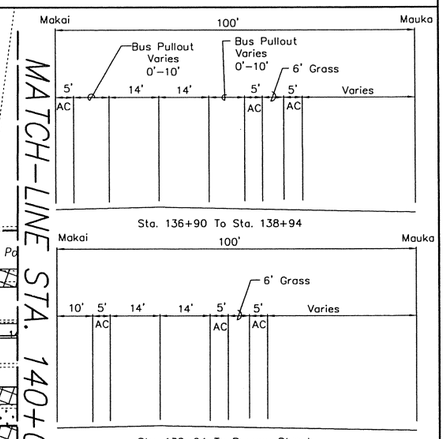


EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

ROADWAY PLAN

STA. 130+00 TO 140+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

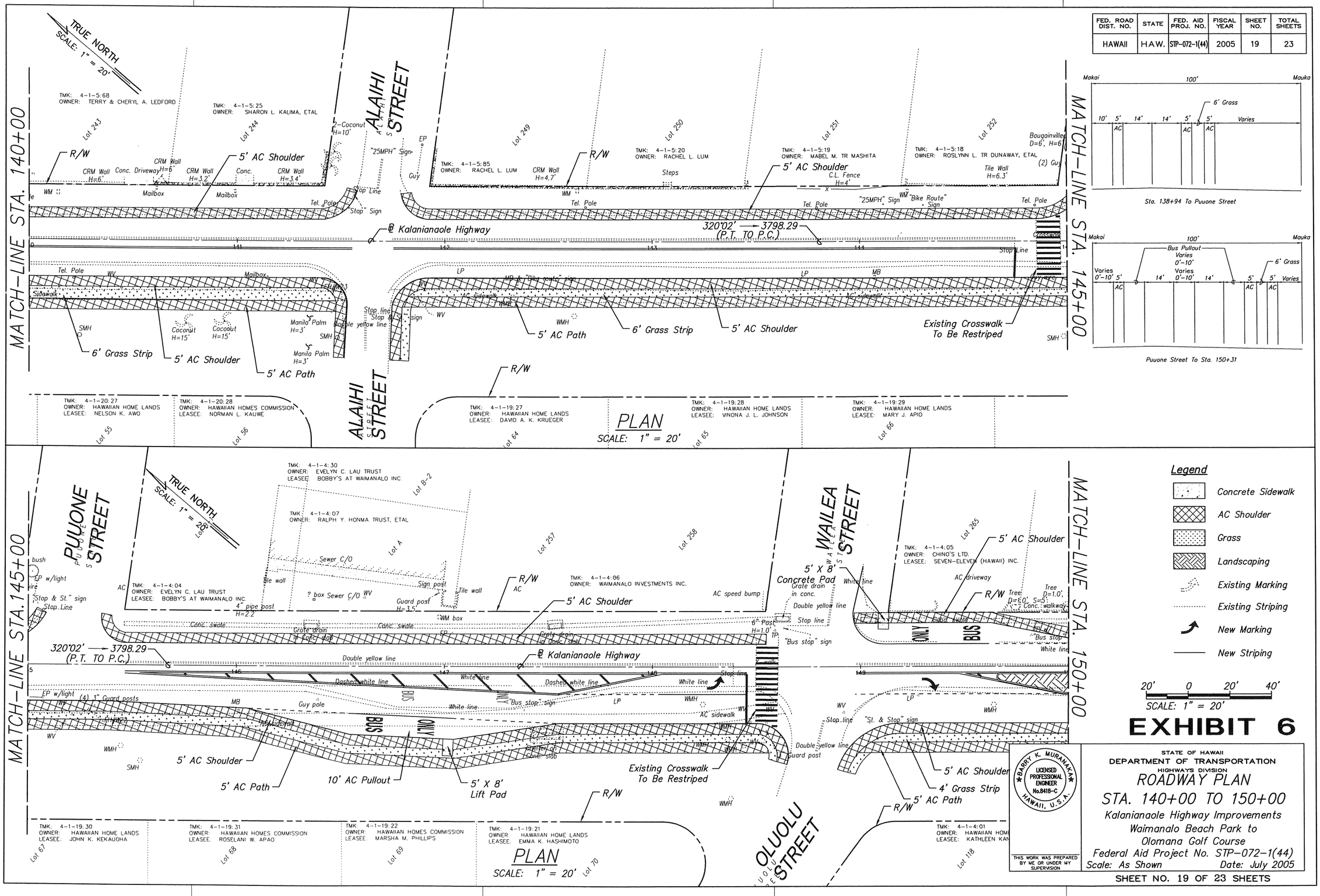
Scale: As Shown Date: July 2005

SHEET NO. 18 OF 23 SHEETS

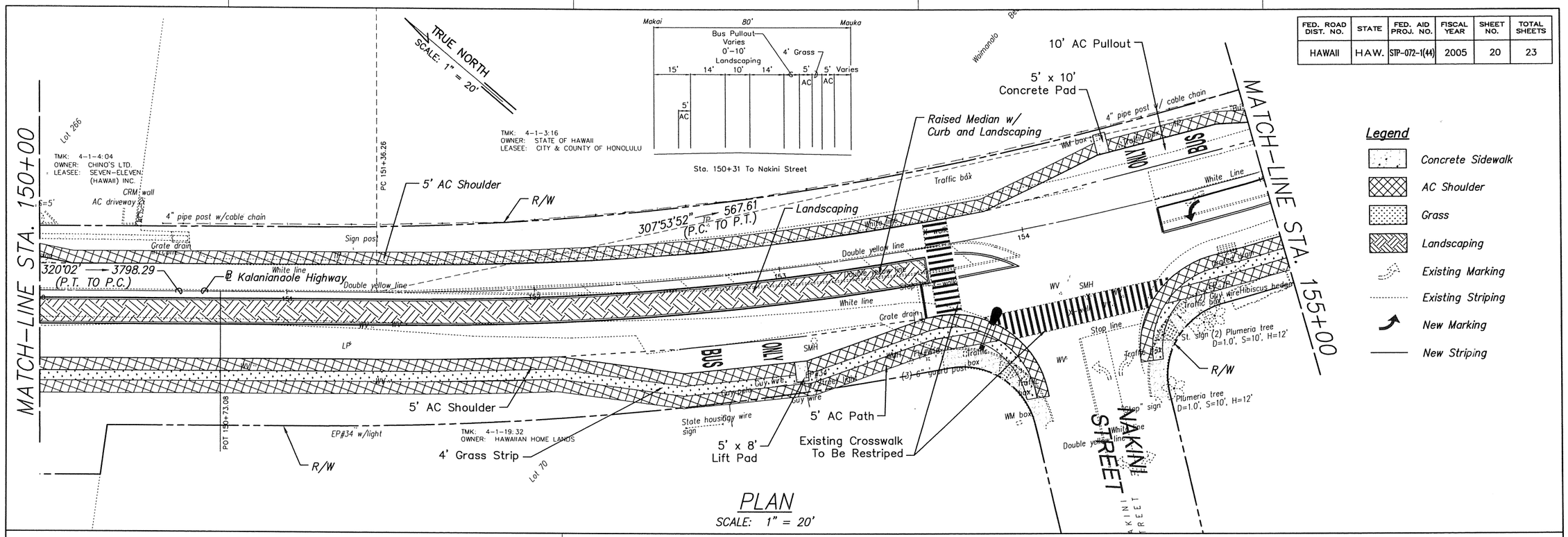
PREFIX: G:\dath00-01\acad\
FILE: dath00001021.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:16pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:24pm

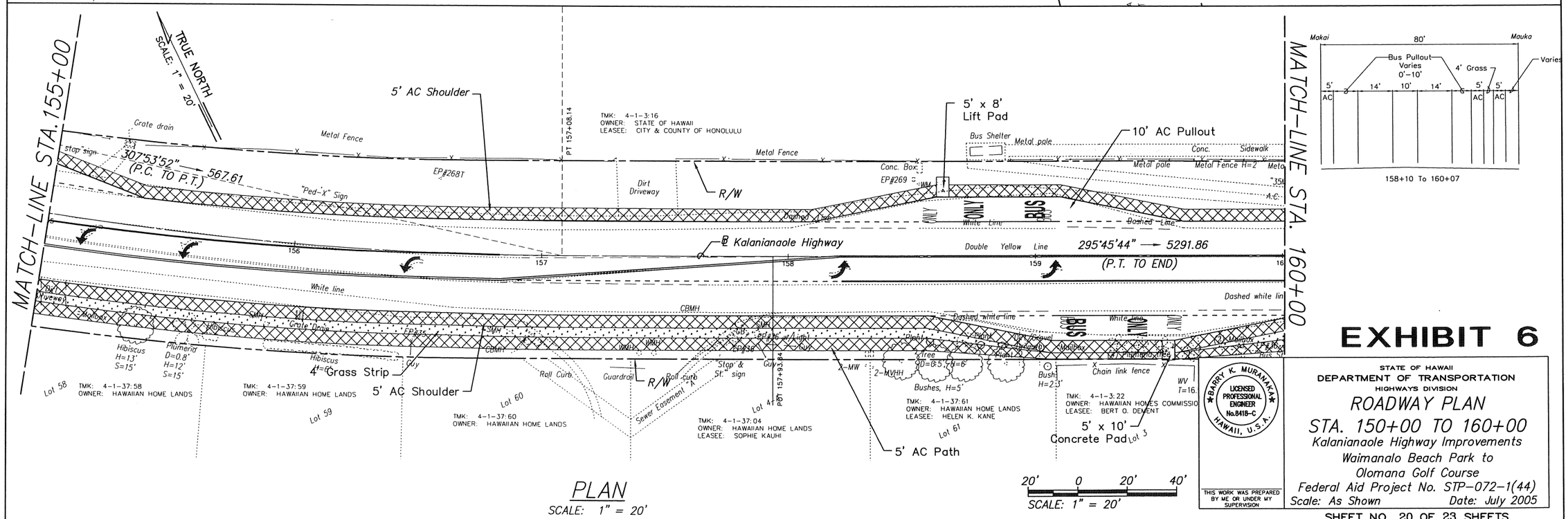
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	19	23



FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	20	23



PLAN
SCALE: 1" = 20'



PLAN
SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 150+00 TO 160+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

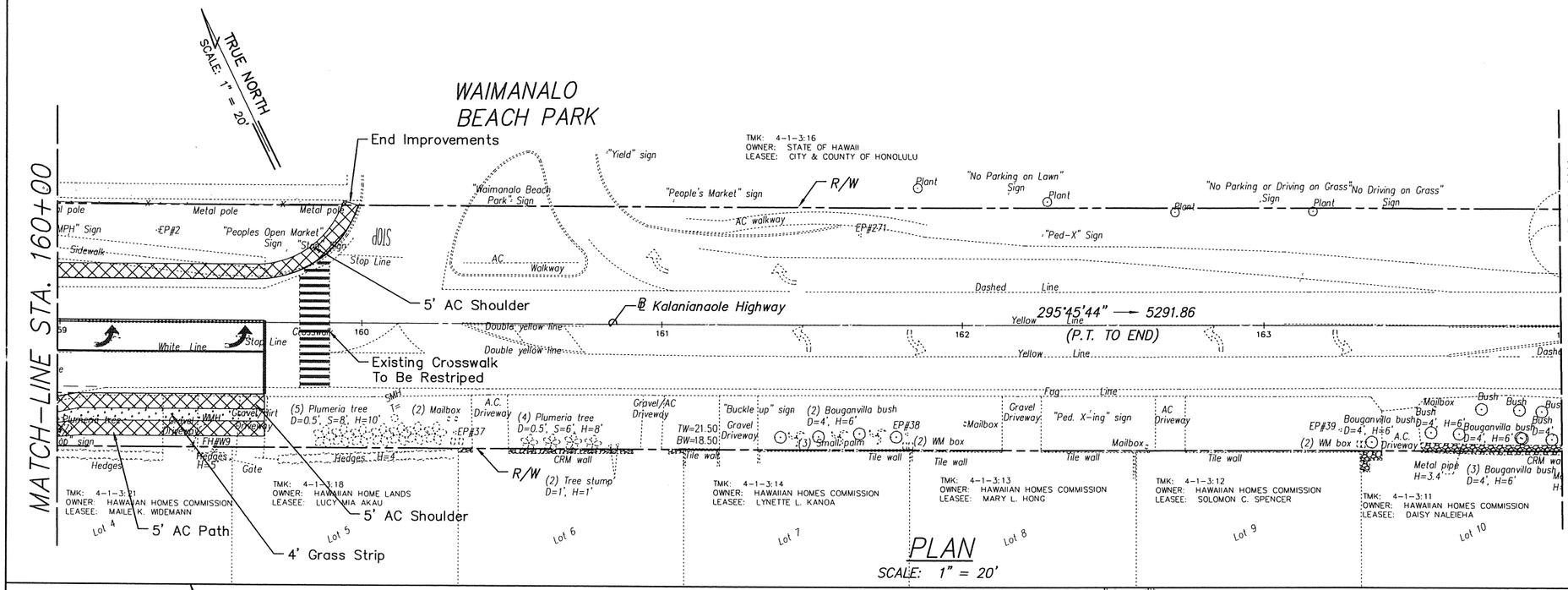
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 20 OF 23 SHEETS

PREFIX: G:\doth00-01\acad\
FILE: doth0001023.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:16pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:26pm

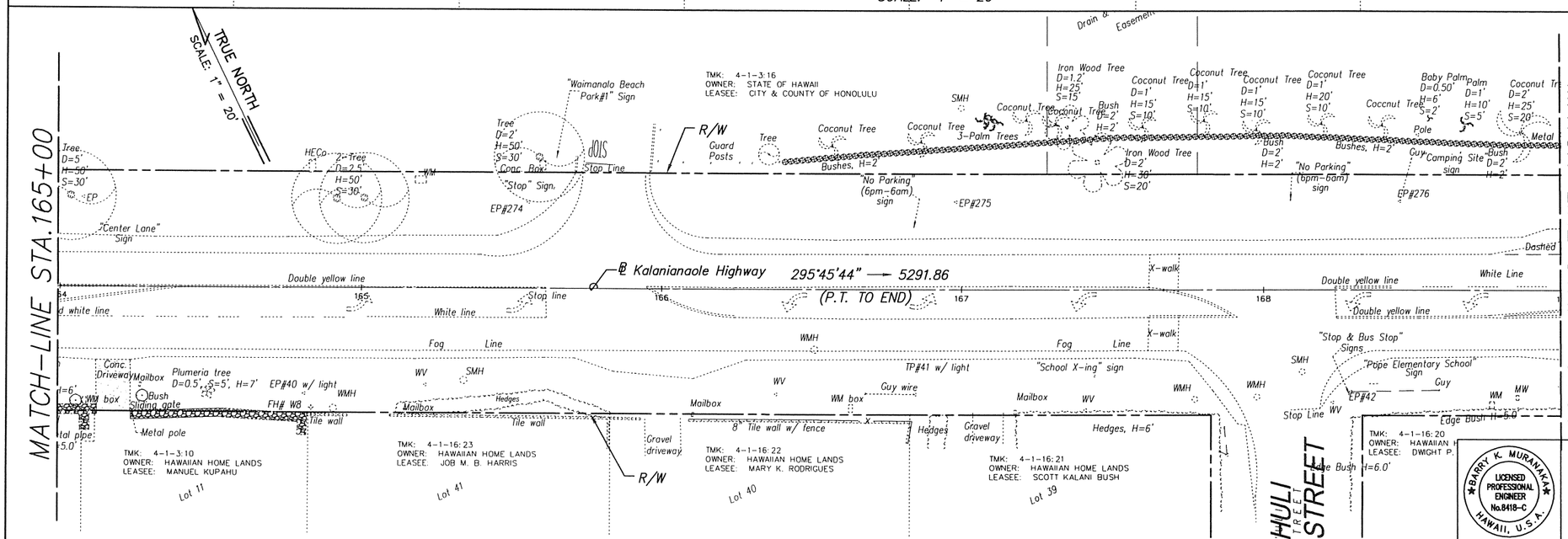
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	21	23



PLAN
SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping



PLAN
SCALE: 1" = 20'

20' 0 20' 40'
SCALE: 1" = 20'

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:16pm
LAST SAVED BY:
LAST MODIFIED: Tue, 19 Jul 2005 - 3:28pm

PREFIX: G:\doth00-01\acad\
FILE: doth0001024.dwg
BEGIN: 12/01/99
SCALE: 1=1

EXHIBIT 6

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

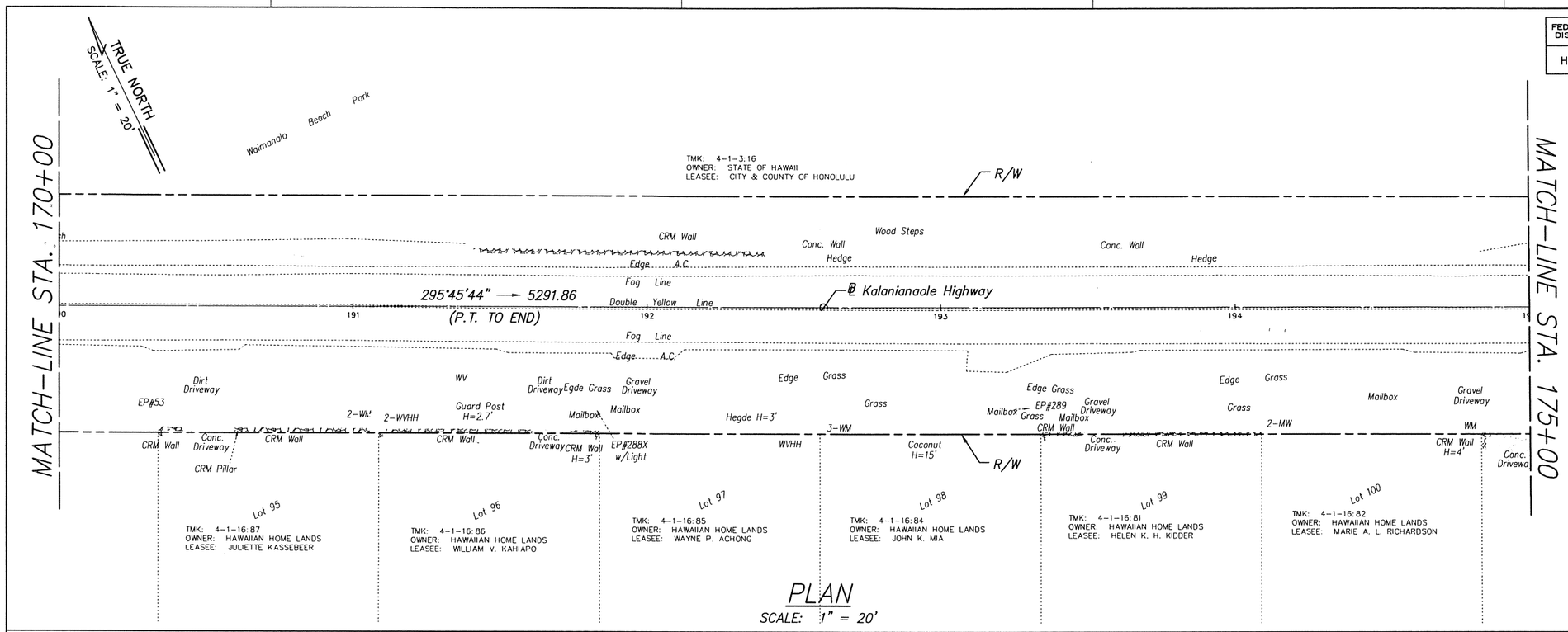
STA. 160+00 TO 170+00
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

SHEET NO. 21 OF 23 SHEETS

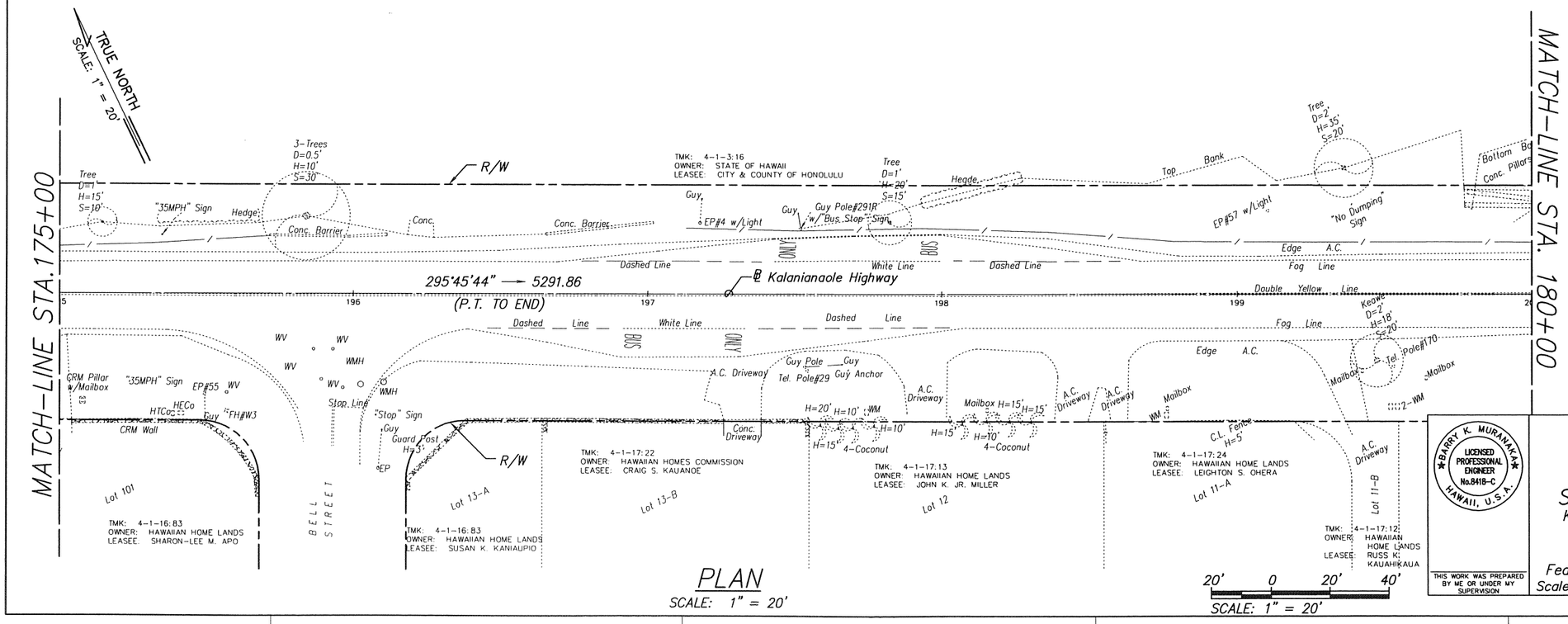
FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	22	23



PLAN
SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping



PLAN
SCALE: 1" = 20'

EXHIBIT 6

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY PLAN

STA. 170+00 TO 180+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)

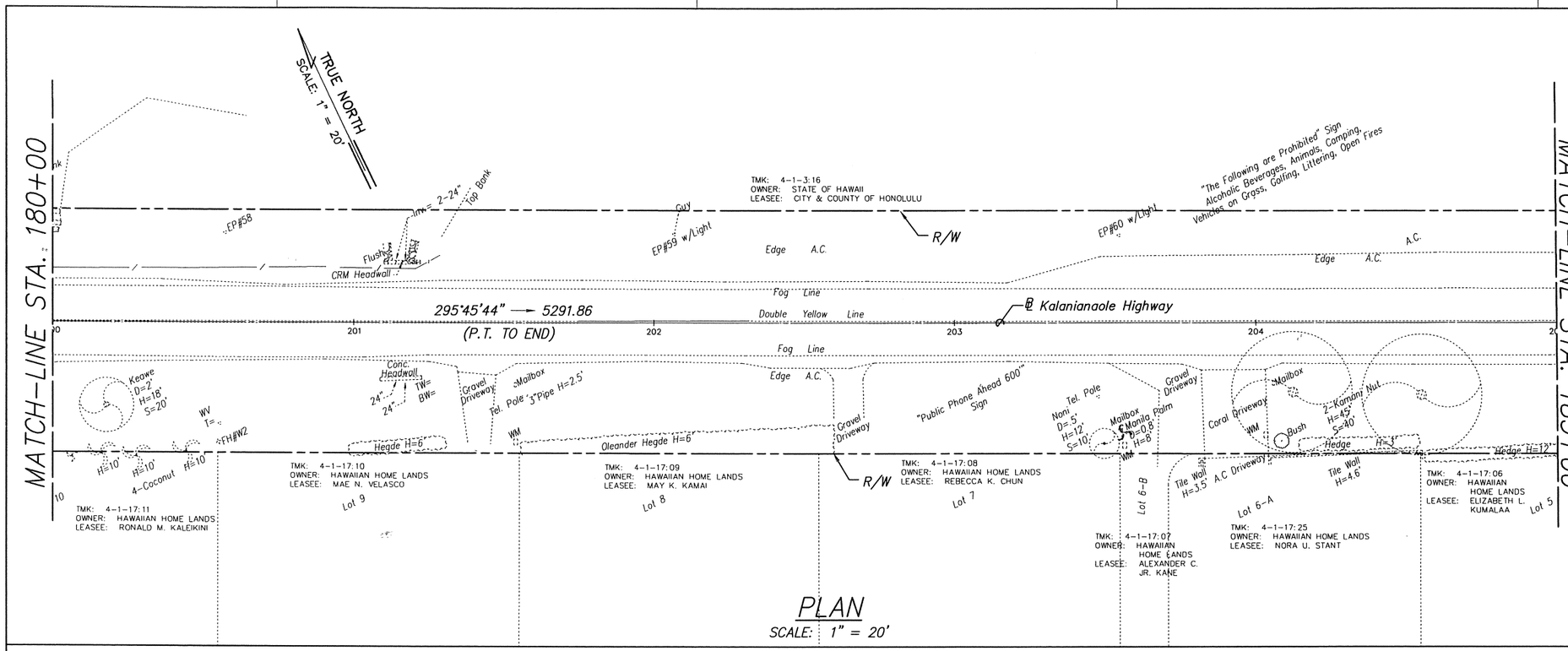
Scale: As Shown Date: July 2005

SHEET NO. 22 OF 23 SHEETS

PREFIX: G:\dath00-01\acad\
FILE: dath0001027.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:17pm
LAST SAVED BY:
LAST MODIFIED: Thu, 07 Jul 2005 - 1:35pm

FED. ROAD DIST. NO.	STATE	FED. AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	23	23

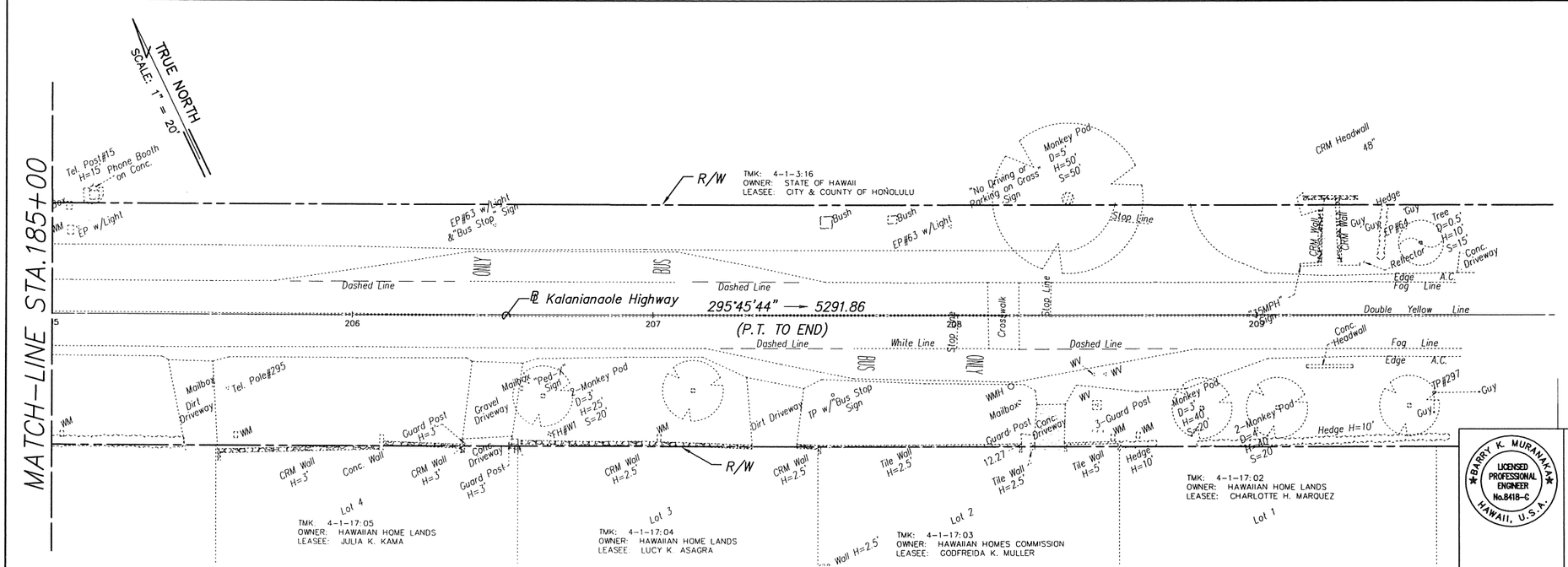


PLAN

SCALE: 1" = 20'

Legend

- Concrete Sidewalk
- AC Shoulder
- Grass
- Landscaping
- Existing Marking
- Existing Striping
- New Marking
- New Striping



PLAN

SCALE: 1" = 20'

20' 0 20' 40'

SCALE: 1" = 20'

PREFIX: G:\oath00-01\acad\
FILE: oath0001028.dwg
BEGIN: 12/01/99
SCALE: 1=1

P.M.: STY
CURRENT OPR: jsk3
PREV. OPR:
CURRENT TIME: Aug 10, 2005 - 3:17pm
LAST SAVED BY:
LAST MODIFIED: Thu, 07 Jul 2005 - 1:15pm

EXHIBIT 6

BARRY K. MURANAKA
LICENSED PROFESSIONAL ENGINEER
No.8418-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

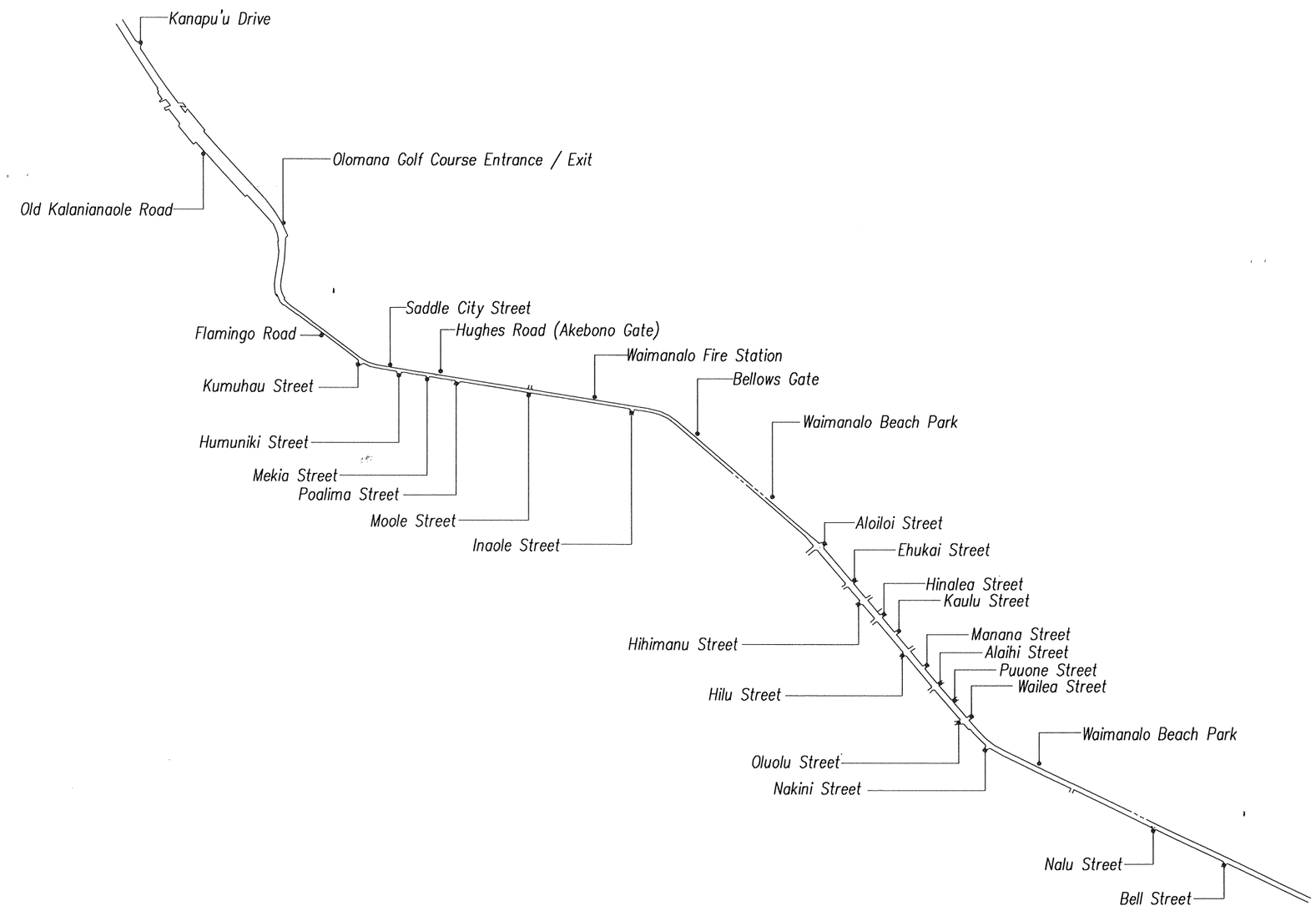
ROADWAY PLAN

STA. 180+00 TO END

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: As Shown Date: July 2005

SHEET NO. 23 OF 23 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-1	24



ELECTRICAL SYMBOLS

SYMBOL	DESCRIPTION
	Existing Highway Light Standard, Bracket Arm and Luminaire on Concrete Foundation
	Existing Highway Light Bracket Arm and Luminaire, Mounted on Existing Wood Utility Pole
	Existing Wood Utility Pole and Down Guy
	Existing Traffic Signal Standard on Concrete Base
	Existing Traffic Signal Detector Loop
	Existing Utility Company, Traffic Signal, or Highway Light Concrete Handhole / Pullbox
	Existing Utility Company Concrete Manhole

OVERALL PROJECT LOCATION PLAN

SCALE: 1"=1000'

NORTH

1000'500' 0 1000' 2000' 3000'

SCALE: 1"=1000'

GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

OVERALL PROJECT LOCATION PLAN, ELECTRICAL SYMBOLS

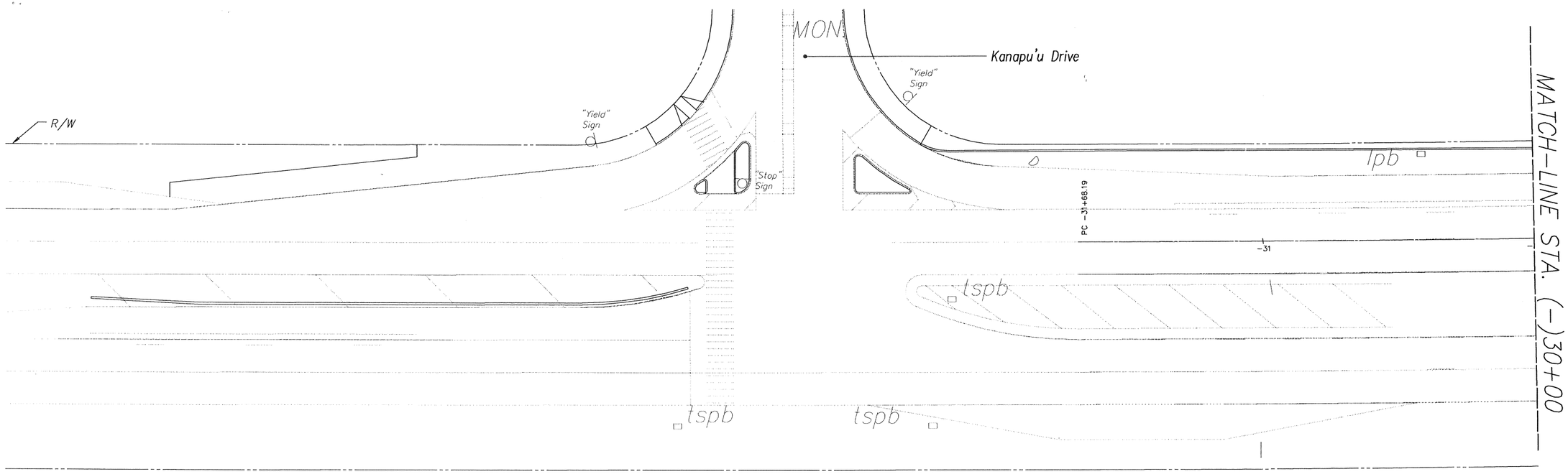
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-1 OF 24 SHEETS

ORIGINAL PLAN
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE
NOTE BOOK
No.

LAST SAVE: 12/12/05 @ 15:20:28 BY: JM PLOT SC 1"=0"=1'
Z:\ACAD\PROJECTS\24120\V001_24120_symbols XREFS: NALO_FSTRIPE2=NALO_FSTRIPE3 NALO_FSTRIPE3 NALO_FSTRIPE3 _X24120_SYMBOLS XNALO_FSTRIPE3=RHA WAIMBL OLOMANA_TRADING WAIMANALO BASE OVERSIZE1=\OVERSIZE1 _X24120-ELECALL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-2	24



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'

SCALE: 1"=20'

GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
BEGIN TO STA. (-)30+00

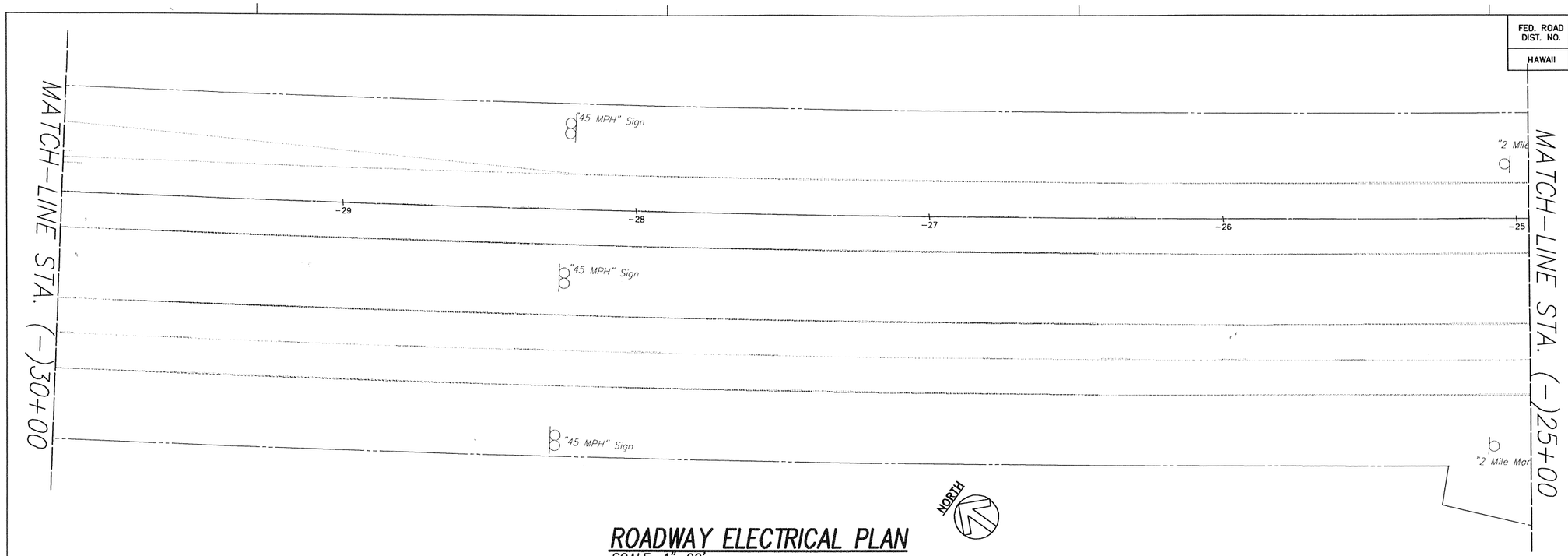
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-2 OF 24 SHEETS

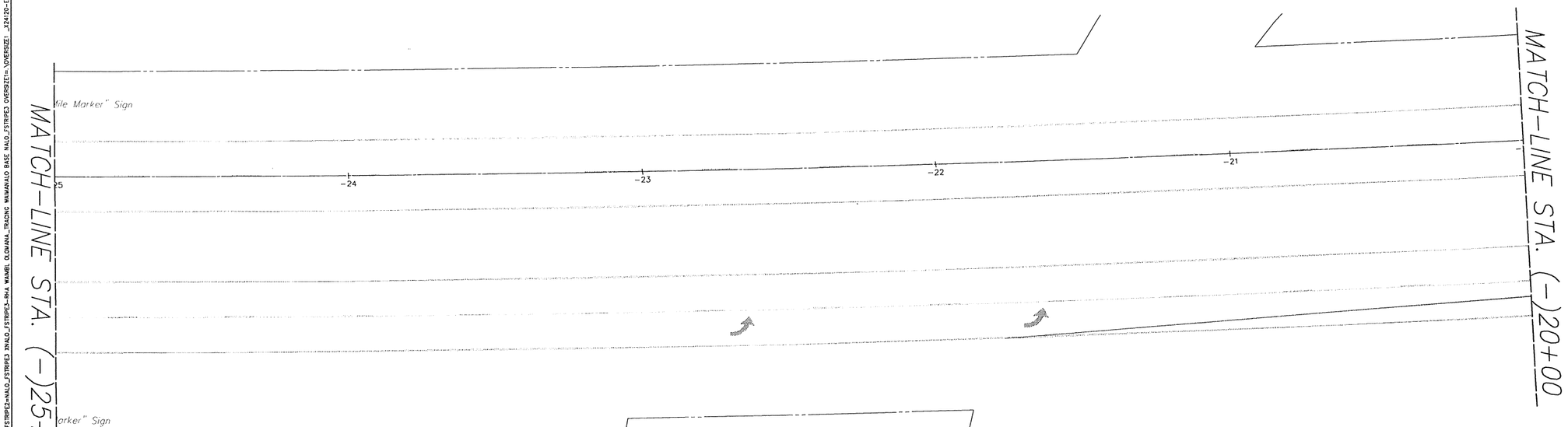
ORIGINAL PLAN
SURVEY PLOTTED BY ____ DATE ____
DRAWN BY ____
NOTE BOOK TRACED BY ____
DESIGNED BY ____
QUANTITIES BY ____
CHECKED BY ____
No. ____

LAST SAVE: 12/12/05 @ 14:03:23 BY: AM PLOT SC: 10"=1'
Z:\ACAD\PROJECTS\24120\DOT_24120-mhn000104 XREFS: NALO_FSTRIPE2=NALO_FSTRIPE2 XNALO_FSTRIPE3 XNALO_FSTRIPE3-RHA WAIMB. OLOMANA_TRACING WAIMANALO BASE NALO_FSTRIPE3 OVERSIZE1=\OVERSIZE1 _X24120-ELECALL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-3	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. (-)30+00 TO (-)20+00

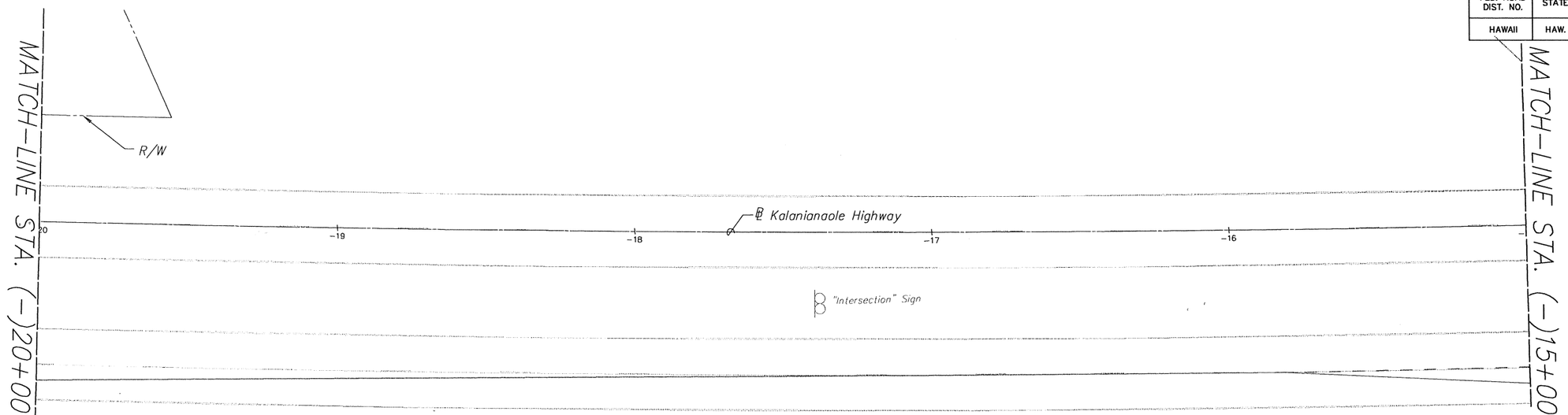
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-3 OF 24 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

LAST SAVE: 12/13/05 @ 14:36:40 PM PDT 96 1"=20'=1'
Z:\ACAD\PROJECTS\24120\v003_24120-ele001005.DWG; NALO_FSTRIPE2=NALO_FSTRIPE3 XNALO_FSTRIPE2=RH4 WAIMB1 OLOMANA_TRACING WAIMANALO BASE NALO_FSTRIPE2 OVERSIZE1=\OVERSIZE1 _X24120-ELECALL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-4	24

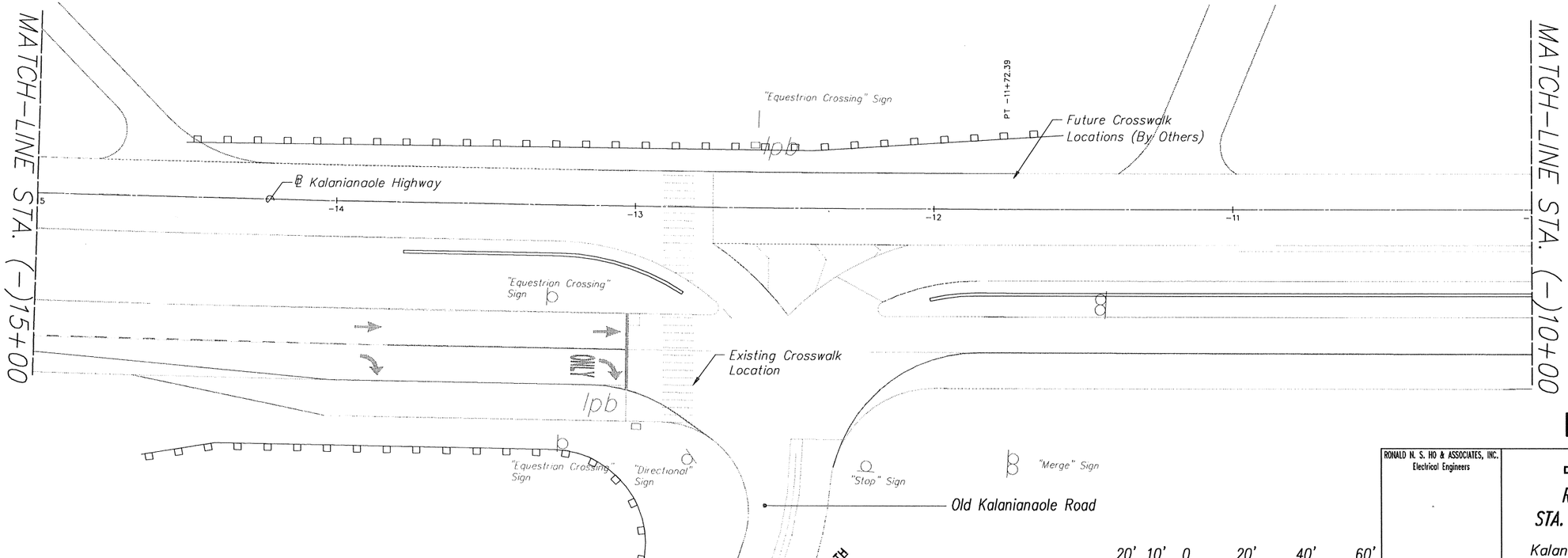


"Merge" Sign

"Intersection" Sign

NORTH

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'

SCALE: 1"=20'

GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. (-)20+00 TO STA. (-)10+00

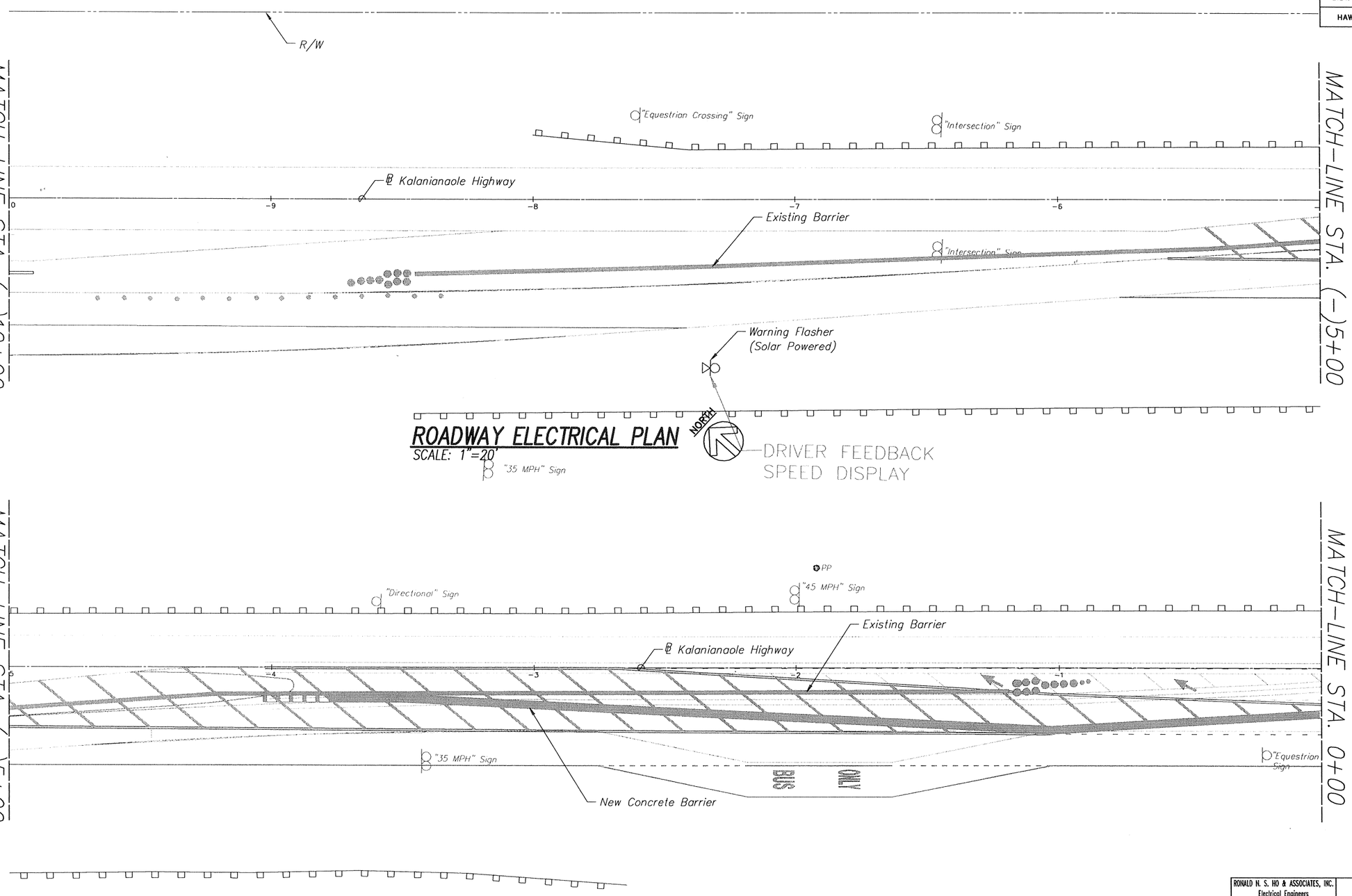
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-4 OF 24 SHEETS

ORIGINAL PLAN
NOTE BOOK No.
SURVEY PLOTTED BY
DRAWN BY
TRACED BY
DESIGNED BY
QUANTITIES BY
CHECKED BY
DATE

LAST SAVE: 12/13/05 @ 14:06:38 BY: AM PLOT SC 1'-0"=1'
Z:\AUAD\PROJECTS\24120\v00-L_24120-eeh001006.DWG
XREFS: NALO_FSTRIPE2=NALO_FSTRIPE2 XNALO_FSTRIPE3 XNALO_FSTRIPE3-RHA WAMBL OLOMANA_TRACING WAIMANALO BASE NALO_FSTRIPE3 OVERSIZE1=\OVERSIZE1 _X24120-ELECNLL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-5	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. (-) 5+00 to STA. 0+00:
Alternate 1: New Highway Light Standards
Alternate 2: New Highway Light Standards
Alternate 3: New Highway Light Standards

EXHIBIT 7

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
	TRACED BY	
NOTE BOOK	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

LAST SAVE: 12/12/05 @ 14:10:25 BY: AM PLOT SC:1'-0"=1'
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RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
04/30/06
EXPIRATION DATE OF THE LICENSE

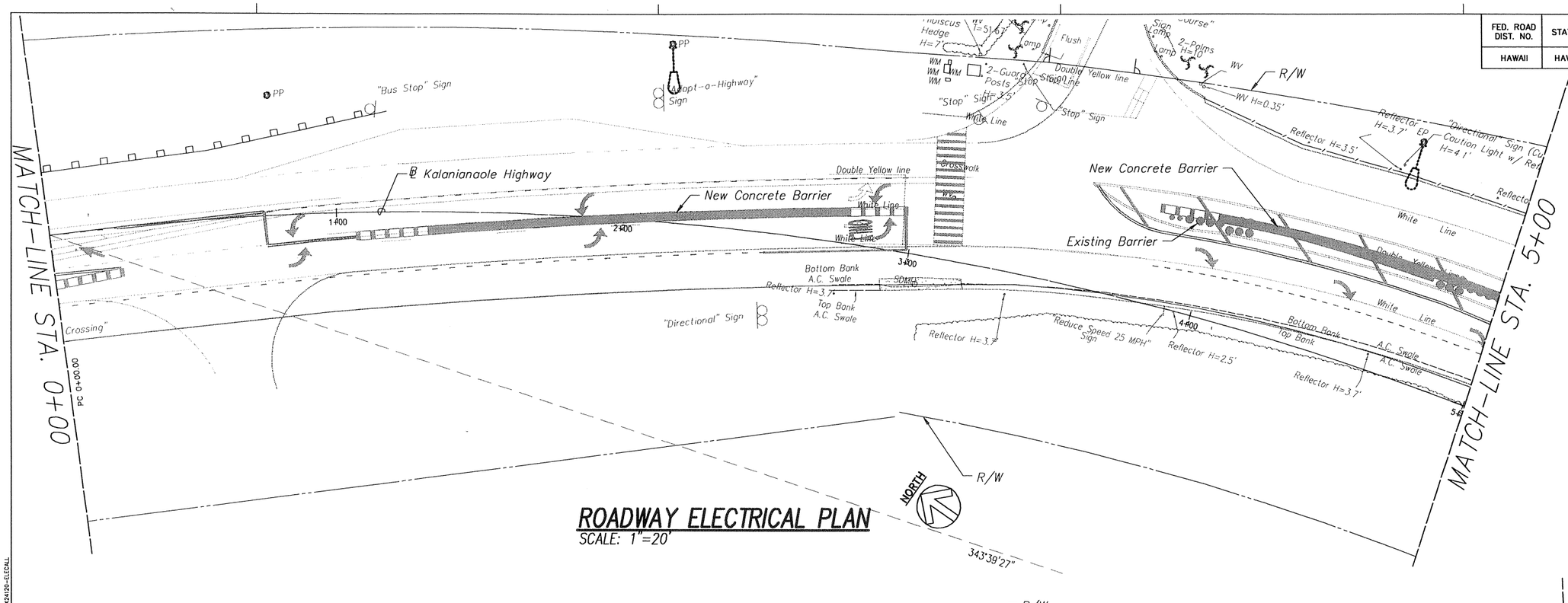
STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. (-)10+00 TO STA. 0+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

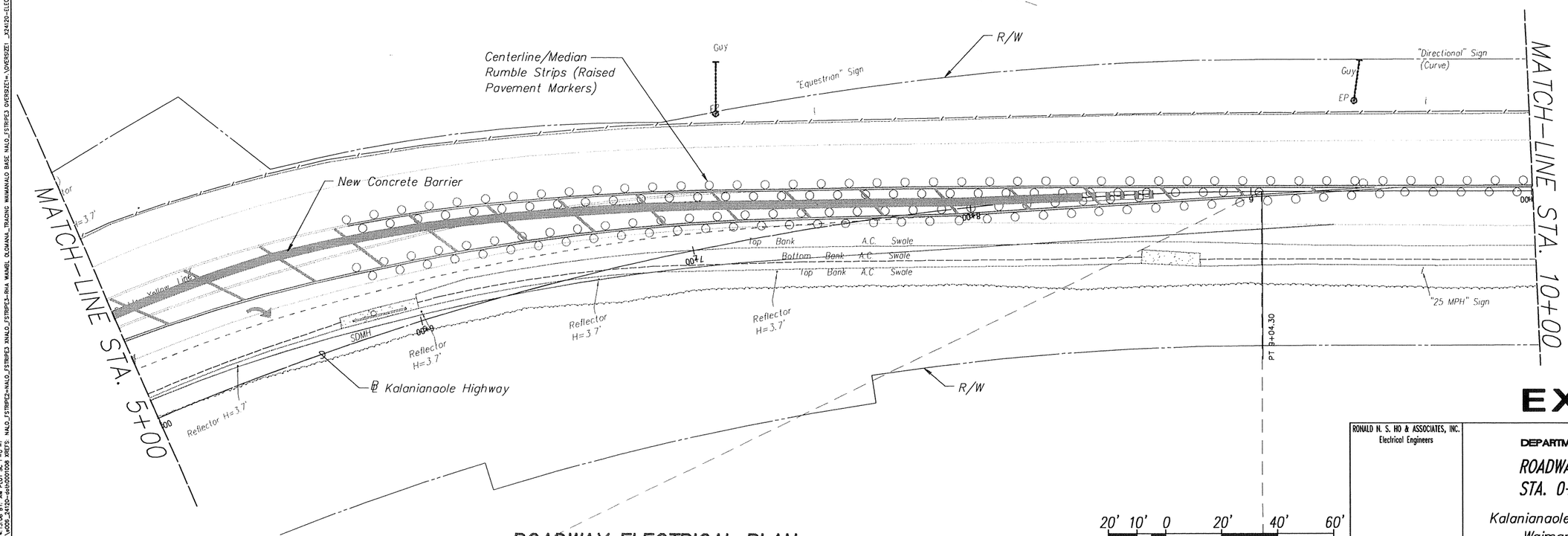
SHEET No. E-5 OF 24 SHEETS

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-6	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. 0+00 to STA. 10+00:
Alternate 1: New Highway Light Standards
Alternate 2: New Highway Light Standards
Alternate 3: New Highway Light Standards



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 0+00 TO STA. 10+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-6 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK No.

LAST SAVE: 12/12/05 @ 14:13:08 BY: AM PLOT SC: 1'=0'=1'
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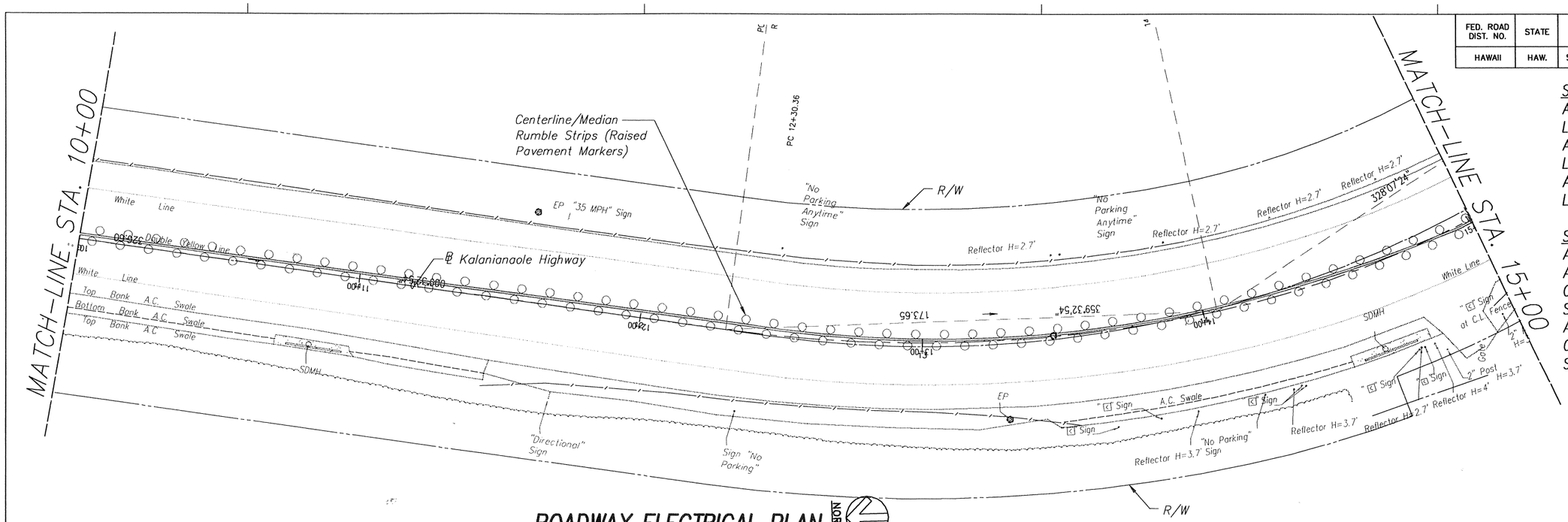
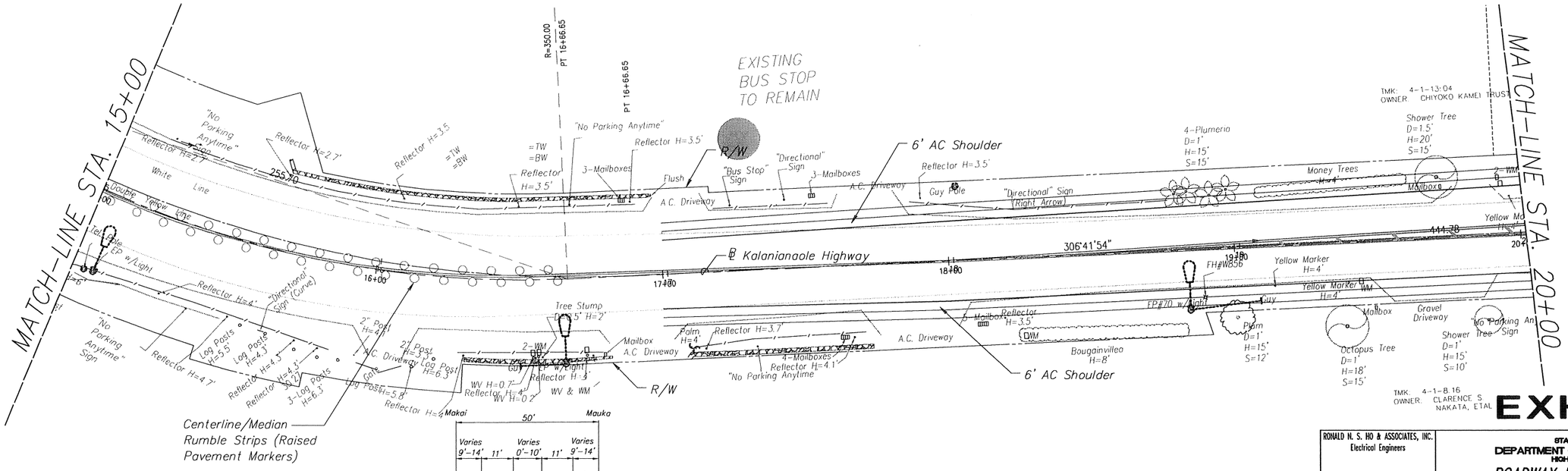
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-7	24

STA. 10+00 to STA. 17+00:
Alternate 1: New Highway Light Standards
Alternate 2: New Highway Light Standards
Alternate 3: New Highway Light Standards

STA. 17+00 to STA. 20+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

SCALE: 1"=20'
GRAPHIC SCALE
20' 10' 0 20' 40' 60'

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 10+00 TO STA. 20+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-7 OF 24 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
	QUANTITIES BY	
No.	CHECKED BY	

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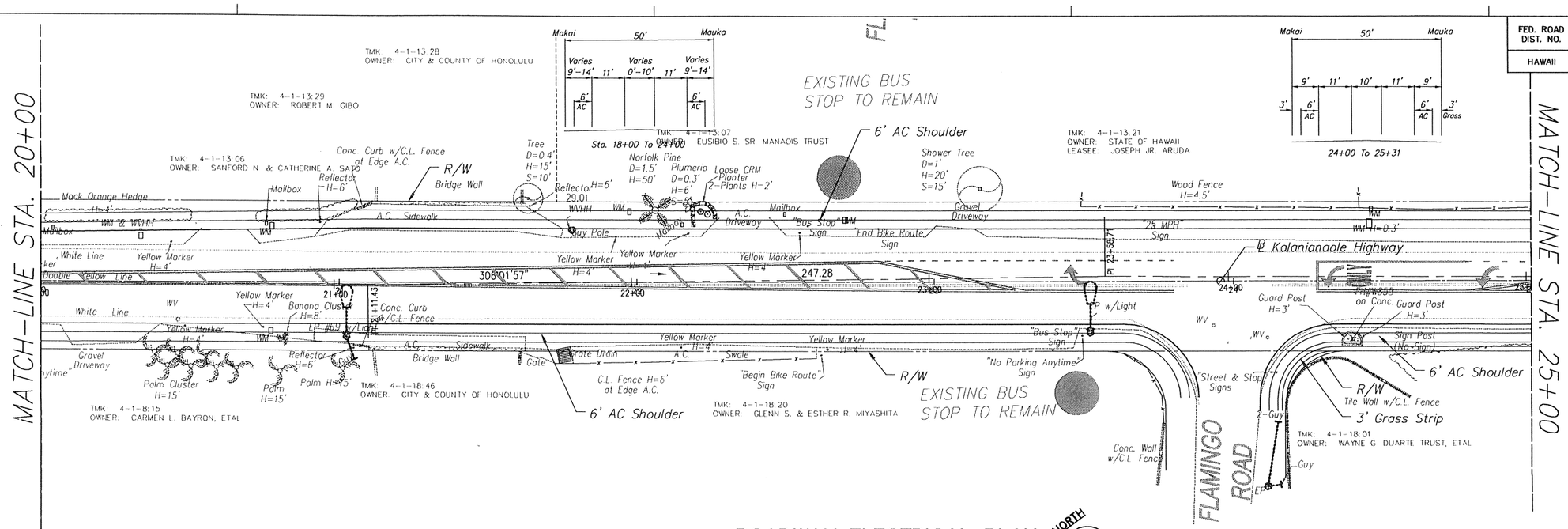
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-8	24

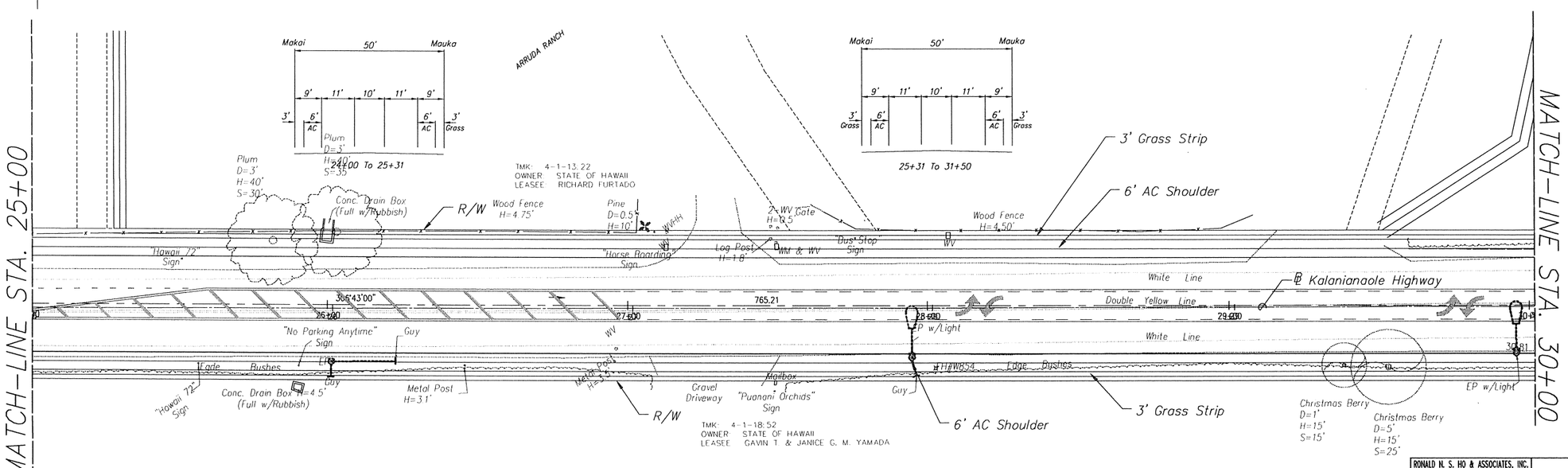
STA. 20+00 to STA. 30+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'

SCALE: 1"=20'

GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 20+00 TO STA. 30+00

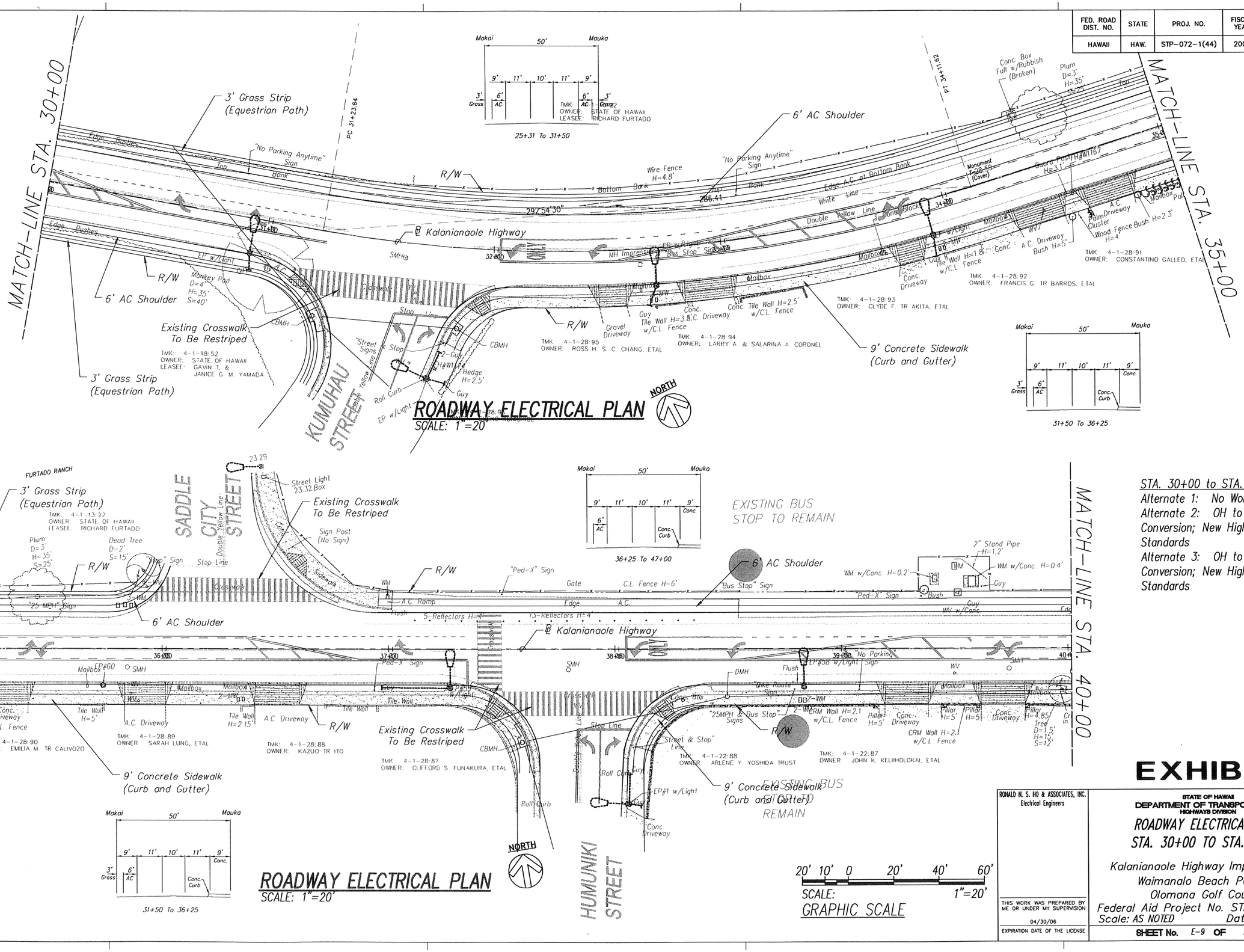
Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-8 OF 24 SHEETS

ORIGINAL PLAN	SURVEY PLOTTED BY	DATE
	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

LAST SAVE: 12/12/05 @ 14:18:29 BY: AM PLOT SC 1'=0'=1' Z:\ACAD\PROJECTS\24120\v08_24120-ed-h0001010.DWG REFS: NALO_FSTRIPE2=NALO_FSTRIPE2 XNALO_FSTRIPE3-RHA NAME: OLOMANA_TRACING WAIMANALO BASE NALO_FSTRIPE3 OVERSIZE1= \OVERSIZE1 _X24120-ELECALL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-9	24



STA. 30+00 to STA. 40+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 30+00 TO STA. 40+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-9 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

LAST SAVE: 12/12/05 @ 11:18:15 BY: JM PLOT SC: 1"=0"=1"
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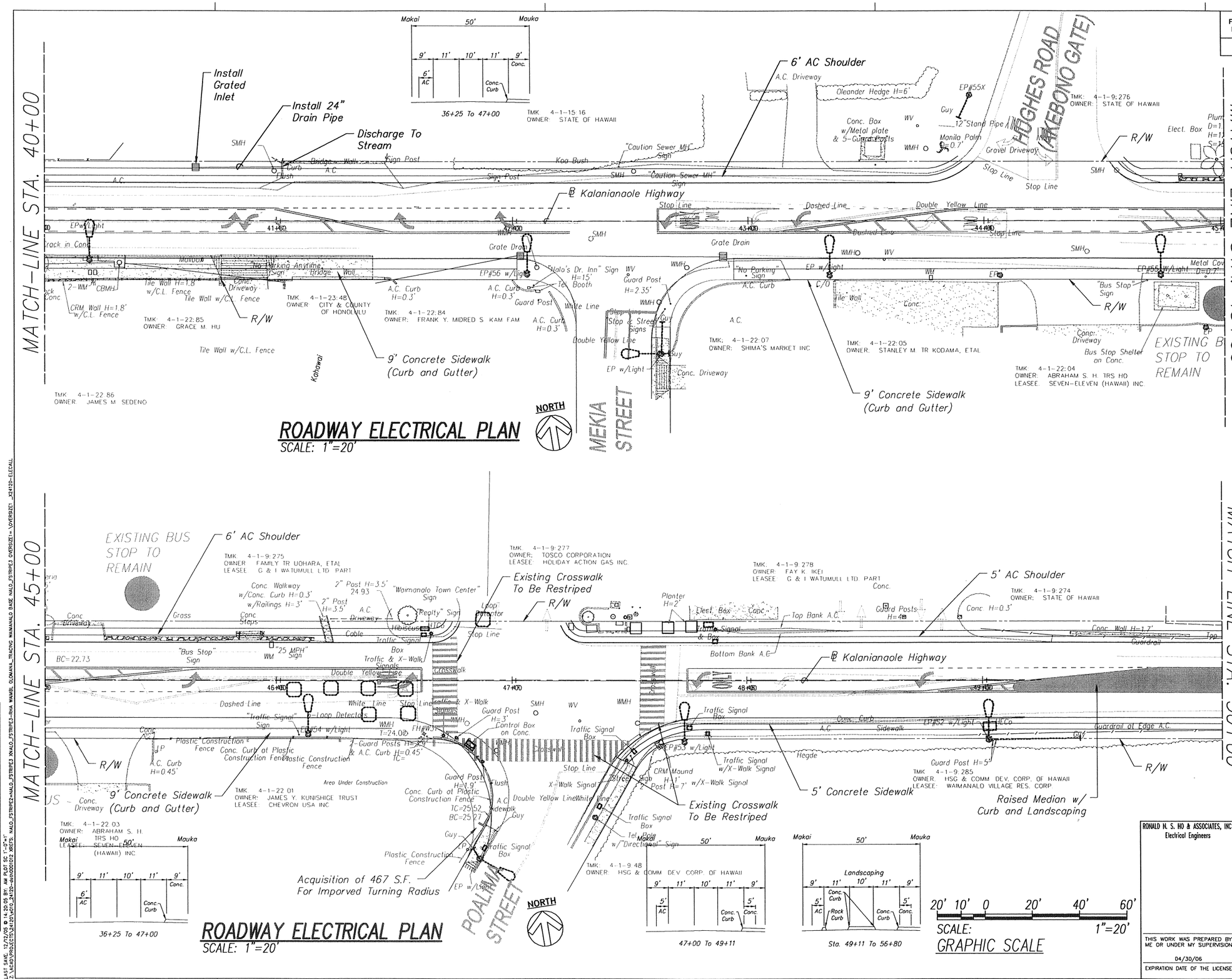
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-10	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. 40+00 to STA. 42+00:
Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

STA. 42+00 to STA. 50+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 40+00 TO STA. 50+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-10 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE | NOTE BOOK | No.

LAST SAVE: 12/12/05 @ 14:20:05 BY: AM PLOT SC 1'-0"=1'
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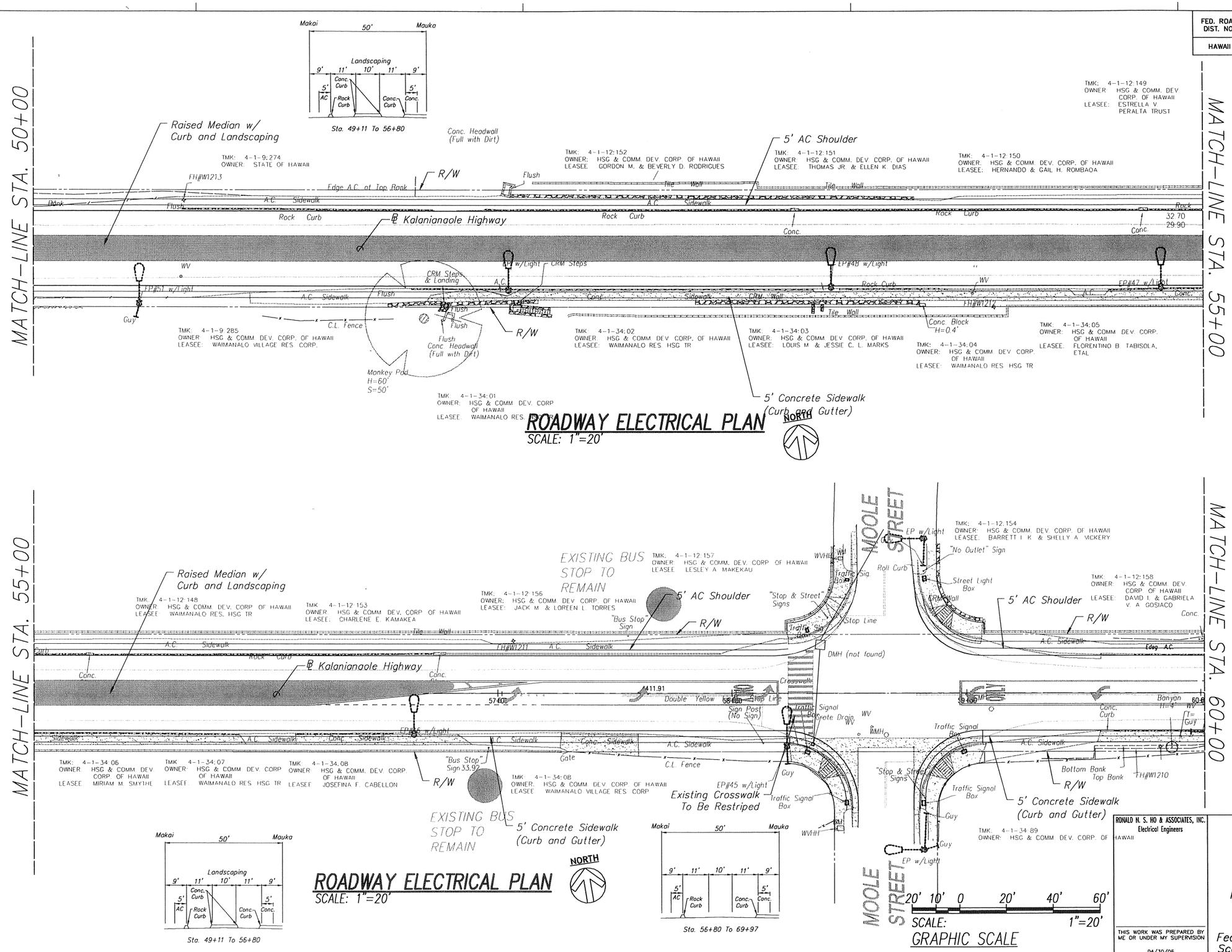
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-11	24



STA. 50+00 to STA. 51+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

STA. 51+00 to STA. 60+00:
Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers
HAWAII

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 50+00 TO STA. 60+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-11 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK No.

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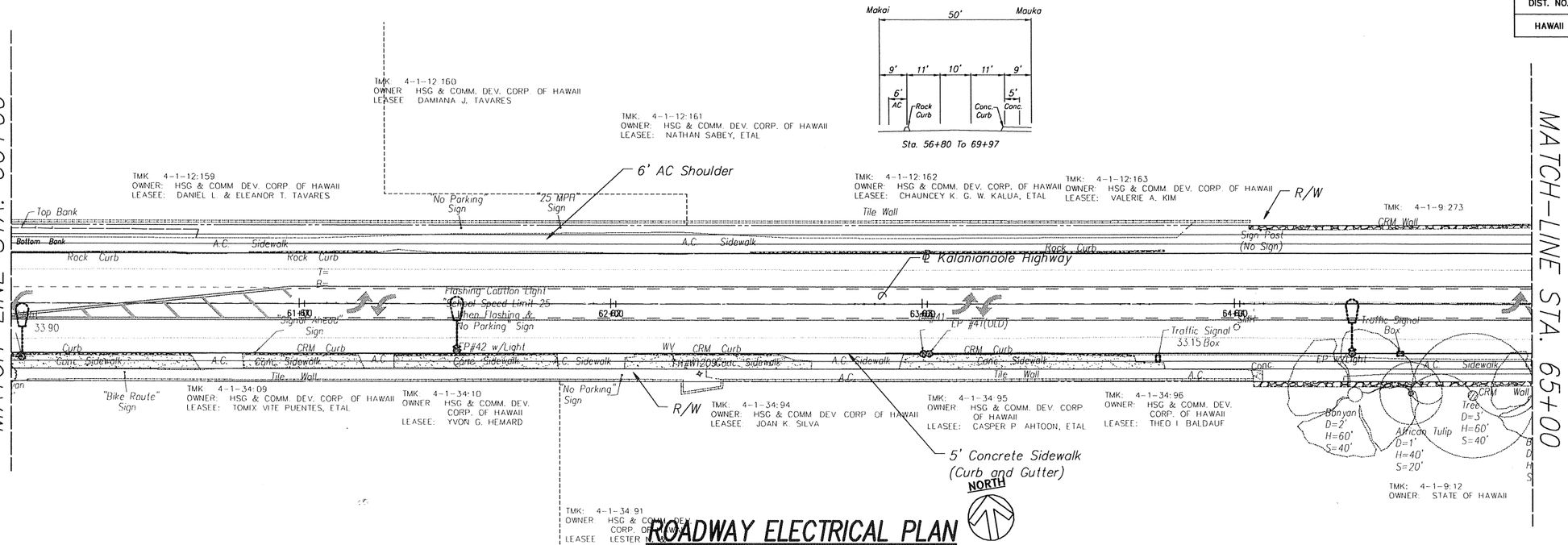
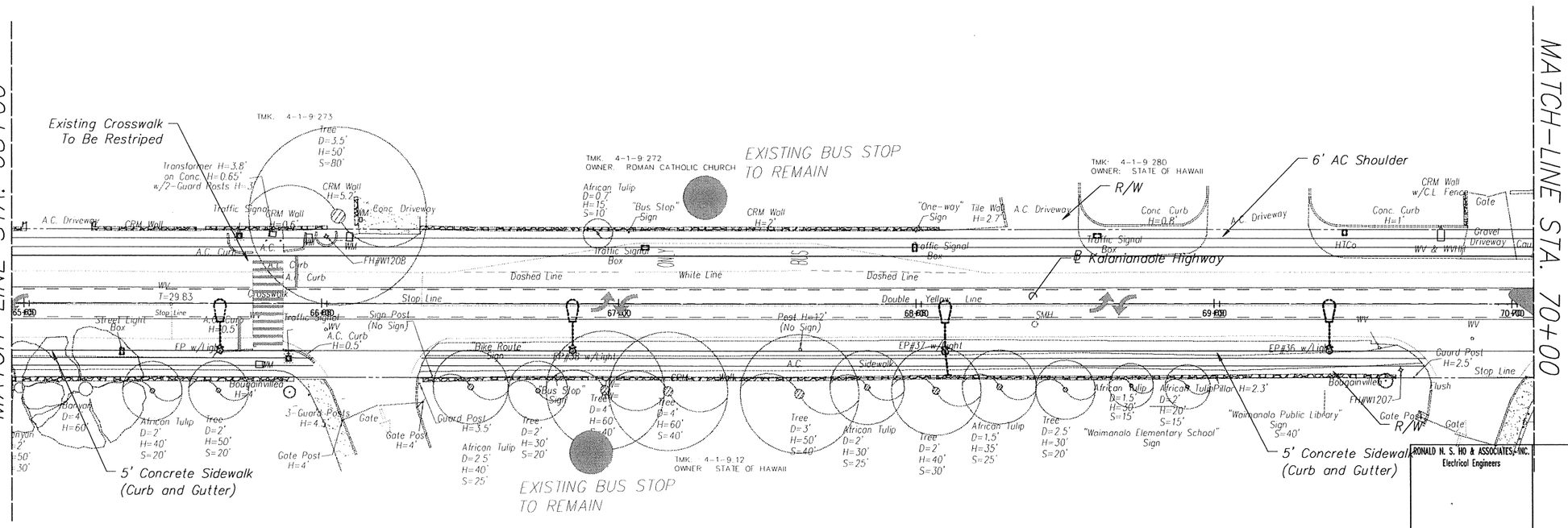
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-12	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. 60+00 to STA. 70+00:
Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 60+00 TO STA. 70+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-12 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK No.

LAST SAVE: 12/12/05 @ 14:23:05 BY: JAY PLOT SC 1=1
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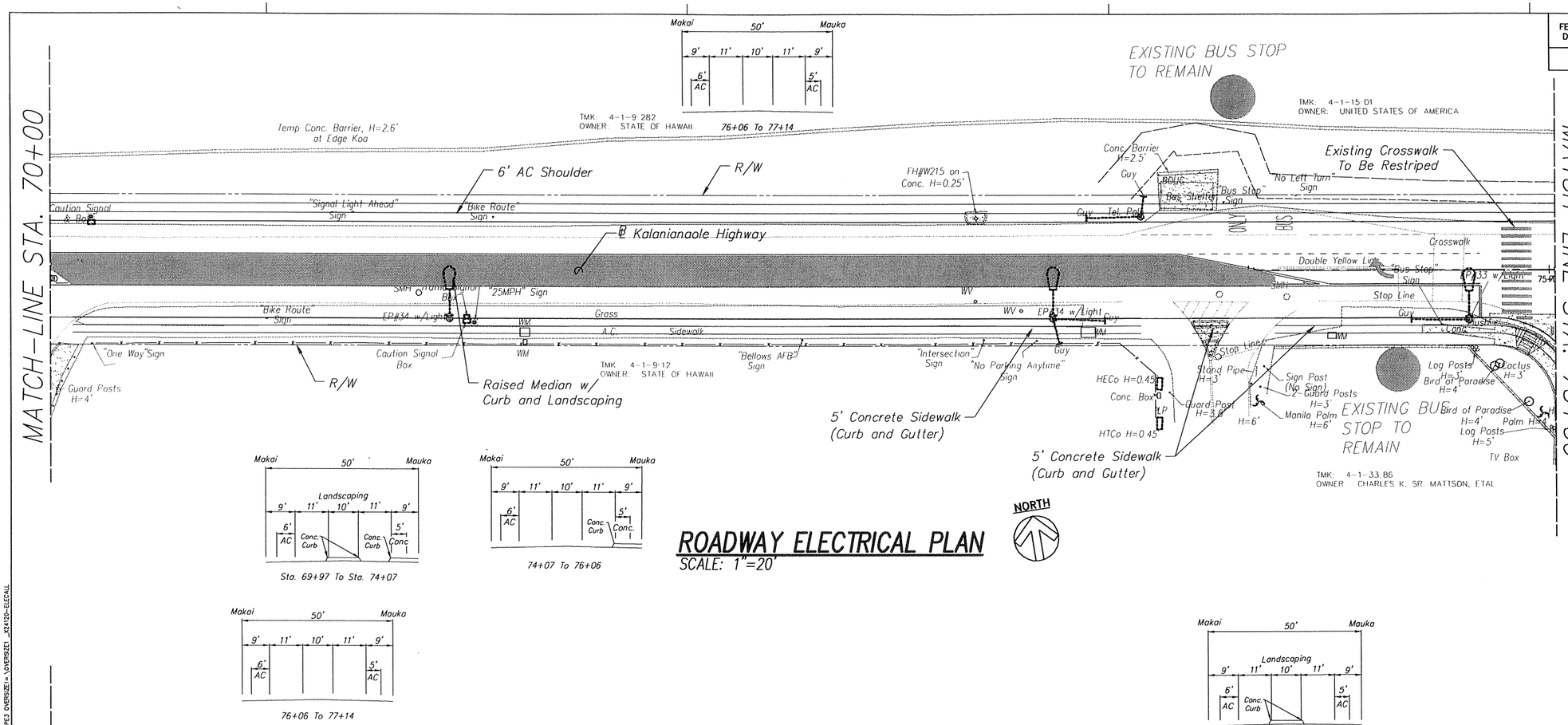
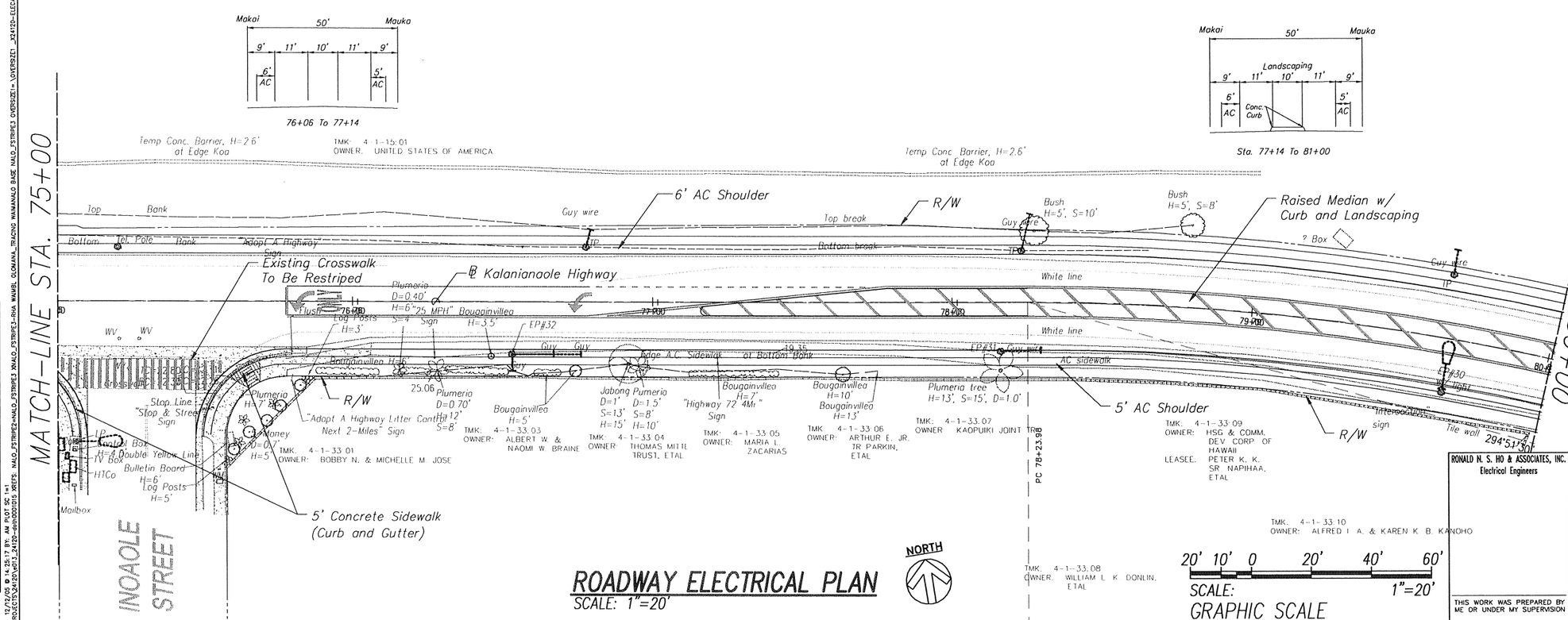
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-13	24

STA. 70+00 to STA. 80+00:
Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 70+00 TO STA. 80+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-13 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK | No.

LAST SAVE: 12/12/05 @ 14:25:17 BY: AM PLOT SC: 1=1
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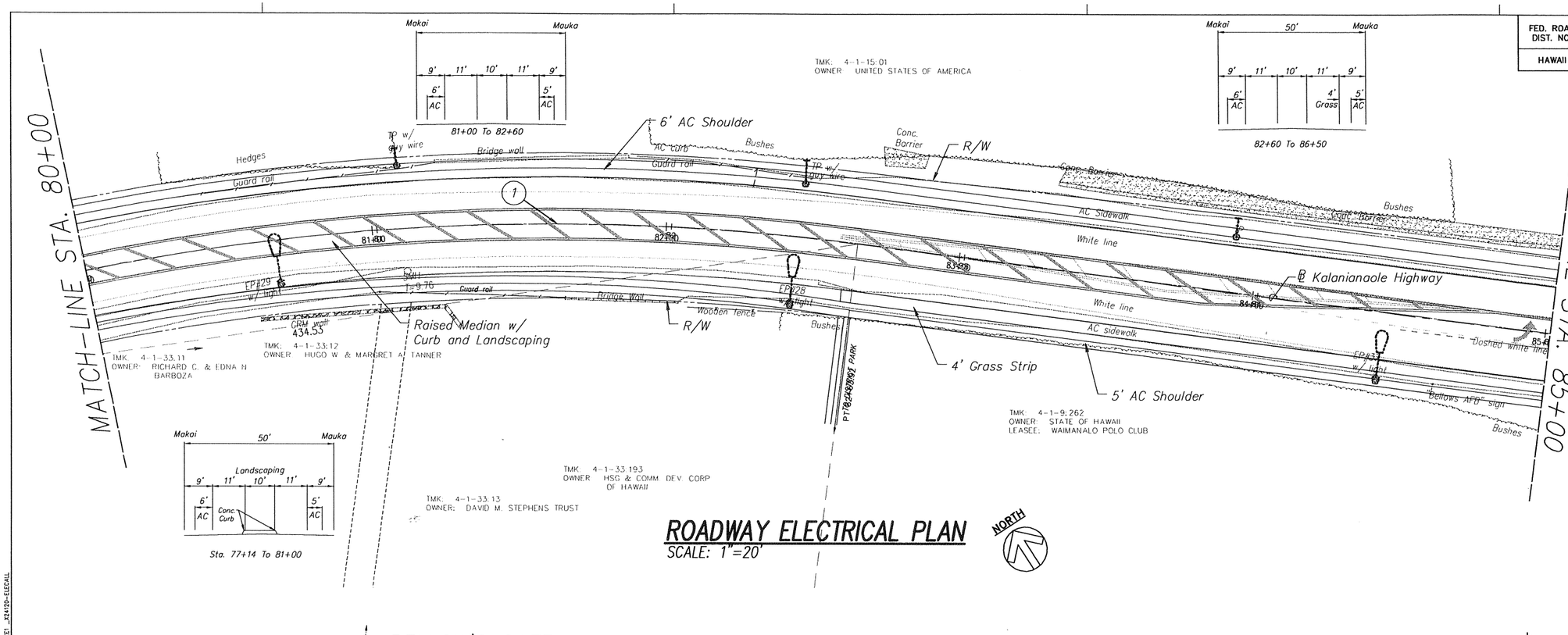
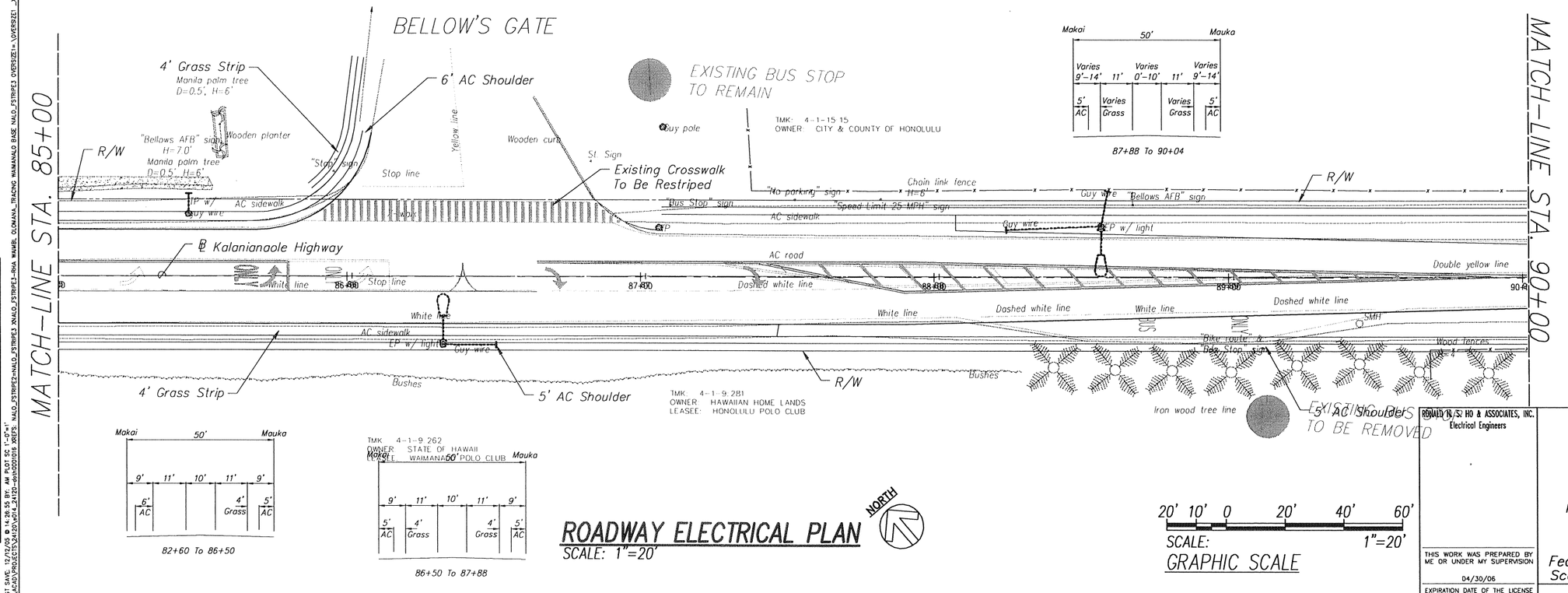
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-14	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. 80+00 to STA. 90+00:
Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROLAND Y.S. HO & ASSOCIATES, INC.
Electrical Engineers

ROADWAY ELECTRICAL PLAN
STA. 80+00 TO STA. 90+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

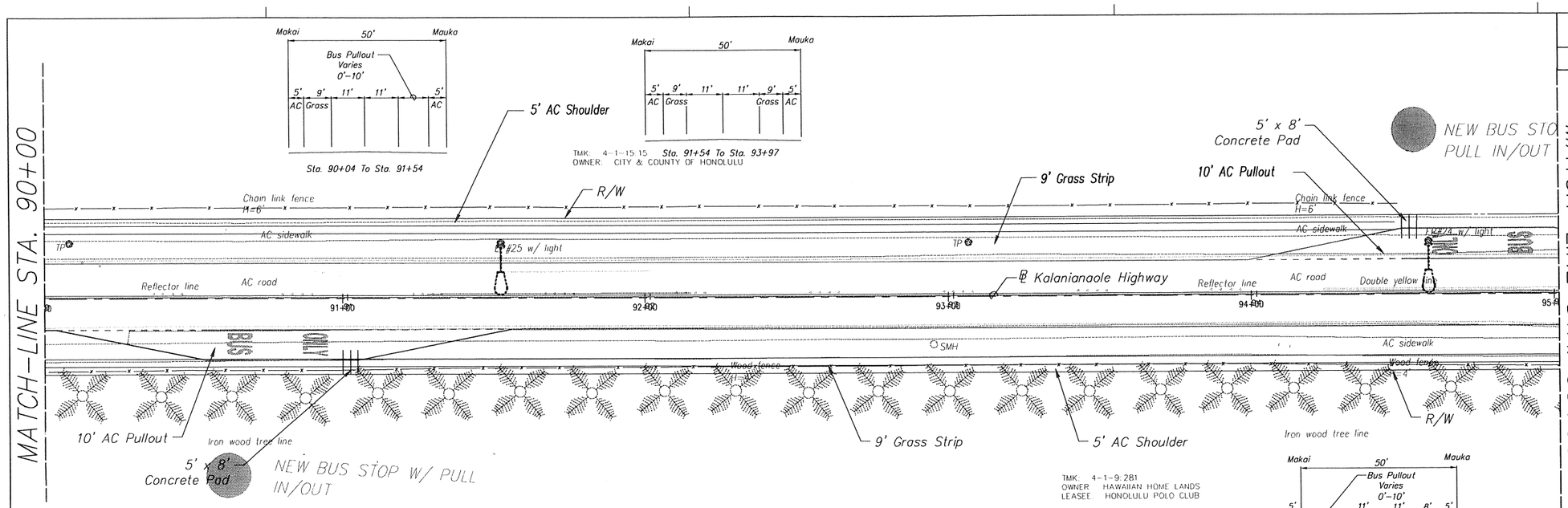
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
04/30/06
EXPIRATION DATE OF THE LICENSE

SHEET No. E-14 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE
NOTE BOOK No.

LAST SAVE: 12/12/05 @ 14:26:55 BY: AM PLOT SC 1'-0"=1' Z:\ACAD\PROJECTS\24120\sh14_24120-elec001016 XREFS: NALO_FSTRIPE2-NALO_FSTRIPE3 XNALO_FSTRIPE3-RHA WAMB. OLOMANA_TRACING WAIMANALO BASE NALO_FSTRIPE3 OVERSIZE1 OVERSIZE1 _24120-ELECALL

FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-15	24



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

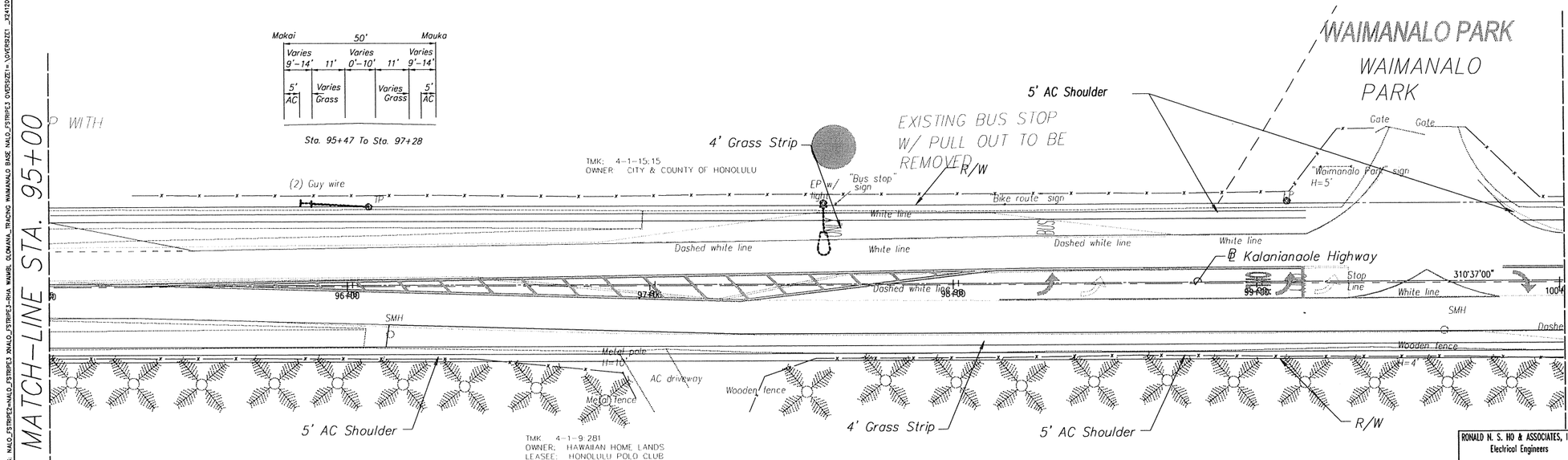
NORTH

STA. 90+00 to STA. 100+00:

Alternate 1: OH to OH Utility Relocation; New Highway Light Standards

Alternate 2: OH to UG Utility Conversion; New Highway Light Standards

Alternate 3: OH to UG Utility Conversion; New Highway Light Standards



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'

SCALE: 1"=20'

GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

04/30/06

EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 90+00 TO STA. 100+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-15 OF 24 SHEETS

ORIGINAL PLAN | SURVEY PLOTTED BY | DRAWN BY | TRACED BY | DESIGNED BY | QUANTITIES BY | CHECKED BY | DATE

NOTE BOOK No.

LAST SAVE: 12/7/05 @ 14:28:54 BY: AM PLOT SC: 1=1
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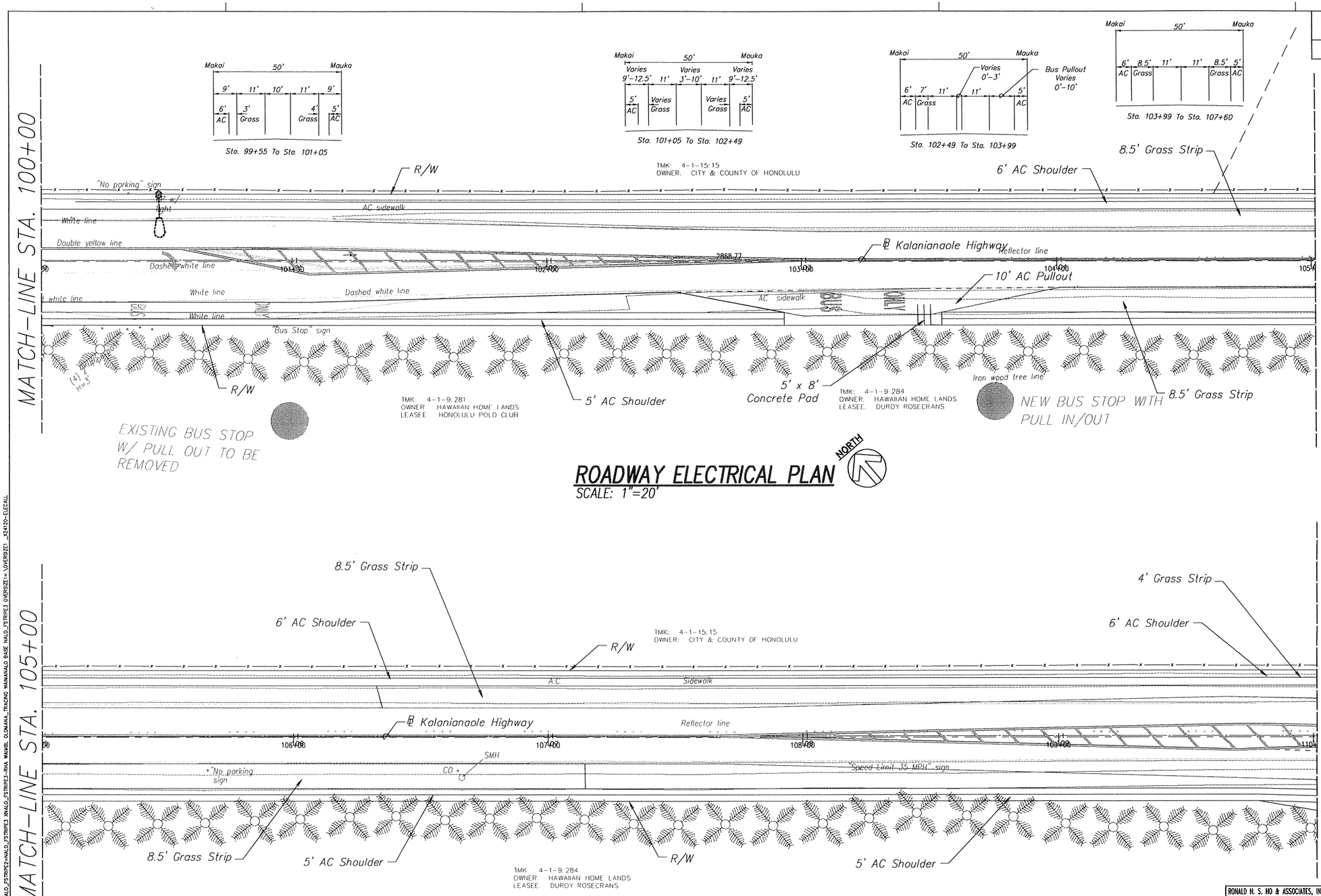
FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
HAWAII	HAW.	STP-072-1(44)	2005	E-16	24



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

STA. 100+00 to STA. 110+00:
Alternate 1: No Work
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to UG Utility Conversion; New Highway Light Standards

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 100+00 TO STA. 110+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-16 OF 24 SHEETS

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	DRAWN BY	
NOTE BOOK	TRACED BY	
	DESIGNED BY	
No.	QUANTITIES BY	
	CHECKED BY	

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FED. ROAD DIST. NO.	STATE	PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS
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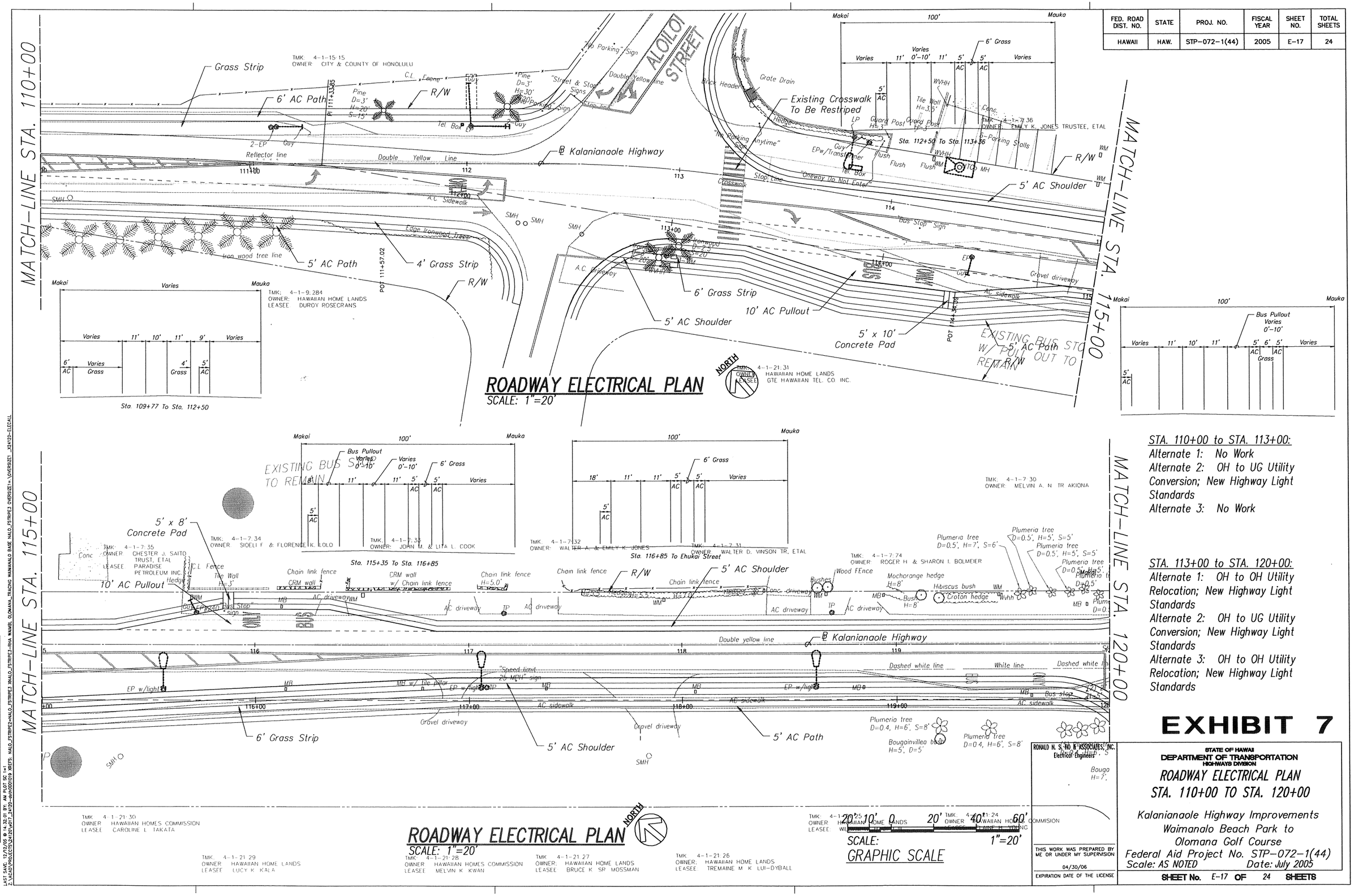

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Alternate 3: No Work

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Alternate 1: OH to OH Utility Relocation; New Highway Light Standards
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: OH to OH Utility Relocation; New Highway Light Standards

EXHIBIT 7

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 110+00 TO STA. 120+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

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04/30/06
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SHEET No. E-17 OF 24 SHEETS

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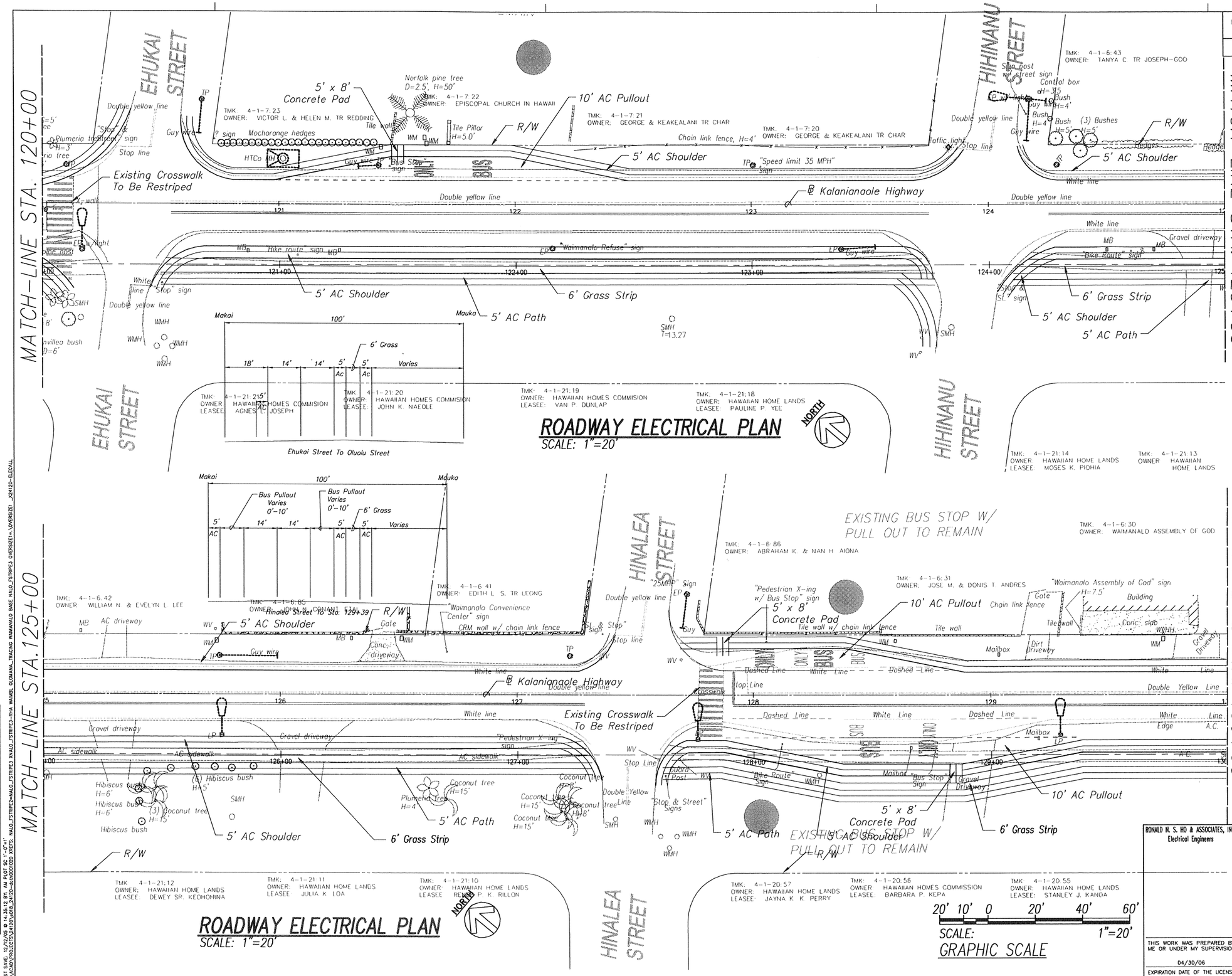

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04/30/06
EXPIRATION DATE OF THE LICENSE

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DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 120+00 TO STA. 130+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-18 OF 24 SHEETS

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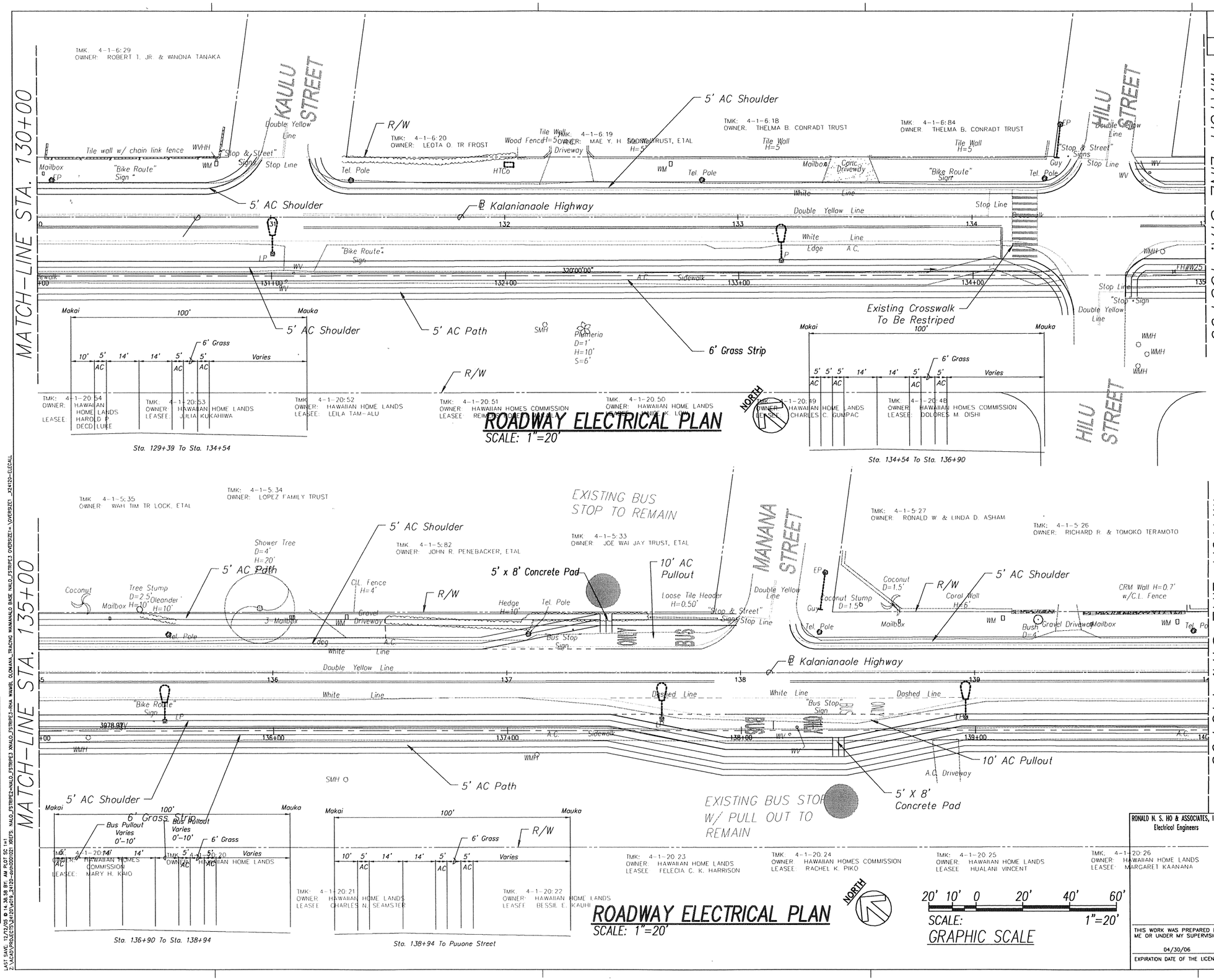

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SCALE: 1"=20'

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Alternate 3: OH to OH Utility Relocation; New Highway Light Standards

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 130+00 TO STA. 140+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-19 OF 24 SHEETS

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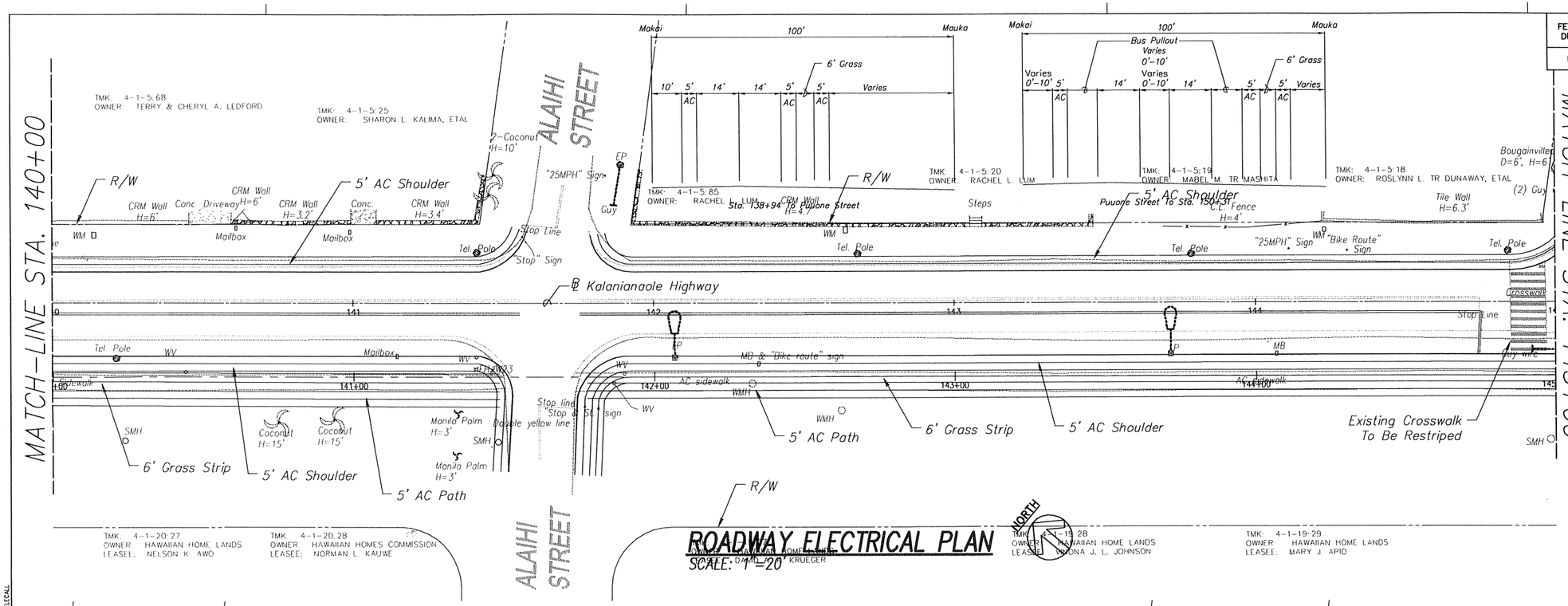

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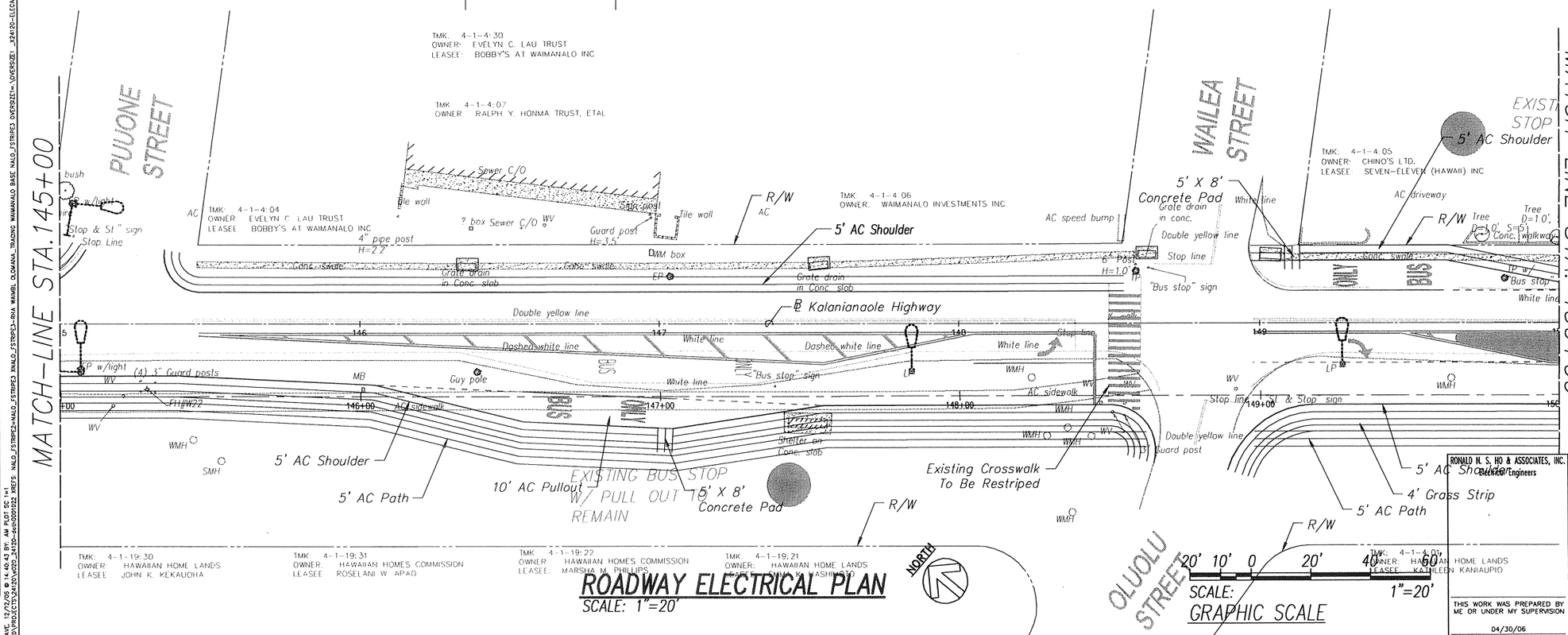

ROADWAY ELECTRICAL PLAN

SCALE: GRAPHIC SCALE 20' 10' 0 20' 40' 60' 1"=20'

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Alternate 1: OH to OH Utility Relocation; New Highway Light Standards

Alternate 2: OH to UG Utility Conversion; New Highway Light Standards

Alternate 3: OH to OH Utility Relocation; New Highway Light Standards

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC. Civil Engineers

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 140+00 TO STA. 150+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

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EXPIRATION DATE OF THE LICENSE

SHEET No. E-20 OF 24 SHEETS

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Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
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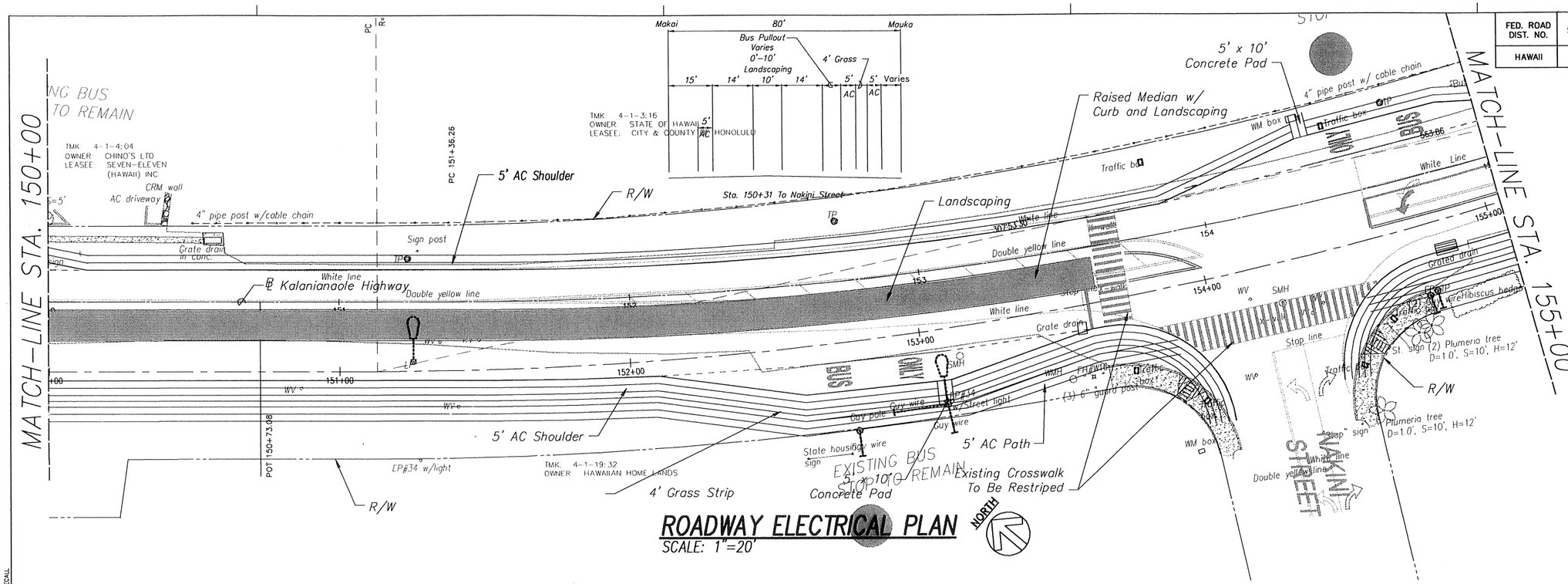

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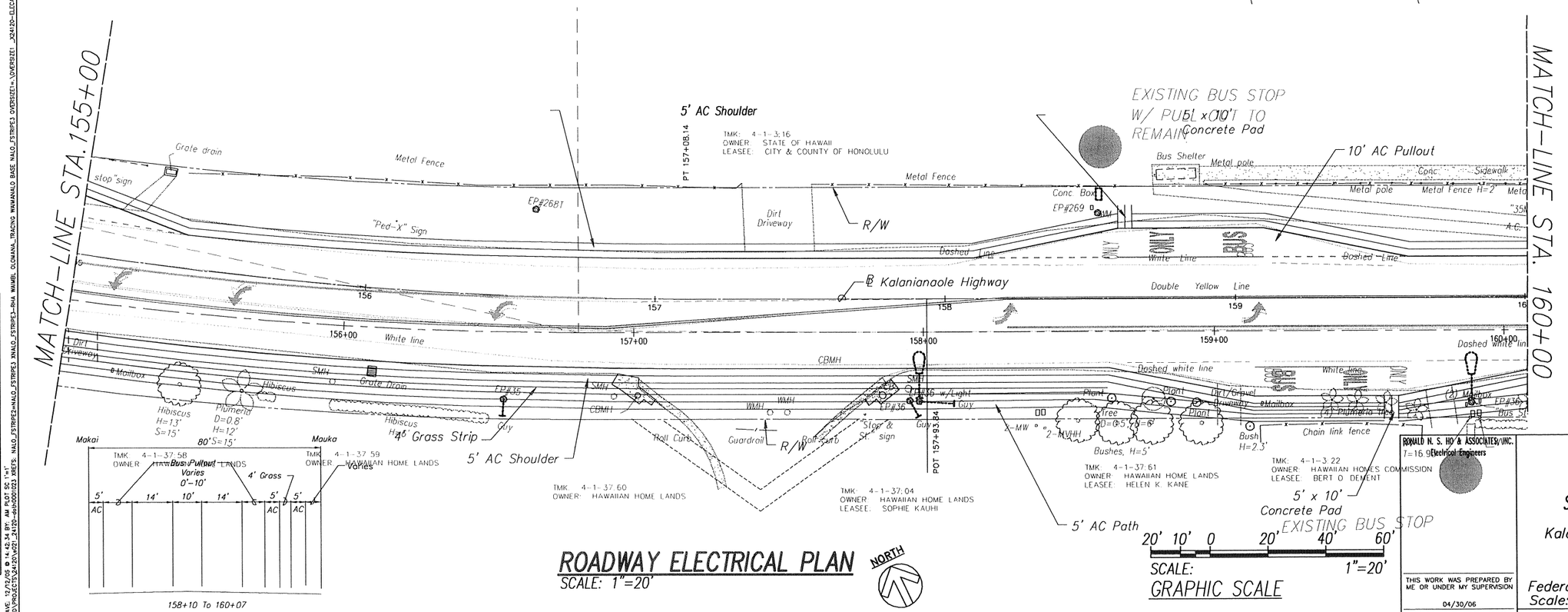

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

SCALE: GRAPHIC SCALE 1"=20'

EXHIBIT 7

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

ROADWAY ELECTRICAL PLAN
STA. 150+00 TO STA. 160+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-21 OF 24 SHEETS

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NOTE BOOK | No.

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HAWAII	HAW.	STP-072-1(44)	2005	E-22	24

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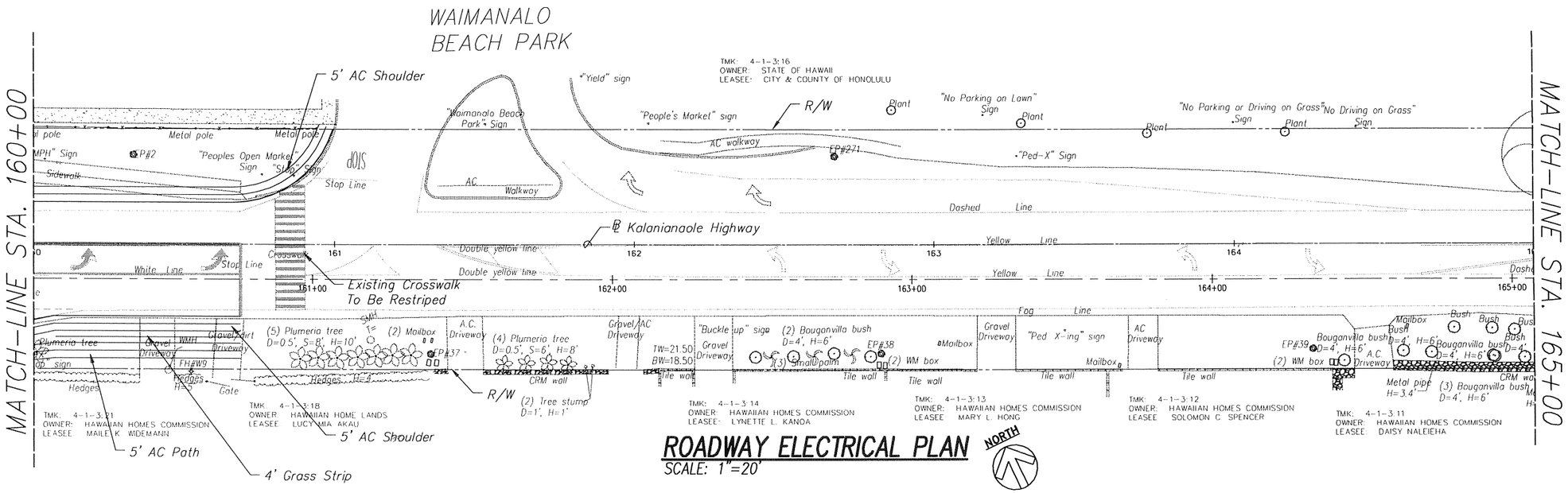
Alternate 2: OH to UG Utility Conversion; New Highway Light Standards
Alternate 3: No Work



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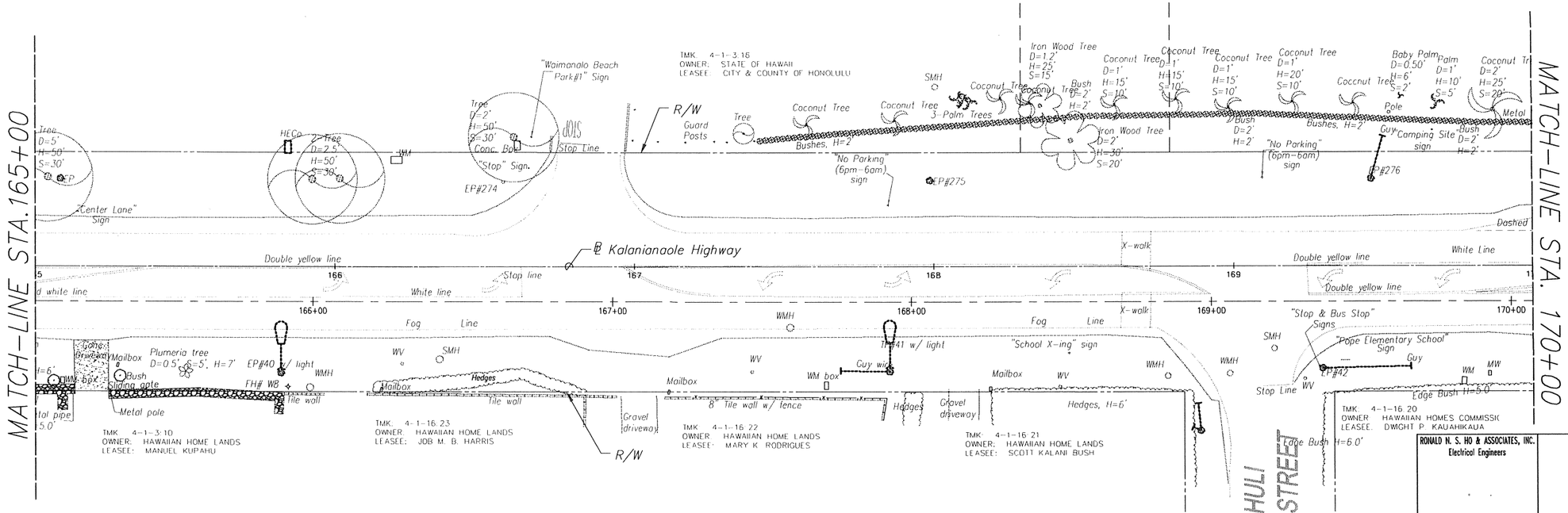
SCALE: 1"=20'



ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 160+00 TO STA. 170+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-22 OF 24 SHEETS

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NOTE BOOK | No.

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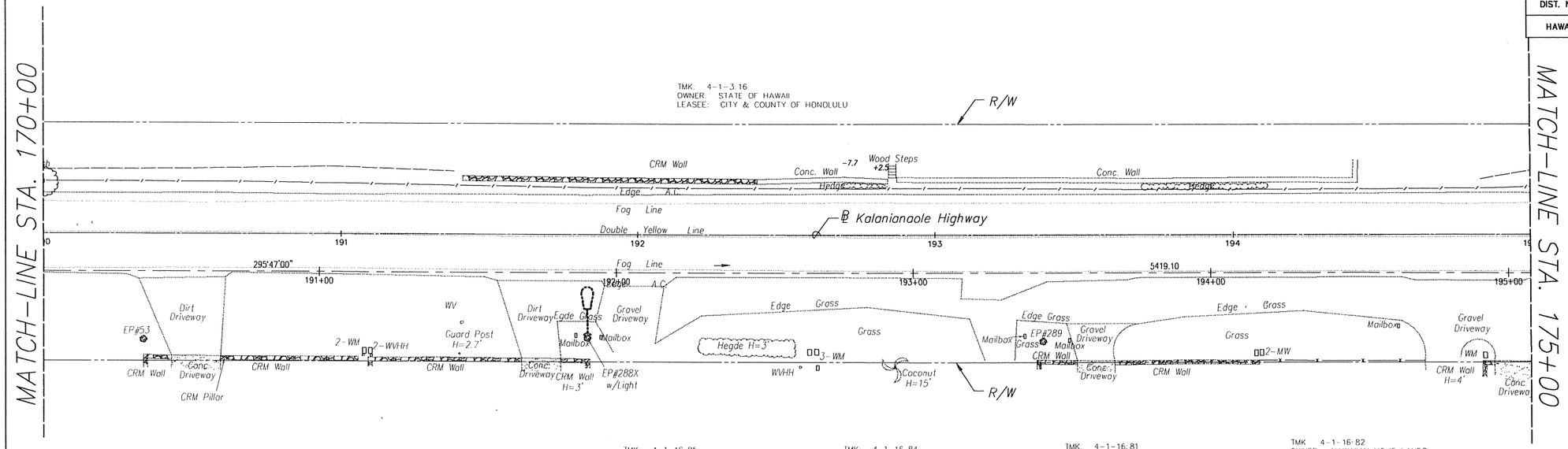
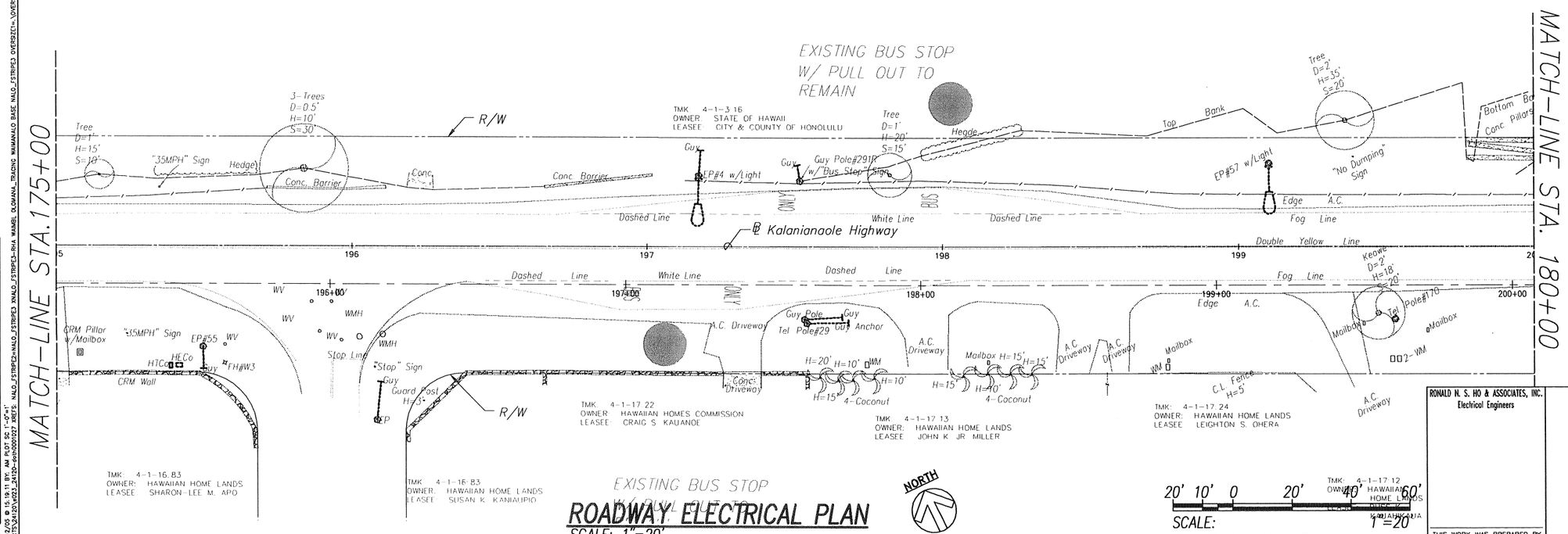


ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH



EXISTING BUS STOP
W/ PULL OUT TO REMAIN

ROADWAY ELECTRICAL PLAN
SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'
SCALE: 1"=20'
GRAPHIC SCALE

EXHIBIT 7

RONALD N. S. HO & ASSOCIATES, INC.
Electrical Engineers

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04/30/06
EXPIRATION DATE OF THE LICENSE

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 170+00 TO STA. 180+00

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-23 OF 24 SHEETS

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	DRAWN BY	
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	DESIGNED BY	
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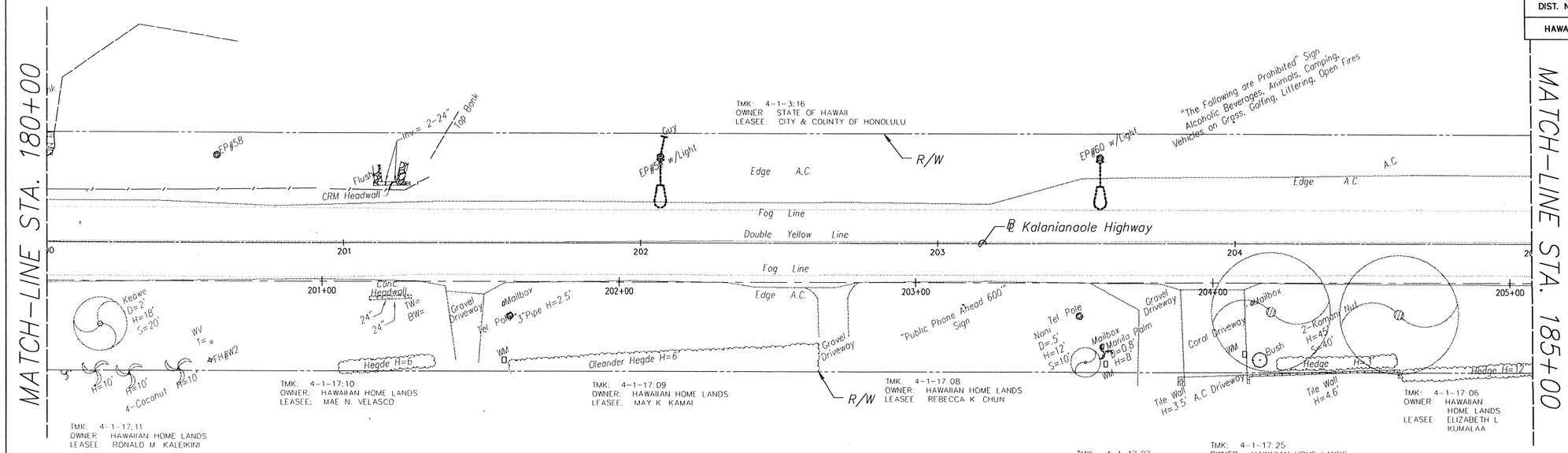
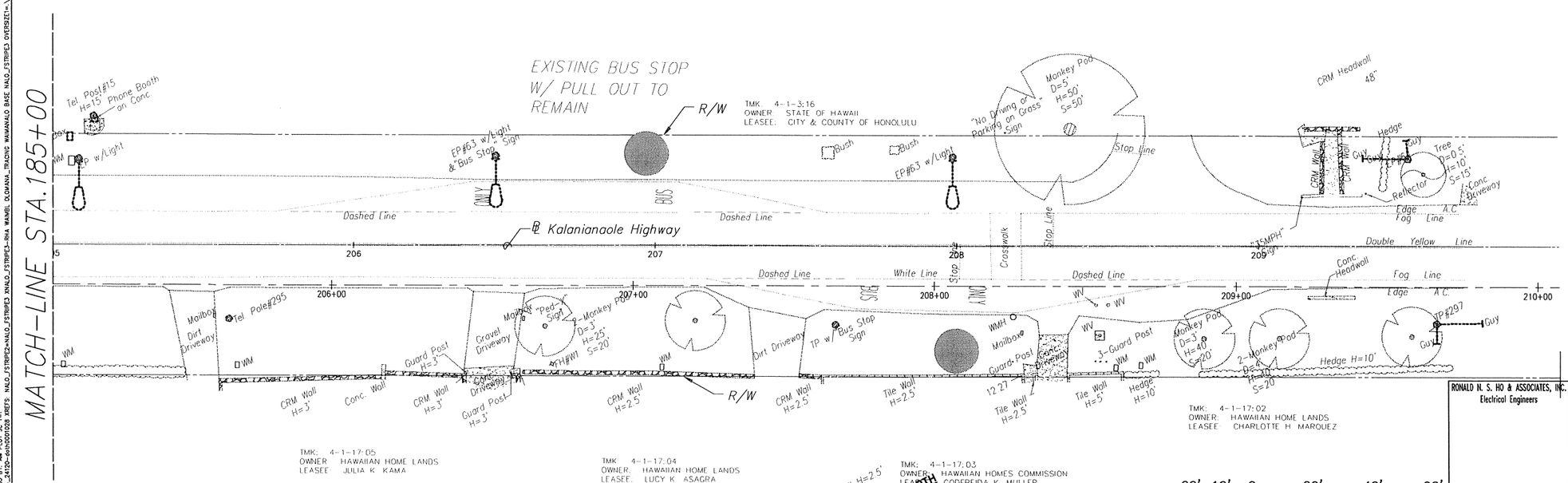


ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH



ROADWAY ELECTRICAL PLAN

SCALE: 1"=20'

NORTH

20' 10' 0 20' 40' 60'

SCALE: 1"=20'

GRAPHIC SCALE

EXHIBIT 7

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HIGHWAYS DIVISION

ROADWAY ELECTRICAL PLAN
STA. 180+00 TO END

Kalanianaole Highway Improvements
Waimanalo Beach Park to
Olomana Golf Course
Federal Aid Project No. STP-072-1(44)
Scale: AS NOTED Date: July 2005

SHEET No. E-24 OF 24 SHEETS

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APPENDIX A

SOIL TYPES

The Soils Conservations Soil Survey map of the island (see APPENDIX A - SOILS SURVEY MAP) identified twelve soil types of varying properties. These soil types include:

Papaa clay, 6 to 20 percent soles (PYD)
Papaa clay, 35 to 70 percent slopes (PYF)

The Papaa series consists of well-drained soils on uplands where these soils were formed from colluviums and residuum derived from basalt. They are moderately sloping to very steep, and occur on elevations ranging from nearly sea level to 500 feet. The PYD soil type has a slow to medium runoff and the erosion hazard is slight to moderate. With the PYF soil, the permeability is slow and the runoff is rapid creating a severe erosion hazard.

Alaeloa silty clay, 15 to 35 percent slopes (AeE)

The Alaeloa series consists of well-drained soils on uplands. These soils developed in material weathered from basic igneous rock. They are gently sloping to very steep. Elevations range from 100 to 1,500 feet. Permeability is moderately rapid with a medium runoff. The erosion hazard is moderate.

Kokokahi clay, 6 to 12 percent slopes (KtC)

The Kokokahi series consists of moderately well drained soils on talus slopes and alluvial fans. These soils developed in colluviums and alluvium derived from basic igneous rock. They are moderately sloping to steep. Elevations range from nearly sea level to 125 feet. Permeability is slow to moderately slow. The runoff is medium, and the erosion hazard is slight to moderate.

Kaloko clay, noncalcareous variant (KfB)

The Kaloko series consists of poorly drained soils. These soils developed in alluvium derived from basic igneous rock. They are nearly level, with elevations ranging from sea level to 20 feet. This soil occurs in slight depressions on the coastal plains. It is more acid and grayer than is typical of the Kaloko series, and it is underlain by noncalcareous material. Permeability is slow, runoff is ponded to very slow, and the erosion hazard is none to slight.

Hanalei silty clay, 0 to 2 percent slopes (HnA)

The Hanalei series consists of somewhat poorly drained to poorly drained soils on bottom lands. These soils developed in alluvium derived from basic igneous rock. They are level to gently sloping and elevations range from nearly sea level to 300 feet. This soil is on stream bottoms and flood plains. Permeability is moderate. Runoff is slow, and erosion is no more than slight.

Pohakupu silty clay loam, 0 to 8 percent slopes (PkB)

The Pohakupu series consists of well-drained soils on terraces and alluvial fans. These soils formed in old alluvial derived from basic igneous material. This soil has smooth slopes and occurs on terraces and alluvial fans and slopes are mainly 3 to 8 percent. Permeability is moderately rapid, runoff is slow, and erosion hazard is slight.

Ewa silty clay loam, moderately shallow, 0 to 2 percent slopes (EmA)

The Ewa series consists of well-drained soils in basins and on alluvial fans. These soils developed in alluvial derived from basic igneous rock. They are nearly level to moderately sloping. Elevations range from near sea level to 150 feet. Runoff is very slow, and the erosion hazard is no more than slight.

Coral Outcrop (CR)

Coral outcrop consists of coral or cemented calcareous sand. The coral reefs formed in shallow ocean water during the time the ocean stand was at a higher level. Small areas of coral outcrop are exposed on the ocean shore, on the coastal plains, and at the foot of the uplands. Elevations range from sea level to approximately 100 feet.

Jaucas sand, 0 to 15 percent slopes (JaC)

The Jaucas series consists of excessively drained, calcareous soils that occur as narrow strips on coastal plains, adjacent to the ocean. They developed in wind- and water-deposited sand from coral and seashells. They are nearly level to strongly sloping. Elevations range from sea level to 100 feet. Permeability is rapid, and runoff is very slow to slow. The hazard of water erosion is slight, but wind erosion is a severe hazard where vegetation has been removed.

Mokuleia loam (Ms)

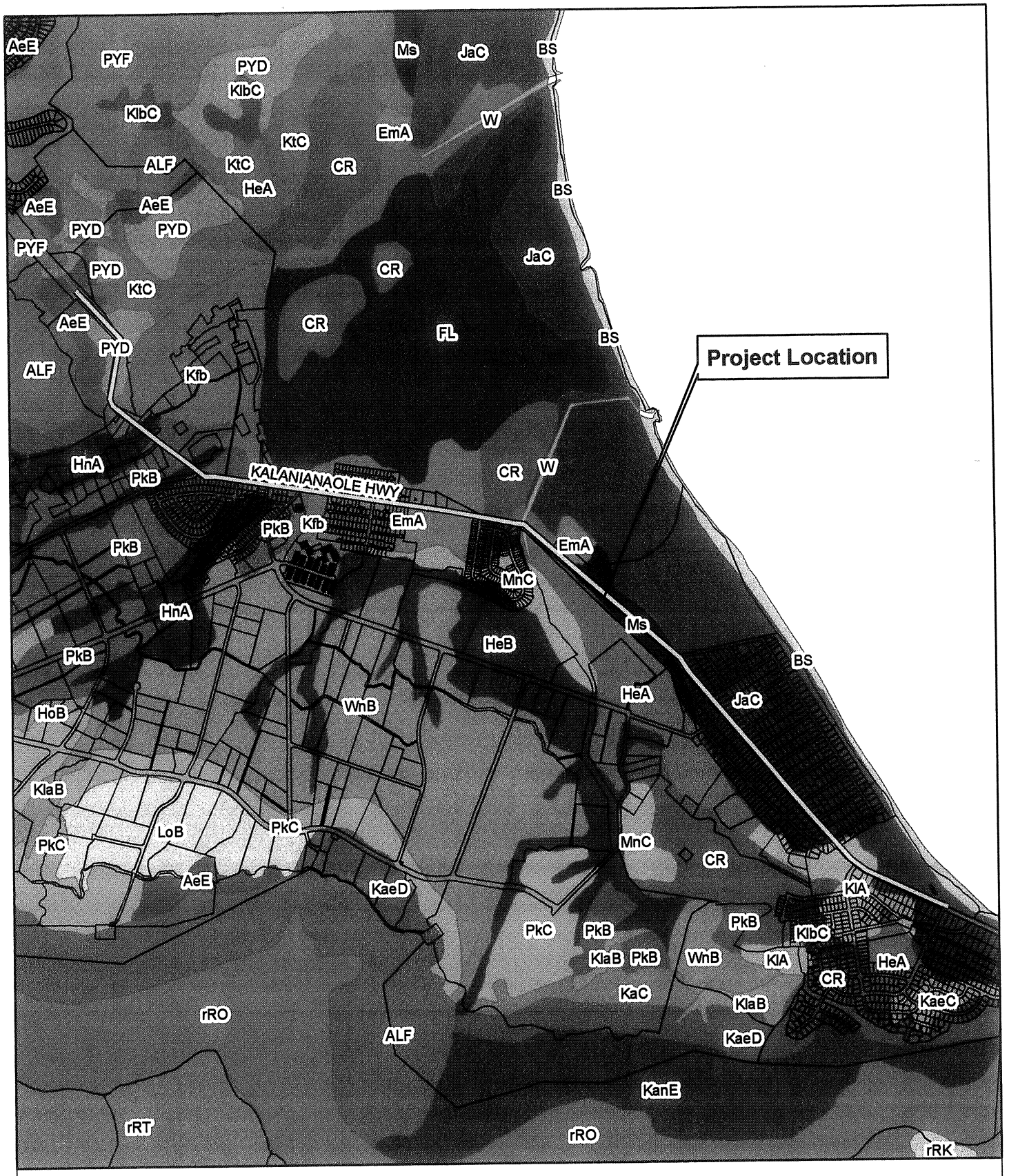
The Mokuleia series consists of well-drained soils along the coastal plains. These soils formed on recent alluvium deposited over coral sand. They are shallow and nearly level. Elevations range from nearly sea level to 100 feet.

Haleiwa silty clay, 0 to 2 percent slopes (HeA)

The Haleiwa series consists of well-drained soils on fans and drainageways along the coastal plains. They developed in alluvium derived from basic igneous material. They are nearly level to strongly sloping. Elevations range from sea level to 250 feet. Permeability is moderate. Runoff is very slow, and the erosion hazard is no more than slight.

Kawaihapai clay loam, 0 to 2 percent slopes (KIA)

The Kawaihapai series consists of well-drained soils in drainageways and on alluvial fans on the coastal plains. These soils formed in alluvium derived from basic igneous rock in humid uplands. They are nearly level to moderately sloping. Elevations range from nearly sea level to 300 feet. Permeability is moderate. Runoff is slow, and the erosion hazard is no more than slight.



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Appendix A
Soil Survey Map

Kalanianaole Highway Improvements
Waimanalo Beach Park to Olomana Golf Course
Federal Job No. STP-072-1(41)
Scale: As Shown Date: October 15, 2002

APPENDIX B

TRAFFIC STUDY

FINAL TRAFFIC ENGINEERING REPORT

FOR THE PROPOSED

KALANIANAOLE HIGHWAY IMPROVEMENTS
FLAMINGO ROAD TO ALOILOI STREET

PREPARED FOR

AKINAKA & ASSOCIATES, INC.

PREPARED BY

TMC

THE TRAFFIC MANAGEMENT CONSULTANT

Table of Contents

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I. Introduction 1

A. Project Description 1

B. Purpose of the Study 1

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FINAL
TRAFFIC ENGINEERING REPORT
FOR THE PROPOSED
KALANIANAOLE HIGHWAY IMPROVEMENTS
FLAMINGO ROAD TO ALOILOI STREET

I. Introduction

A. Project Description

The State of Hawaii Department of Transportation (DOT) is planning to improve traffic operations on Kalanianaole Highway between Olomana Golf Course and Waimanalo Beach Park in Waimanalo, Oahu, Hawaii. However, this study analyzes only the following intersections:

1. Flamingo Road
2. Kumuhau Street
3. Humuniki Street
4. Mekia Street
5. Moole Street
6. Inaole Street
7. Aloiloi Street

Figure 1 depicts the vicinity map.

B. Purpose of the Study

The purpose of this study is to analyze the projected traffic operations for the proposed roadway improvements on Kalanianaole Highway between Flamingo Road and Aloiloi Street in Waimanalo, Oahu, Hawaii. This report presents the findings and recommendations of the study.

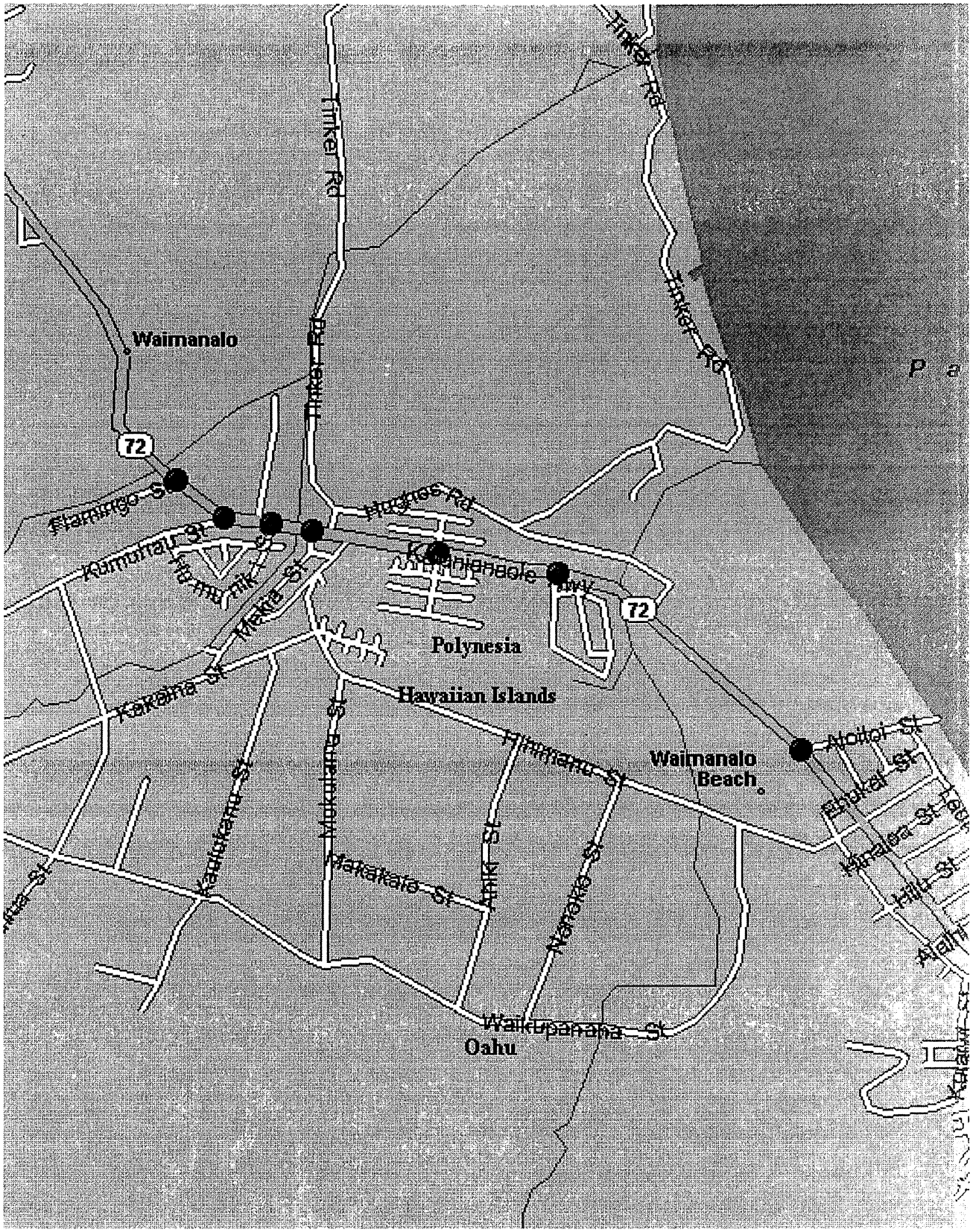

Figure 1. Vicinity Map

C. Scope of the Study

The scope of this study includes:

1. Manual traffic count surveys at the study intersections along Kalanianaole Highway, during the peak periods of traffic.
2. An analysis of the existing peak hour traffic conditions.
3. An analysis of the AM and PM peak hour traffic operations of the intersections along Kalanianaole Highway for the planning horizon year under the proposed improvements.
4. Identification of traffic impacts that may occur as a result of the implementation of the proposed project.
5. Recommendation of traffic and roadway improvements that would mitigate the traffic impacts identified in this study.

D. Proposed Improvements

DOT's proposed traffic improvements include widening the entire length of Kalanianaole Highway, between Flamingo Road and Aloiloi Street, to provide exclusive left-turn lanes and/or median shelter lanes at the study intersections. Widening Kalanianaole Highway also would provide for two-way left-turn lanes and bus bays.

The exclusive left-turn lane would provide storage for vehicles turning left into the side street and reduce the delay to through traffic on Kalanianaole Highway. The median shelter lane would facilitate the left-turn movement from the side street onto Kalanianaole Highway. Left-turn movements would be negotiated in a two-stage process, i.e., motorists turning left would look for a gap in traffic approaching from the left, cross the near side lane, queue in the median shelter lane, and then merge into gaps in traffic approaching from the right. Under the existing conditions, motorists turning left from side streets must wait for a gap in both directions of traffic before turning left onto Kalanianaole Highway.

Similarly, the two-way left-turn median lanes provide storage for vehicles in both directions on Kalanianaole Highway, waiting to turn left into driveways and low-volume roadways. The median lane also provides a shelter lane for vehicles turning left onto Kalanianaole Highway from driveways and low-volume roadways.

The proposed bus bays would permit buses to pull out of the through traffic lanes while loading and unloading passengers, thereby reducing delays to through traffic. The following improvements are proposed at the study intersections:

1. **Flamingo Road Intersection**

   The proposed Kalanianaole Highway widening at Flamingo Road would provide an exclusive left-turn lane and a median shelter lane in the westbound direction. A westbound bus bay also is proposed at the intersection, opposite Flamingo Road. Figure 2 depicts the proposed improvements at the intersection of Kalanianaole Highway and Flamingo Road.

2. **Kumuhau Street Intersection**

   The proposed widening of Kalanianaole Highway at Kumuhau Street would provide an exclusive left-turn lane and a median shelter lane in the westbound direction. The proposed improvements at the intersection of Kalanianaole Highway and Kumuhau Street are depicted on Figure 3.

3. **Humuniki Street Intersection**

   The proposed Kalanianaole Highway widening would provide an exclusive left-turn lane and a median shelter lane at Humuniki Street in the westbound direction. Figure 4 depicts the proposed improvements at the intersection of Kalanianaole Highway and Humuniki Street.

4. **Mekia Street Intersection**

   The proposed Kalanianaole Highway widening at Mekia Street would provide an exclusive left-turn lane and a median shelter lane in the westbound direction. The proposed improvements at the intersection of Kalanianaole Highway and Mekia Street are depicted on Figure 5.

5. **Moole Street Intersection**

   The proposed widening of Kalanianaole Highway at Moole Street would provide an exclusive left-turn lane in both directions. Figure 6 depicts the proposed improvements at the intersection of Kalanianaole Highway and Moole Street.

6. **Inaole Street Intersection**

   The proposed widening of Kalanianaole Highway would provide an exclusive left-turn lane and a median shelter lane at Inaole Street in the westbound direction. Bus bays are proposed on both sides of Kalanianaole Highway, to the west of its intersection with Inaole Street. The proposed improvements at the intersection of Kalanianaole Highway and Inaole Street are depicted on Figure 7.

7. **Aloiloi Street Intersection**

   The proposed Kalanianaole Highway widening would provide an eastbound exclusive left-turn lane at Aloiloi Street. Figure 8 depicts the proposed improvements at the intersection of Kalanianaole Highway and Aloiloi Street.

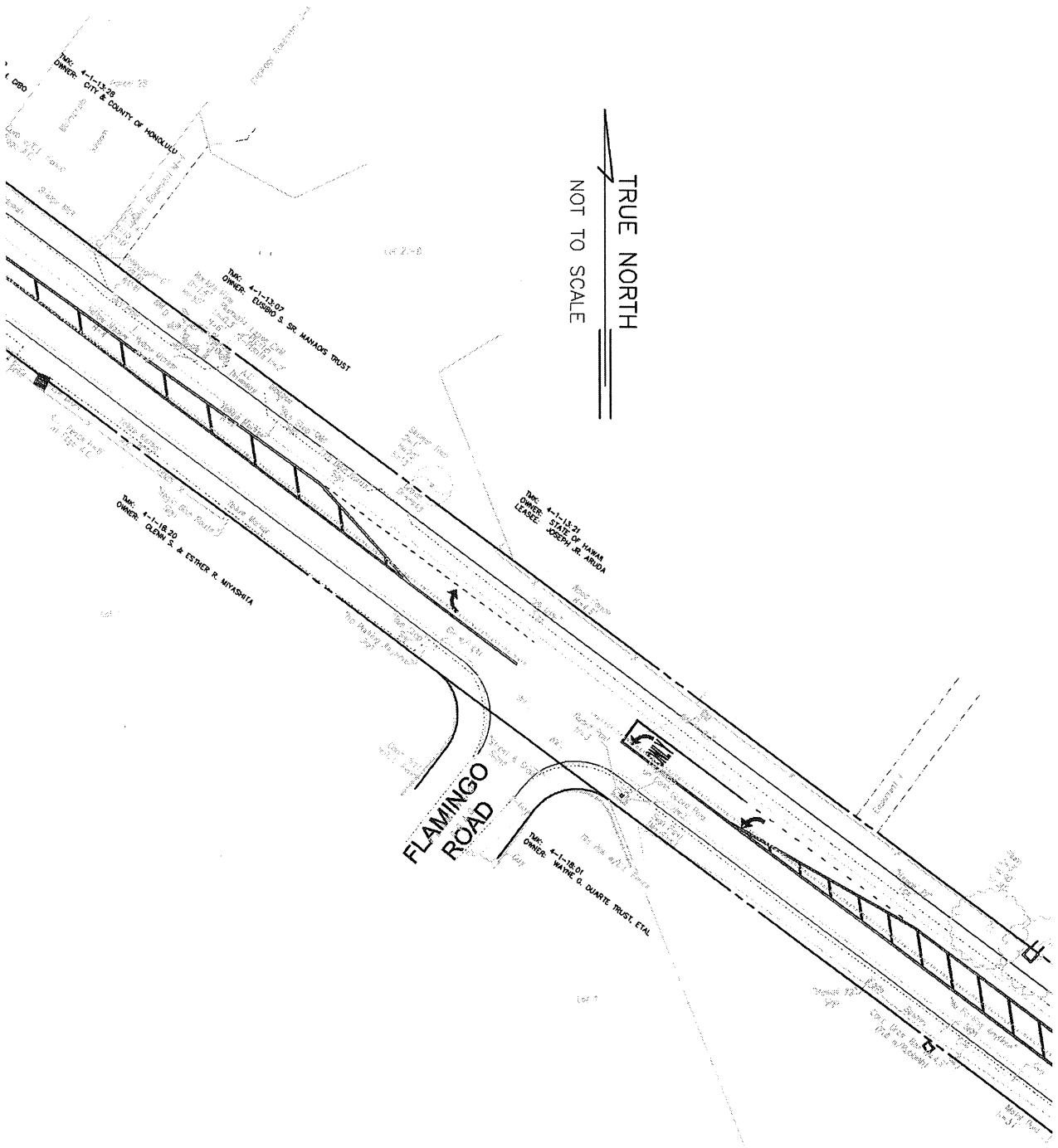

Figure 2. Proposed Flamingo Road Intersection Improvements

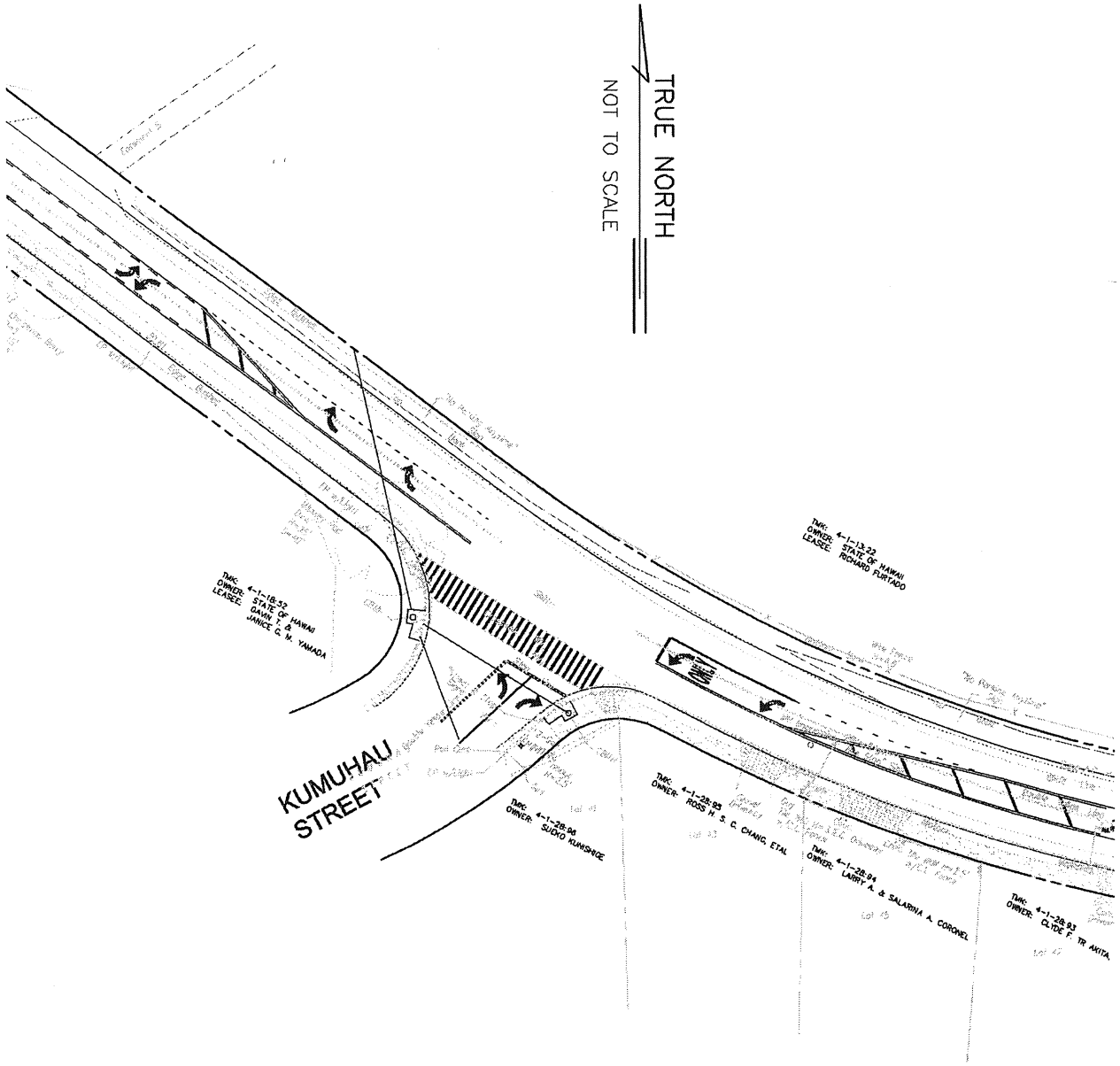

Figure 3. Proposed Kumuhau Street Intersection Improvements

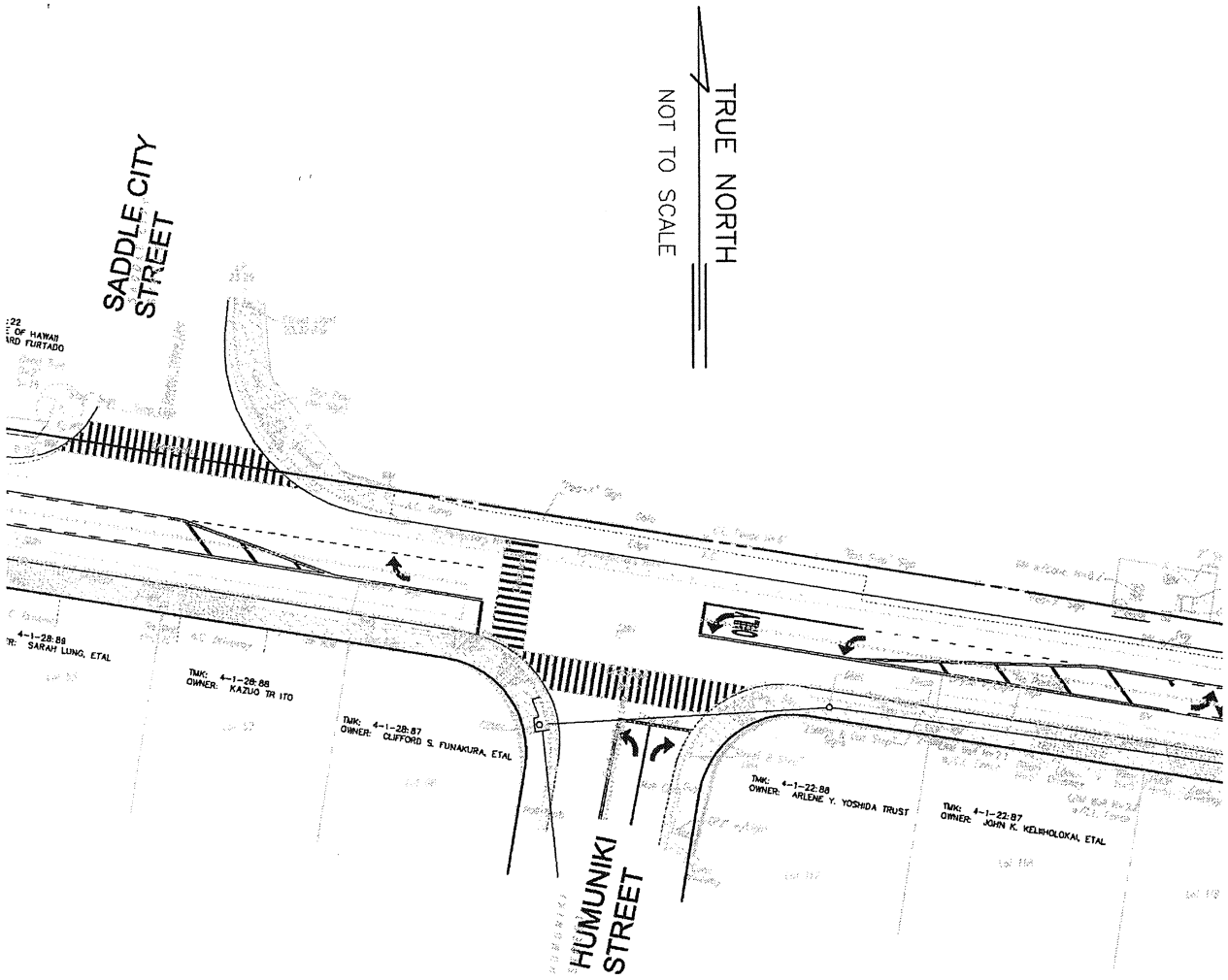

Figure 4. Proposed Humuniki Street Intersection Improvements

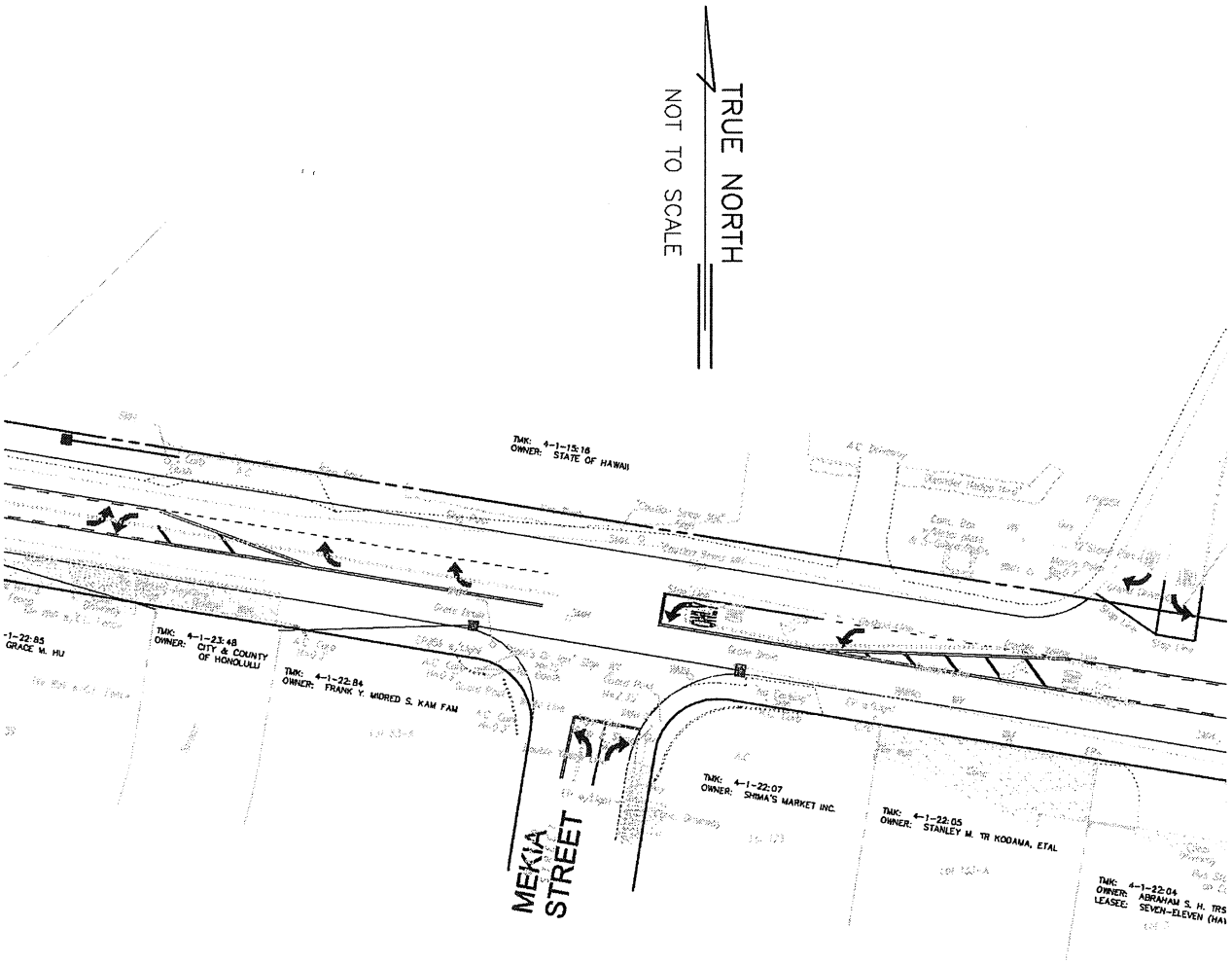

Figure 5. Proposed Mekia Street Intersection Improvements

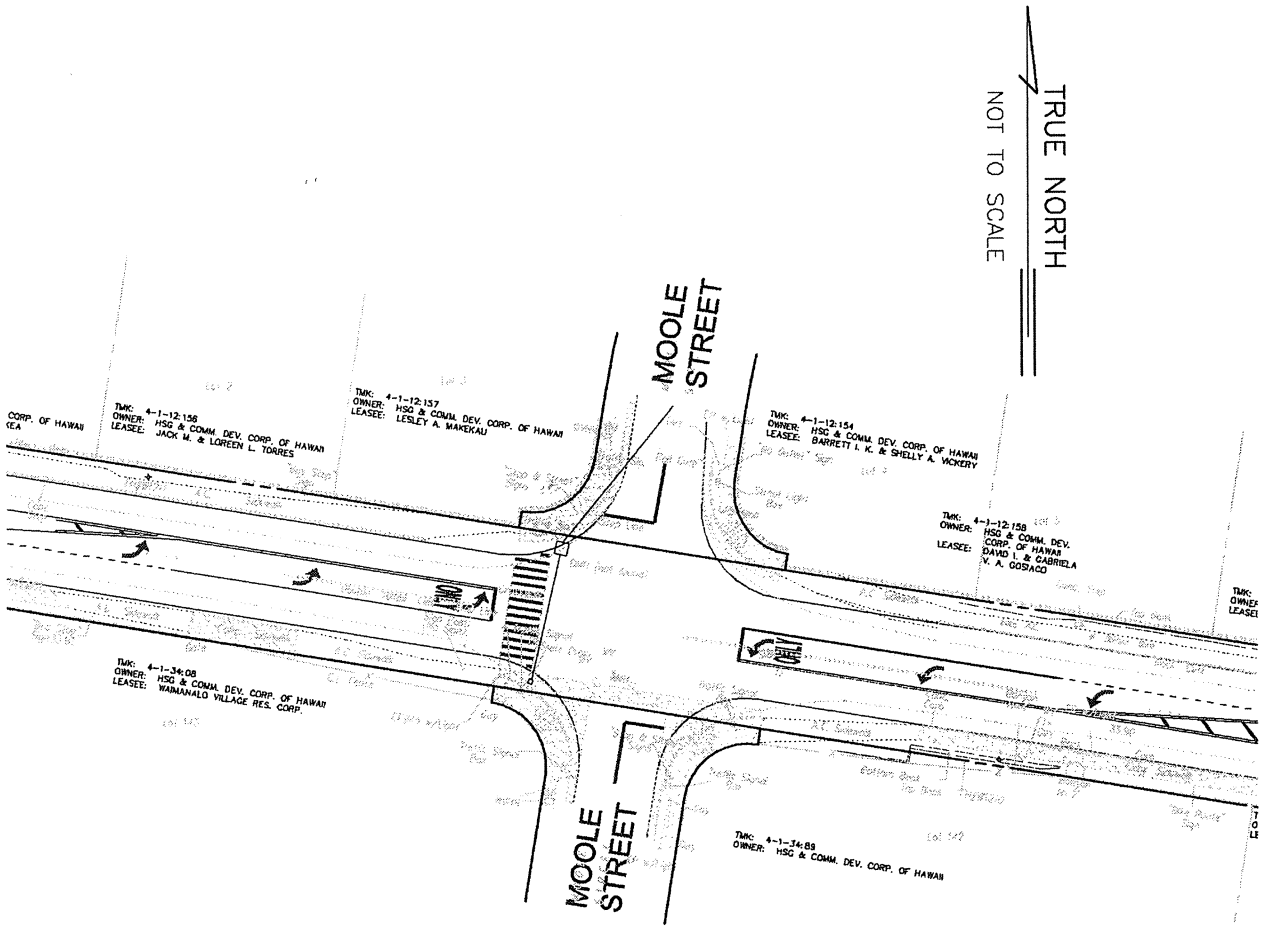

Figure 6. Proposed Moole Street Intersection Improvements

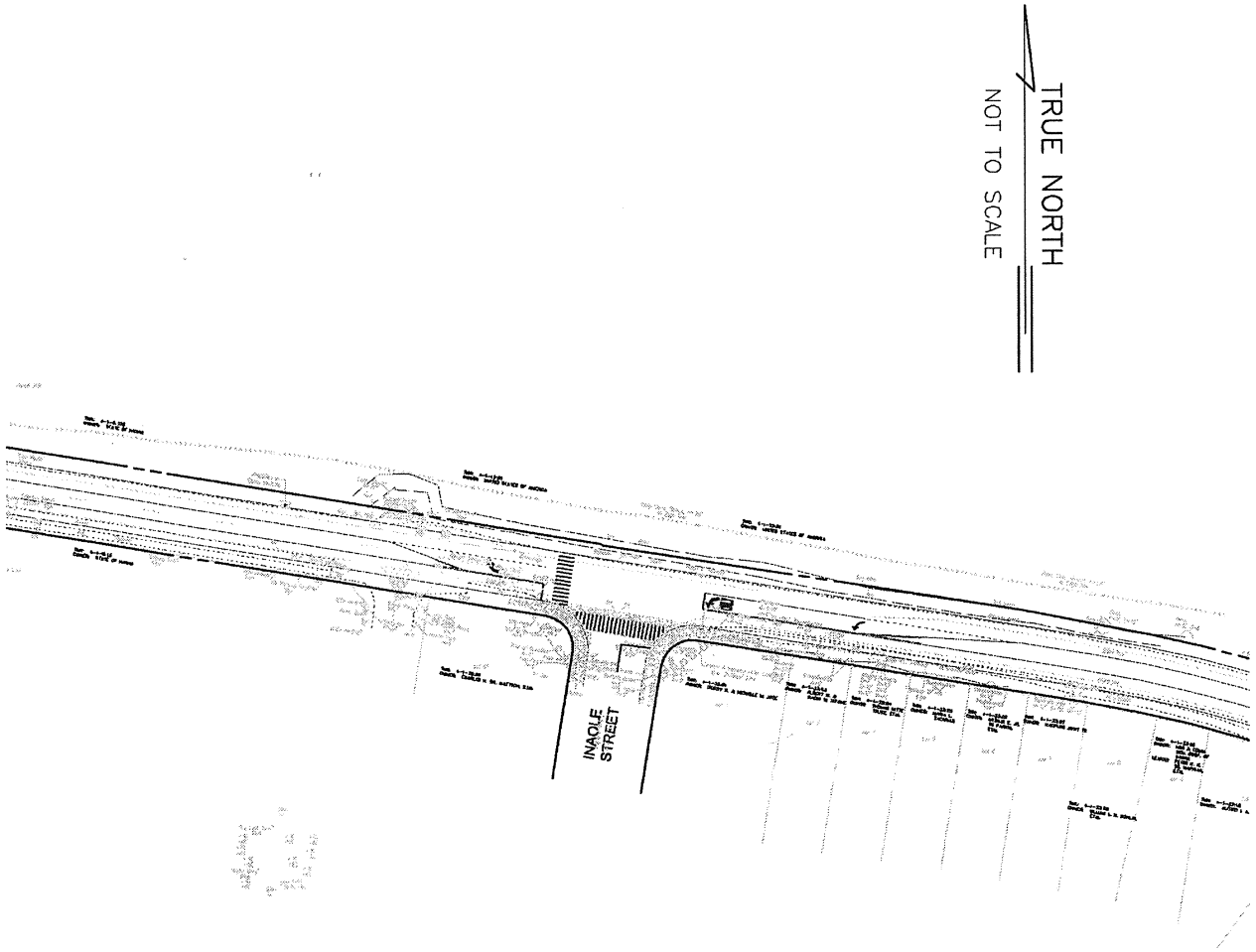

Figure 7. Proposed Inaole Street Intersection Improvements

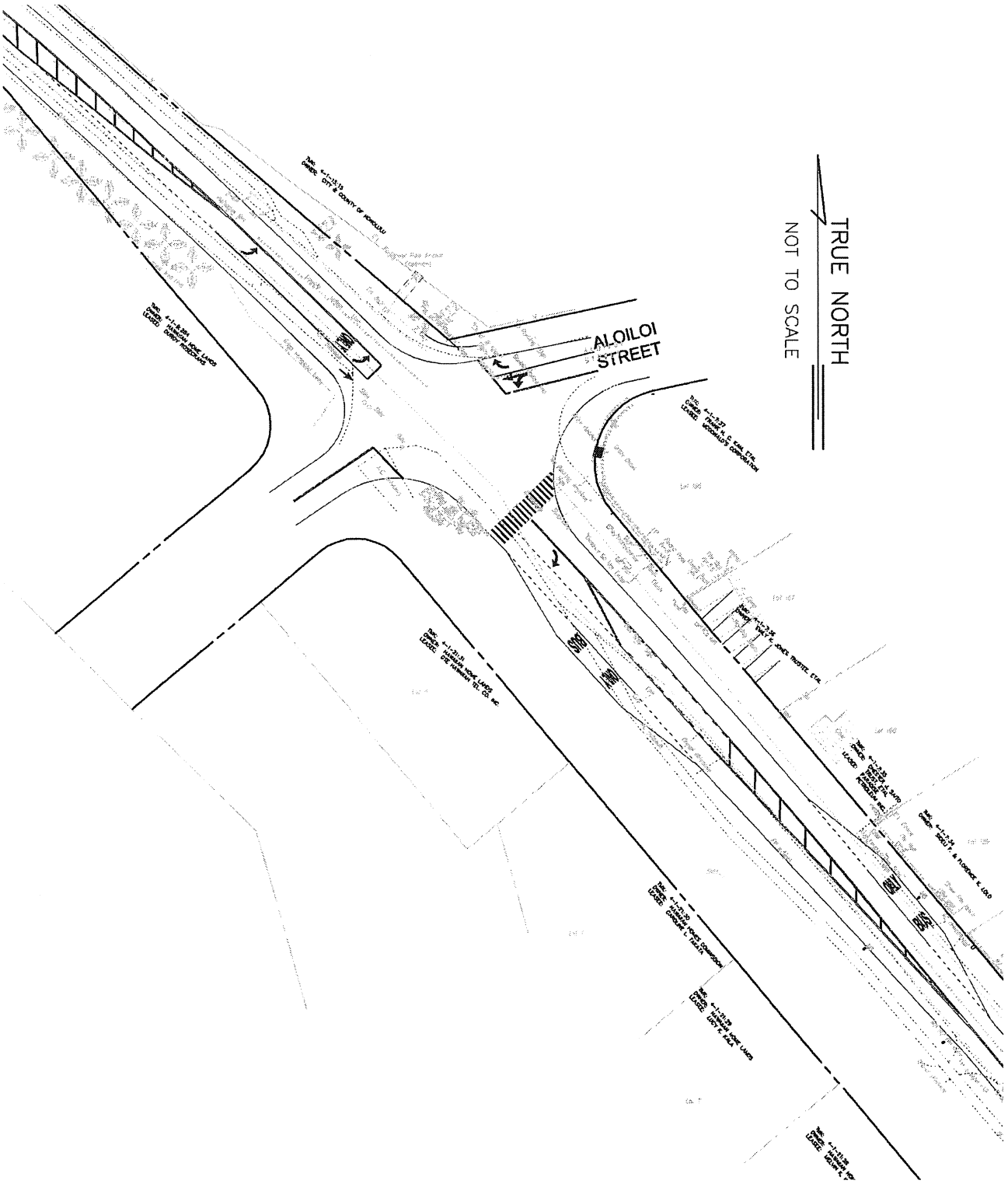

Figure 8. Proposed Aloiloi Street Intersection Improvements

II. Existing Conditions

A. Roadways

Kalanianaole Highway is at two-way, two-lane highway within the Waimanalo area. Kalanianaole Highway is unsignalized at the study intersections. Only the intersection of Kalanianaole Highway and Poalima Street is signalized in the Waimanalo area.

The side streets at the study intersections along Kalanianaole Highway are two-lane, two-way roadways. The side streets are stop-controlled at their intersections with Kalanianaole Highway.

B. Existing Peak Hour Traffic Volumes and Operating Conditions

1. General

a. Field Investigation

Manual traffic count surveys were conducted in February 2002, during the peak periods of traffic – from 6:30 AM to 8:30 AM and from 3:30 PM to 5:30 PM. Traffic count surveys were conducted at the following intersections on Kalanianaole Highway:

- Flamingo Road
- Kumuhau Street
- Humuniki Street
- Mekia Street
- Moole Street
- Inaole Street
- Aloiloi Street

b. Capacity Analysis Methodology

The highway capacity analysis, performed for this study, is based upon procedures presented in the "Highway Capacity Manual" (HCM), Special Report 209, Transportation Research Board, and the "Highway Capacity Software", Federal Highways Administration.

Level of Service (LOS) is defined as "a qualitative measure describing operational conditions within a traffic stream". Several factors are included in determining LOS such as: speed, delay, vehicle density, freedom to maneuver, traffic interruptions, driver comfort, and safety. LOS "A", "B", and "C" are considered satisfactory levels of service. LOS "D" is generally considered a

"desirable minimum" operating level of service. LOS "E" is an undesirable condition and LOS "F" is an unacceptable condition.

C. Existing Peak Hour Traffic

1. Existing AM Peak Hour Traffic

The AM peak hour of traffic occurred between 7:15 AM and 8:15 AM. Kalanianaole Highway carried between 1,300 vehicles per hour (vph) and 1,900 vph, total for both directions, during the AM peak hour of traffic. During the AM peak hour of traffic, the side streets at the study intersections generally operated at unsatisfactory Levels of Service, because of the heavy through traffic on Kalanianaole Highway.

Flamingo Road is a low-volume roadway, which carried less than 20 vph at Kalanianaole Highway, total for both directions, during the AM peak hour of traffic. Flamingo Road operated at LOS "E" at its Tee-intersection with Kalanianaole Highway.

Kumuhau Street carried about 200 vph at Kalanianaole Highway, total for both directions, during the AM peak hour of traffic. Kumuhau Street operated at LOS "F" at its Tee-intersection with Kalanianaole Highway.

Humuniki Street also operated at LOS "F" its Tee-intersection with Kalanianaole Highway, while carrying about 100 vph, total for both directions, during the AM peak hour of traffic.

During the AM peak hour of traffic, Mekia Street carried more than 170 vph, total for both directions, and operated at LOS "F" at its Tee-intersection with Kalanianaole Highway.

Moole Street intersects Kalanianaole Highway at a four-legged intersection. The north (makai) leg carried about 60 vph and the south (mauka) leg carried about 160 vph, total for both directions. Makai bound Moole Street operated at LOS "F" and the mauka bound Moole Street operated at LOS "E" at Kalanianaole Highway, during the AM peak hour of traffic.

Inaole Street carried about 170 vph at Kalanianaole Highway, total for both directions, during the AM peak hour of traffic. Inaole Street operated at LOS "F" at its Tee-intersection with Kalanianaole Highway.

Aloiloi Street is located to the east of Bellows Field. Aloiloi Street intersects Kalanianaole Highway opposite a driveway, which provides access to a sewage pump station and a private residence. Aloiloi Street carried less than 80 vph at Kalanianaole Highway, total for both directions, during the AM peak hour of traffic, operating at LOS "C". Figure 9 depicts the existing AM peak hour traffic volumes and the results of the Level of Service analysis.

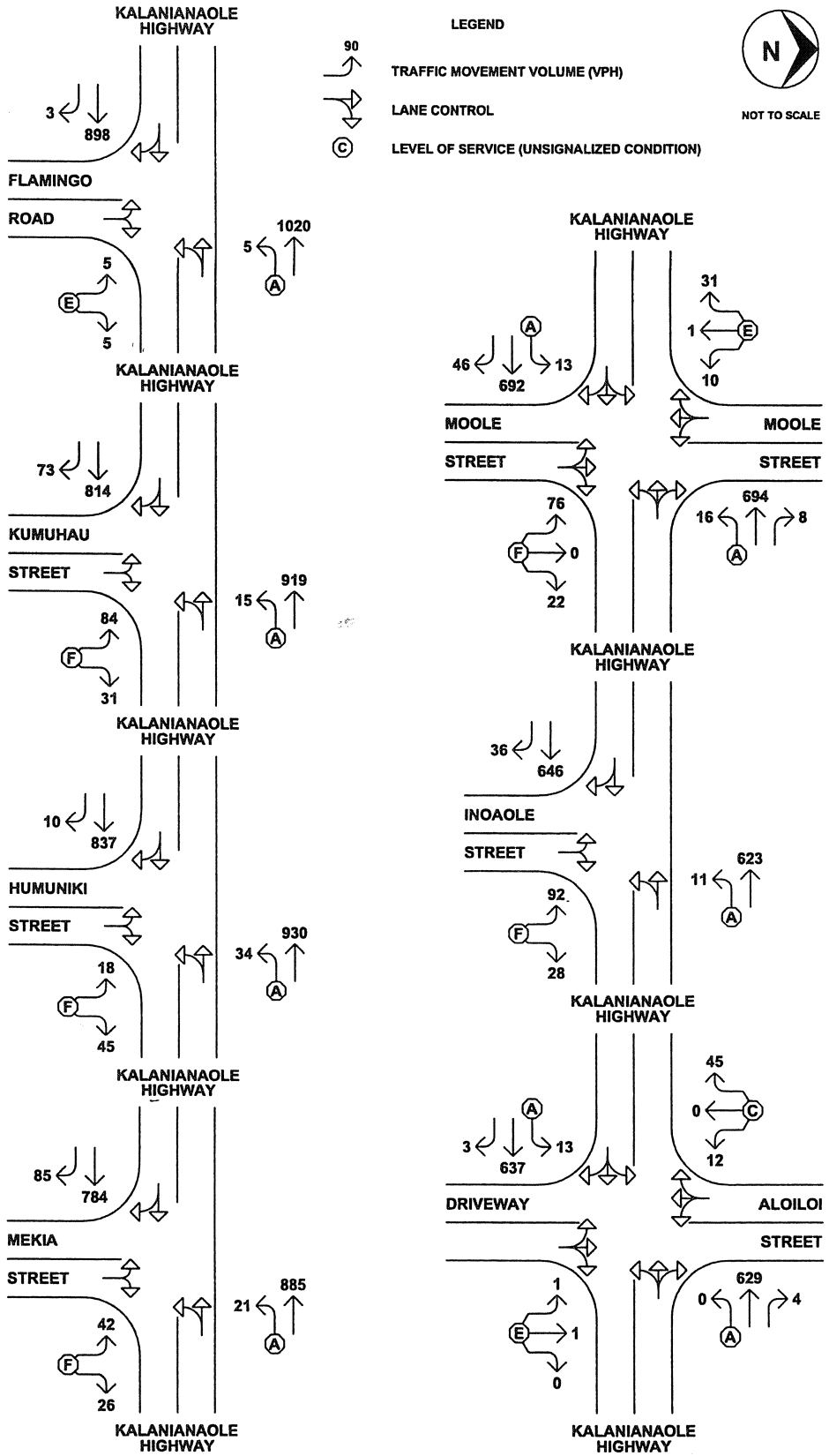

Figure 9. Existing AM Peak Hour Traffic

2. Existing PM Peak Hour Traffic

The PM peak hour of traffic occurred between 3:45 PM and 4:45 PM. Kalanianaole Highway carried between 1,400 vph and 2,000 vph, total for both directions, during the PM peak hour of traffic. The side streets at the study intersections again operated at unsatisfactory Levels of Service, because of the heavy through traffic on Kalanianaole Highway. Long queues were observed in both directions on Kalanianaole Highway, during the PM peak hour of traffic, because of the traffic signal operations at its intersection with Poalima Street. The existing PM peak hour traffic volumes and results of the capacity analysis are depicted on Figure 9.

Flamingo Road carried less than 30 vph at Kalanianaole Highway, total for both directions, during the PM peak hour of traffic. Flamingo Road operated at LOS "F" at its intersection with Kalanianaole Highway.

Kumuhau Street carried less than 220 vph at Kalanianaole Highway, total for both directions, during the PM peak hour of traffic. Kumuhau Street also operated at LOS "F" at its intersection with Kalanianaole Highway.

Humuniki Street operated at LOS "D" at its intersection with Kalanianaole Highway, while carrying about 80 vph, total for both directions, during the PM peak hour of traffic.

During the PM peak hour of traffic, Mekia Street carried about 240 vph, total for both directions, and operated at LOS "F" at its intersection with Kalanianaole Highway.

The makai leg of Moole Street carried about 60 vph and the mauka leg carried about 150 vph, total for both directions. Makai bound Moole Street operated at LOS "F" and the mauka bound Moole Street operated at LOS "E" at its intersection with Kalanianaole Highway, during the PM peak hour of traffic.

Inaole Street carried about 170 vph at Kalanianaole Highway, total for both directions, during the PM peak hour of traffic. Inaole Street operated at LOS "F" at its intersection with Kalanianaole Highway.

Aloiloi Street carried over 100 vph, total for both directions, during the PM peak hour of traffic, and operated at LOS "E" at its intersection with Kalanianaole Highway.

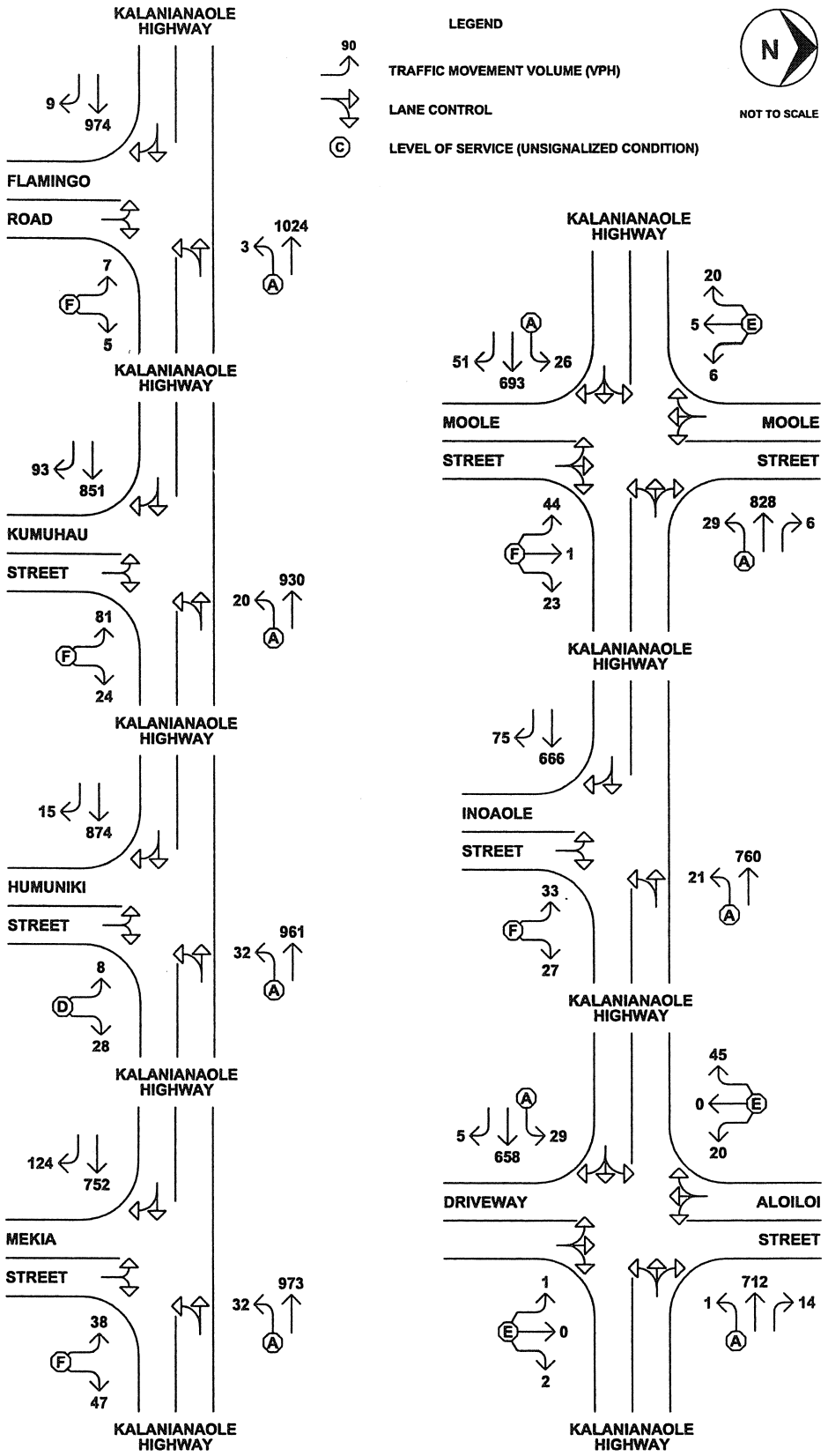

Figure 10. Existing PM Peak Hour Traffic

III. Future Peak Hour Traffic

A. Peak Hour Traffic Forecasts

The Year 2022 was used as the Design Year for the proposed project in this analysis. The Year 2022 traffic forecasts were provided by DOT. Table 1 summarizes the design traffic parameters, which were provided by DOT.

Table 1. Design Traffic

Section	Olomana Golf Course to Bellows Field	Bellows Field to Wailea Street
2001 ADT	21,300	16,500
2002 ADT	21,500	16,700
2022 ADT	25,000	19,500
DHV	2,000	1,600
K	8.0	8.0
D	55/45	50/50
T	4.0	2.0
T24	3.5	3.0

Notes:
ADT = average daily traffic (vehicles per day)
DHV = design hourly volume (vehicles per hour)
K = percentage of ADT occurring during the peak hour of traffic
D = directional distribution of traffic
T = percentage of heavy vehicles during the peak hour of traffic
T24 = percentage of heavy vehicles during a 24-hour period

The Year 2022 ADT forecast represents about 0.8 percent annual growth in traffic. A factor of 1.16 was applied uniformly to the existing traffic conditions to estimate the Year 2022 AM and PM peak hour traffic.

B. Traffic Analysis

1. Year 2022 AM Peak Hour Traffic Analysis

The traffic operations at the study intersections during the Year 2022 AM peak hour of traffic are expected to improve significantly as a result of the proposed widening of Kalanianaole Highway to provide exclusive left-turn lanes and median shelter lanes.

Kumuhau Street, Humuniki Street, and Mekia Street are expected to operate at LOS "D" at Kalanianaole Highway. Both approaches of Moole Street are expected to continue to operate at LOS "F", during the Year 2022 AM peak hour of traffic with the proposed improvements. Figure 12 depicts the Year 2022 AM peak hour traffic and the results of the capacity analysis.

2. Year 2022 PM Peak Hour Traffic Analysis

The traffic operations at the study intersections are expected to improve during the Year 2022 PM peak hour of traffic as a result of the proposed improvements along Kalanianaole Highway.

Kumuhau Street is expected to operate at LOS "F" at its intersection with Kalanianaole Highway. Mekia Street is expected to operate at LOS "D" at Kalanianaole Highway. Both approaches of Moole Street again are expected to operate at LOS "F", during the Year 2022 PM peak hour of traffic with the proposed improvements. Figure 13 depicts the Year 2022 PM peak hour traffic and the results of the capacity analysis.

IV. Recommendations and Conclusions

A. Recommendations

1. Flamingo Road Intersection

a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Flamingo Road.

b. A minimum storage length of 50 feet is recommended for the proposed median shelter lane on westbound Kalanianaole Highway at Flamingo Road.

c. Consideration should be given to relocating the proposed bus bay away from the intersection of Kalanianaole Highway and Flamingo Road to avoid conflicts between the merging traffic movements from the median shelter lane and from the bus bay.

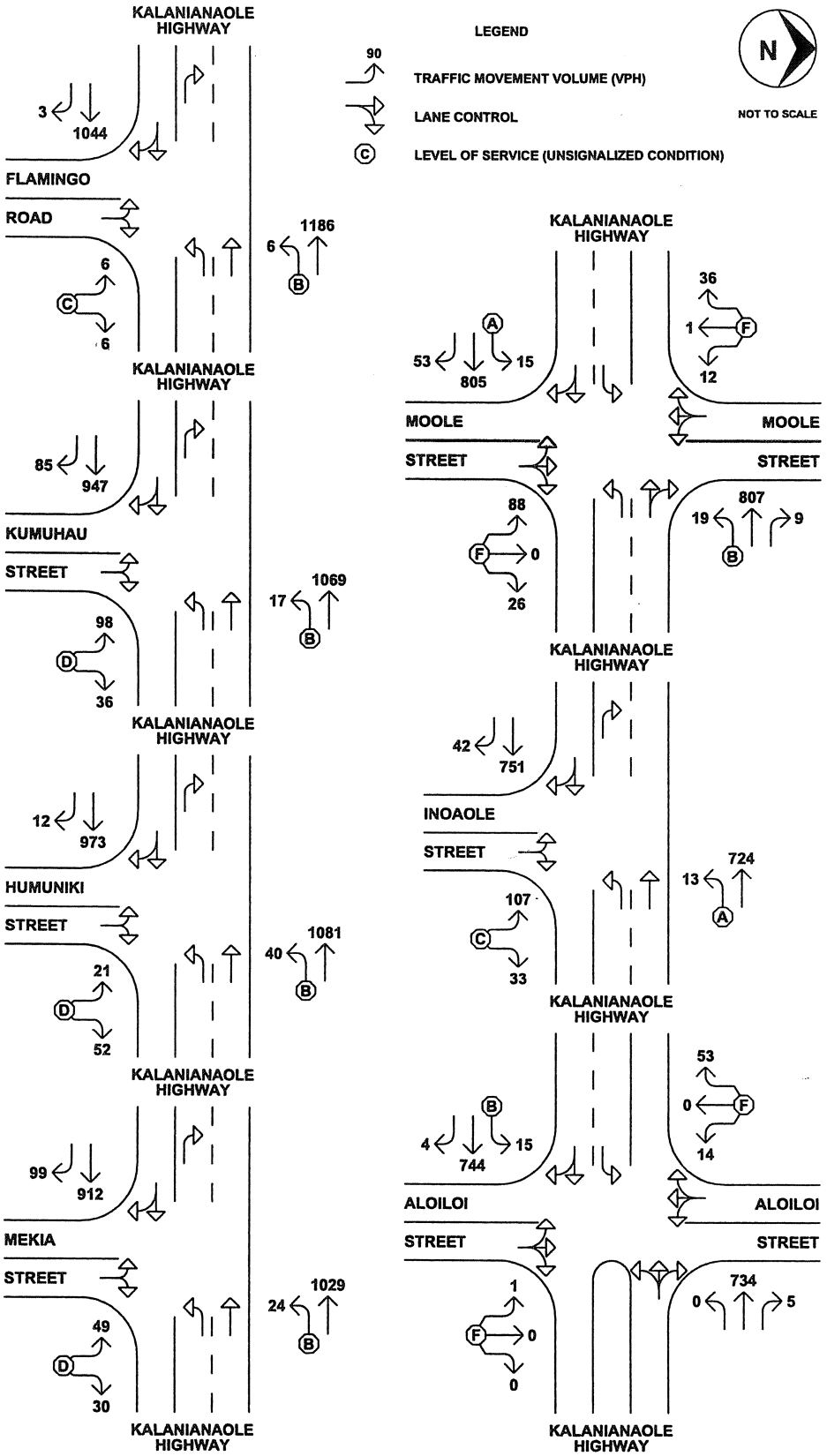

Figure 11. Year 2022 AM Peak Hour Traffic

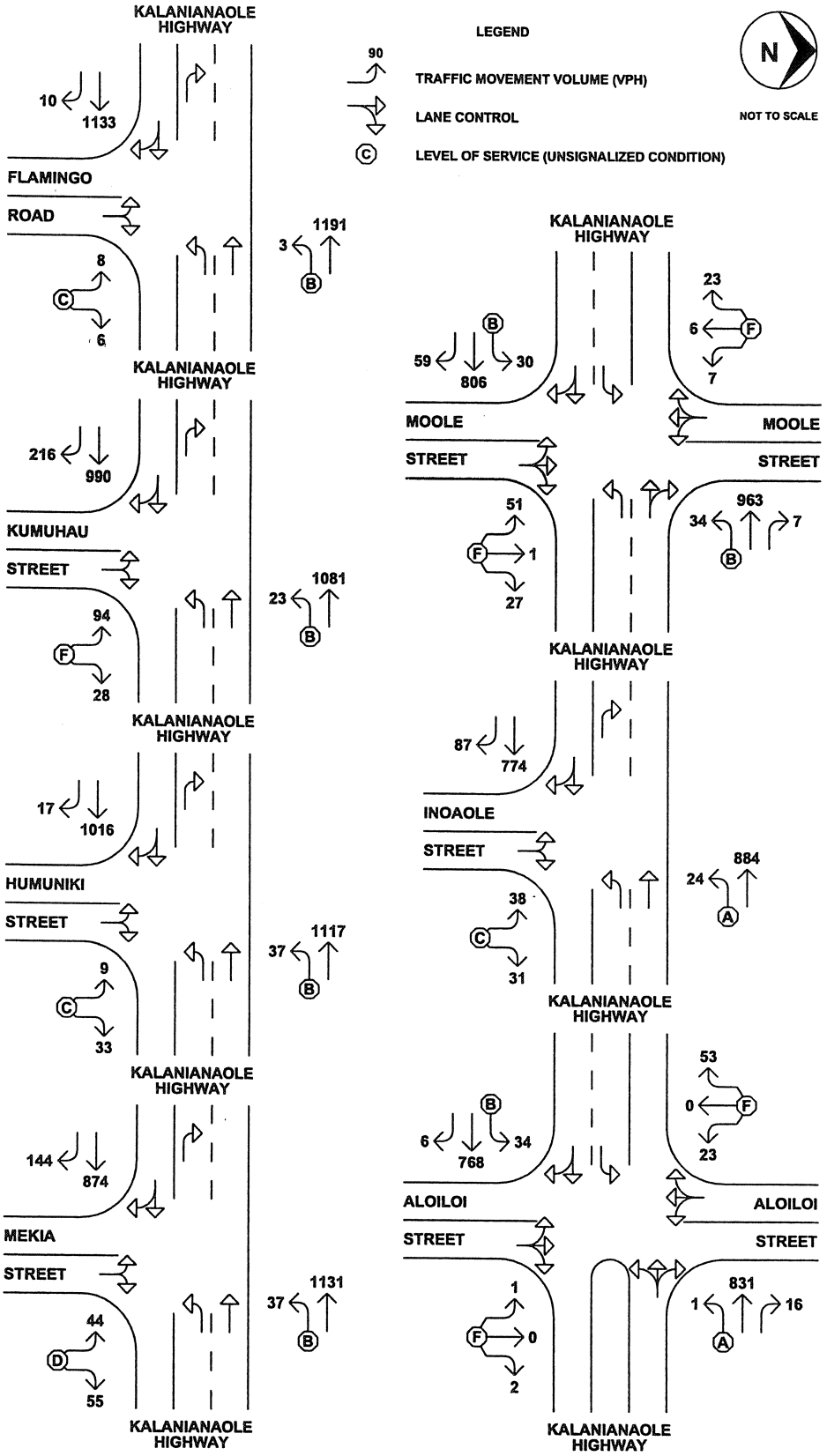

Figure 12. Year 2022 PM Peak Hour Traffic

2. **Kumuhau Street Intersection**

   a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Kumuhau Street.

   b. A minimum storage length of 75 feet is recommended for the proposed median shelter lane on westbound Kalanianaole Highway at Kumuhau Street. The recommended storage length would improve the left-turn movement operations from Kumuhau Street from LOS "F" to LOS "E", during the PM peak hour of traffic.

   c. Consideration should be given to restriping/widening Kumuhau Street at Kalanianaole Highway to provide separate left-turn and right-turn lanes. The separate turning lanes on Kumuhau Street would improve the right-turn movement operations from LOS "F" to LOS "C", during the PM peak hour of traffic.

3. **Humuniki Street Intersection**

   a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Humuniki Street.

   b. A minimum storage length of 75 feet is recommended for the proposed median shelter lane on westbound Kalanianaole Highway at Humuniki Street. The recommended storage length would improve the left-turn movement operations from Kumuhau Street from LOS "D" to LOS "C", during the AM peak hour of traffic.

   c. Consideration should be given to restriping/widening Humuniki Street at Kalanianaole Highway to provide separate left-turn and right-turn lanes. The separate turning lanes on Humuniki Street would improve the right-turn movement operations from LOS "D" to LOS "C", during the AM peak hour of traffic.

4. **Mekia Street Intersection**

   a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Mekia Street.

   b. A minimum storage length of 125 feet is recommended for the proposed median shelter lane on westbound Kalanianaole Highway at Mekia Street. The recommended storage length would improve the left-turn movement operations from Kumuhau Street from LOS "D" to LOS "C", during both the AM and PM peak hours of traffic.

   c. Consideration should be given to restriping/widening Mekia Street at Kalanianaole Highway to provide separate left-turn and right-turn lanes. The separate turning lanes on Mekia Street would improve the right-turn movement

operations from LOS "D" to LOS "C", during both the AM and PM peak hours of traffic.

5. **Moole Street Intersection**

   a. Minimum storage lengths of 50 feet are recommended for the proposed left-turn lanes on Kalanianaole Highway at Moole Street.

   b. Consideration should be given to providing two-way left-turn median lanes on both approaches of Kalanianaole Highway at the Moole Street intersection, instead of the proposed exclusive left-turn lanes. The two-way left-turn median lane could operate as both a left-turn storage lane and a median shelter lane for left-turn movements to and from Moole Street. The northbound left-turn movement operations on Moole Street would improve from LOS "F" to LOS "E", during the AM and PM peak hours of traffic. The southbound left-turn movement operations on Moole Street would improve from LOS "F" to LOS "C", during both peak hours of traffic.

   c. Consideration should be given to restriping/widening Moole Street at Kalanianaole Highway to provide separate a left-turn lane and a shared through/ right-turn lane on both approaches. The separate turning lanes on Moole Street would improve the right-turn movement operations from LOS "F" to LOS "C", during both peak hours of traffic.

6. **Inaole Street Intersection**

   a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Inaole Street.

   b. A minimum storage length of 50 feet is recommended for the proposed median shelter lane on westbound Kalanianaole Highway at Inaole Street.

7. **Aloiloi Street Intersection**

   a. A minimum storage length of 50 feet is recommended for the proposed left-turn lane on westbound Kalanianaole Highway at Aloiloi Street.

   b. Consideration should be given to providing a minimum 50-foot long median shelter lane on eastbound Kalanianaole Highway at Aloiloi Street. The median shelter lane would improve the left-turn movement operations from southbound Aloiloi Street from LOS "F" to LOS "C", during both peak hours of traffic.

   c. Consideration should be given to restriping/widening Aloiloi Street to provide a shared through/left-turn lane and an exclusive right-turn lane. The exclusive right-turn lane would improve traffic operations to LOS "C", during both peak hours of traffic.

B. Conclusions

The widening of Kalanianaole Highway from two lanes to three lanes is expected to improve the overall traffic operations of the highway facility. The exclusive left-turn lanes, median shelter lanes, two-way left-turn lanes, and bus bays are expected to improve travel times for through traffic. The median shelter lanes and the two-way left-turn lanes also are expected to reduce delays for vehicles turning left onto Kalanianaole Highway from the existing side streets and driveways.

APPENDIX C

TRAFFIC STUDY ADDENDUM

TRAFFIC ENGINEERING REPORT ADDENDUM

FOR THE PROPOSED

KALANIANAOLE HIGHWAY IMPROVEMENTS

OLOMANA GOLF COURSE, KUMUHAU STREET, MOOLE STREET & INTERSECTIONS

PREPARED FOR

AKINAKA & ASSOCIATES, INC.

MARCH 2, 2005

PREPARED BY

THE TRAFFIC MANAGEMENT CONSULTANT

RANDALL S. OKANEKU, P.E., P.T.O.E., PRINCIPAL * 1188 BISHOP ST., # 1907 * HONOLULU, HI 96813

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TRAFFIC ENGINEERING REPORT ADDENDUM
FOR THE PROPOSED
KALANIANAOLE HIGHWAY IMPROVEMENTS
OLOMANA GOLF COURSE, KUMUHAU STREET, MOOLE STREET & INTERSECTIONS

I. Introduction

A. Project Description

The State of Hawaii Department of Transportation (DOT) is planning to improve traffic operations on Kalanianaole Highway between Olomana Golf Course and Waimanalo Beach Park in Waimanalo, Oahu, Hawaii. This report is an addendum to the Final Traffic Engineering Report for the Proposed Kalanianaole Highway Improvements Flamingo Road to Aloiloi Street, dated October 15, 2003, prepared by The Traffic Management Consultant.

B. Purpose of the Study

The purpose of this addendum is threefold:

1. Analyze the DOT-proposed geometric improvements at the intersection of Kalanianaole Highway and Olomana Golf Course Driveway;
2. Analyze the traffic signal warrants at the intersection of Kalanianaole Highway and Kumuhau Street; and
3. Analyze the traffic signal warrants at the intersection of Kalanianaole Highway and Moole Street.

Figure 1 depicts the vicinity map.

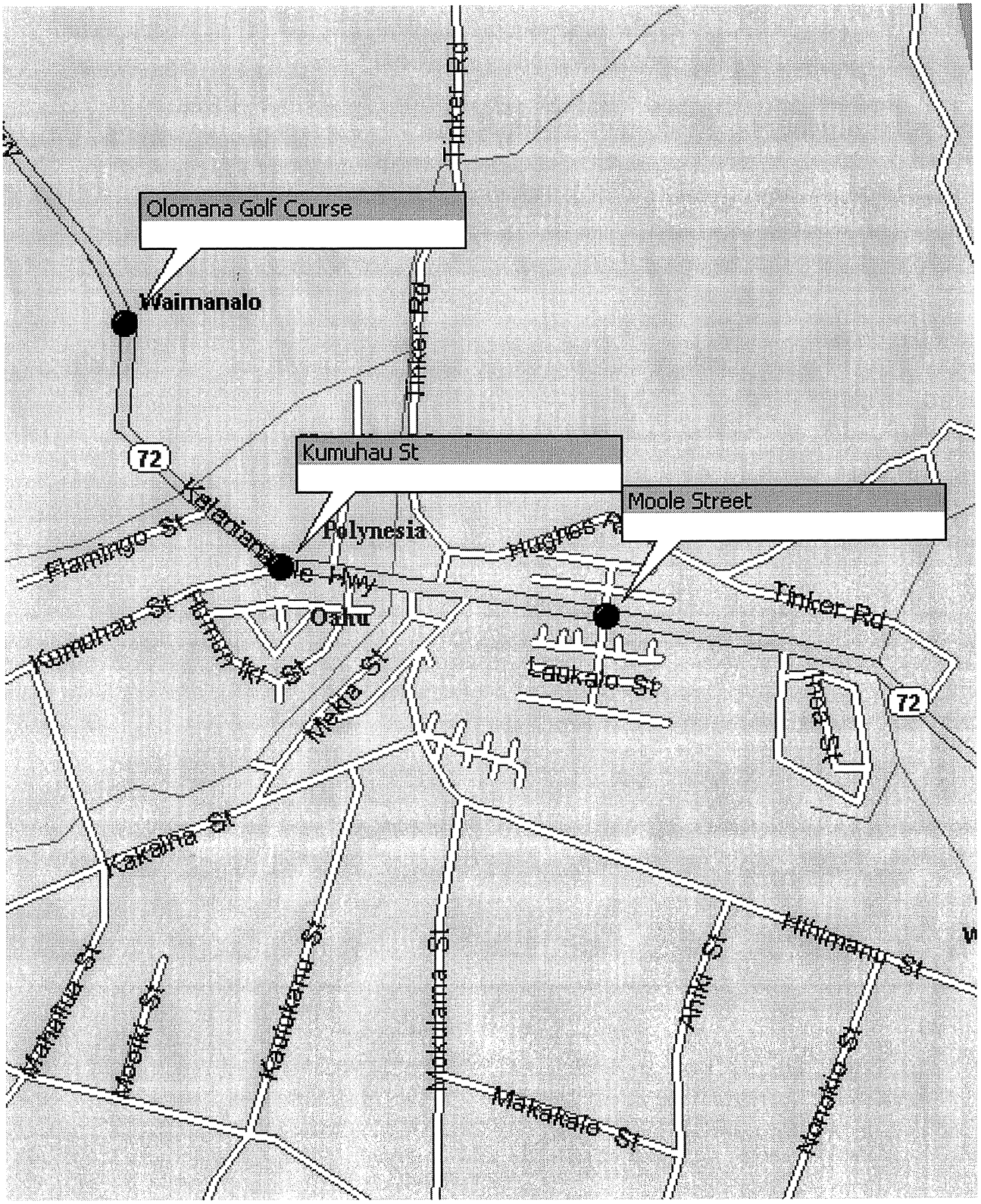


Figure 1. Vicinity Map

C. Scope of the Study

The scope of this study includes:

1. Manual traffic count surveys at the intersection of Kalanianaole Highway and Olomana Golf Course Driveway, during the peak periods of traffic.

2. An analysis of the existing peak hour traffic conditions at the intersection of Kalanianaole Highway and Olomana Golf Course Driveway, during the peak hours of traffic.

3. Twenty-four (24) hour traffic count surveys at the Kalanianaole Highway intersections at Kumuhau Street, and at Moole Street.

4. Peak period pedestrian count surveys at the Kalanianaole Highway intersections at Kumuhau Street, and at Moole Street.

5. Traffic Signal Warrant analyses for the Kalanianaole Highway intersections at Kumuhau Street and at Moole Street in accordance with the standards and guidelines of the latest edition of the Manual on Uniform Traffic Control Devices (MUTCD), Federal Highways Administration, U. S. Department of Transportation.

6. Analysis of the traffic operations of the proposed right-turn lane on northbound Kalanianaole Highway at its intersection with the Olomana Golf Course Driveway.

D. Methodologies

1. Capacity Analysis Methodology

The highway capacity analysis, performed for this study, is based upon procedures presented in the "Highway Capacity Manual" (HCM), Special Report 209, Transportation Research Board, and the "Highway Capacity Software", Federal Highways Administration. The capacity analysis worksheets are attached in the Appendix.

Level of Service (LOS) is defined as "a qualitative measure describing operational conditions within a traffic stream". Several factors are included in determining LOS, such as: speed, delay, vehicle density, freedom to maneuver, traffic interruptions, driver comfort, and safety. LOS "A", "B", and "C" are considered satisfactory levels of service. LOS "D" is generally considered a "desirable minimum" operating level of service. LOS "E" is an undesirable condition and LOS "F" is an unacceptable condition.

2. Traffic Signal Warrant Analysis

The Manual on Uniform Traffic Control Devices provides guidelines to determine the necessity for the installation of traffic signals. Warrants 1, 2, 3, and 4 were analyzed in this study. The MUTCD recommends that "a traffic control signal should

not be installed unless one or more of the factors described herein are met." The MUTCD goes on to recommend that "satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

a. Warrant 1, Eight-Hour Vehicular Volume

Warrant 1 is separated into two conditions. Condition A, Minimum Vehicular Volume, is considered when the volume of intersecting traffic over an eight-hour period is the principal reason to consider traffic signalization. The minimum volumes on the major and minor streets required for Condition A are met when for any 8 hours of an average day, the minimum volumes on the major street are 500 vph on one-lane approaches, total for both directions, and the minimum volumes on the minor street are 150 vph, one direction only.

Condition B, Interruption of Continuous Traffic, is considered when the traffic volume on the major street is so heavy that traffic on the minor street would suffer excessive delay or conflict entering or crossing the major street. The minimum volumes on the major and minor streets required for Condition A are met when for any 8 hours of an average weekday, the minimum volumes on the major street are 750 vph on one-lane approaches, total for both directions, and the minimum volumes on the minor street are 75 vph, one direction only.

Warrant 1 would be satisfied if the minimum vehicular volumes meet the 80 percent levels of both Conditions A and B. The 70 percent level of the minimum vehicular volumes for either Condition A or B is applicable to isolated communities with populations of less than 10,000, or where the major street speed exceeds 40 mph. Neither condition applies to Kalanianaole Highway (25 mph posted speed) in Waimanalo (2000 Census Resident Population = 10,161).

b. Warrant 2, Four-Hour Vehicular Volume

Warrant 2 is considered when the volume of intersecting traffic over a four-hour period is the principal reason to consider traffic signalization. The minimum volumes on the major and minor streets required for Warrant 2 are met when for any 4 hours of an average day, the minimum volume on the major street are 1,100 vph on one-lane approaches, total for both directions, and the minimum volumes on the minor street are 80 vph, one direction only. The 70 percent level of the minimum vehicular volumes is applicable to isolated communities with populations of less than 10,000, or where the major street speed exceeds 40 mph.

c. Warrant 3, Peak Hour

Warrant 3 is considered when during a minimum of one hour in an average day, the minor street would suffer excessive delay or conflict entering or crossing the major street. Warrant 3 is separated into two categories.

Condition A is primarily based upon stopped time delay experienced by traffic on the minor street. Condition A is satisfied when all three conditions are met: the total stop-time delay experienced on the one-lane approach of the minor street exceeds 4 vehicle-hours; and the volume on the same minor street approach exceeds 100 vehicles per hour (vph); and the total volumes entering the intersection exceed 650 vph for a Tee-intersection and 800 vph for a four-legged intersection.

Condition B is based upon intersecting volumes of traffic. The minimum volumes on the major and minor streets required for Condition B are met when for any hour of an average weekday, the minimum volumes on the major street are 1,500 vph on one-lane approaches, total for both directions, and the minimum volumes on the minor street are 100 vph, one direction only.

d. Warrant 4, Pedestrian Volume

Warrant 4 is considered when heavy traffic volumes on the major street result in excessive delays for pedestrians crossing the street. Warrant 4 is met when the pedestrian volume crossing the major street exceeds 190 pedestrians per hour; and there are fewer than 60 gaps per hour in traffic, when pedestrians can safely cross the major street.

3. Traffic Simulation

SimTraffic is a microscopic traffic simulation software, developed by Trafficware Corporation. Microscopic traffic simulation is a stochastic process, which can analyze the interactions of individual vehicles on a roadway network over time. SimTraffic was used to analyze the peak hour delays on the side streets at Kalanianaole Highway.

II. Existing Conditions

A. Roadways

Kalanianaole Highway is at two-way, two-lane highway within the Waimanalo area. Olomana Golf Course Driveway is a two-lane, two-way roadway, which intersects Kalanianaole Highway at a stop-controlled Tee-intersection. Kumuhau Street also is a two-lane, two-way roadway that intersects Kalanianaole Highway at a stop-controlled Tee-intersection. Moole Street is a two-lane, two-way roadway, which intersects Kalanianaole Highway at a stop-controlled four-way intersection.

B. Existing Traffic Volumes and Operating Conditions

1. Field Investigation

Manual traffic count surveys were conducted at the intersection of Kalanianaole Highway and the Olomana Golf Course Driveway in September 2004, during the peak periods of traffic – from 6:30 AM to 8:30 AM and from 3:30 PM to 5:30 PM.

Pedestrian count surveys were conducted at the Kalanianaole Highway intersections at Kumuhau Street and at Moole Street in September 2004. Mechanical traffic count surveys were conducted at the Kalanianaole Highway intersections at Kumuhau Street and at Moole Street in November 2004. The traffic count data are attached in the Appendix.

2. Existing AM Peak Hour Vehicular Traffic

The AM peak hour of traffic occurred between 7:00 AM and 8:00 AM. Kalanianaole Highway carried over 1,900 vehicles per hour (vph), total for both directions, during the AM peak hour of traffic. The Olomana Golf Course Driveway carried 35 vph, total for both directions, during the AM peak hour of traffic. During the AM peak hour of traffic, the Olomana Golf Course Driveway operated at LOS "F", because of the heavy through traffic on Kalanianaole Highway. Figure 2 depicts the existing AM and PM peak hour traffic volumes and the results of the Level of Service analysis.

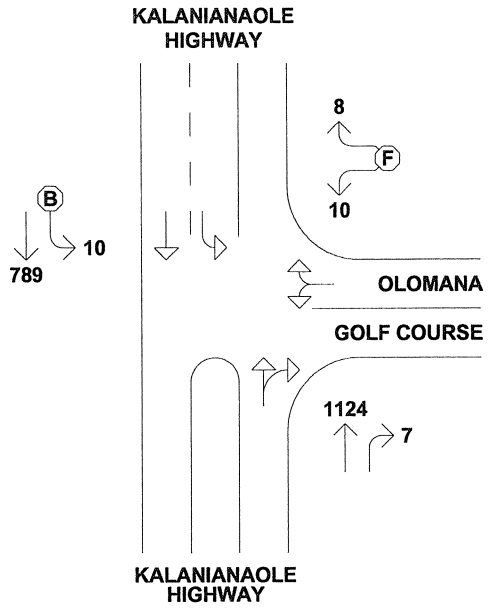
3. Existing PM Peak Hour Vehicular Traffic

The PM peak hour of traffic occurred between 3:45 PM and 4:45 PM. Kalanianaole Highway carried over 2,000 vph, total for both directions, during the PM peak hour of traffic. During the PM peak hour of traffic, the Olomana Golf Course Driveway operated at LOS "E" at Kalanianaole Highway. The Olomana Golf Course Driveway carried 17 vph, total for both directions. Long queues were observed in the southbound direction on Kalanianaole Highway, during the PM peak hour of traffic, because of the existing traffic signals at its intersection with Poalima Street. The existing PM peak hour traffic volumes and results of the capacity analysis are depicted on Figure 2.

4. Existing Peak Hour Pedestrian Traffic

The pedestrian traffic crossing Kalanianaole Highway was minimal, during the AM peak hour of traffic. At Kumuhau Street two (2) pedestrians were observed crossing Kalanianaole Highway. Thirteen (13) pedestrians were observed crossing Kalanianaole Highway, in the vicinity of Moole Street, during the AM peak hour of traffic.

The pedestrian traffic crossing Kalanianaole Highway also was minimal, during the PM peak hour of traffic. No pedestrians were observed crossing Kalanianaole Highway in the vicinity of Kumuhau Street. Eleven (11) pedestrians were observed crossing Kalanianaole Highway, in the vicinity of Moole Street, during the after-school peak hour of traffic.



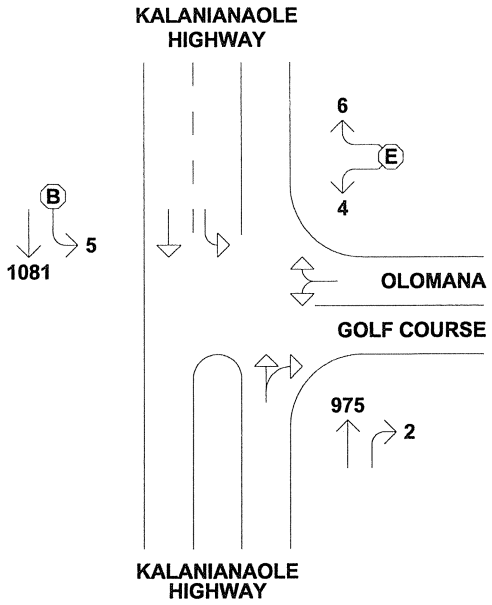
EXISTING AM PEAK HOUR TRAFFIC

LEGEND

90 — **TRAFFIC MOVEMENT VOLUME (VPH)**

LANE CONTROL

C — **LEVEL OF SERVICE (UNSIGNALIZED)**



EXISTING PM PEAK HOUR TRAFFIC

Figure 2. Existing Peak Hour Traffic

5. 24-Hour Vehicular Traffic Data

At Kumuhau Street, Kalanianaole Highway carried over 24,300 vehicles per day (vpd), total for both directions. Kumuhau Street carried over 3,100 vpd, total for both directions.

Kalanianaole Highway carried over 19,900 vpd at Moole Street, total for both directions. The north leg of Moole Street carried over 1,200 vpd, total for both directions, at Kalanianaole Highway. The south leg of Moole Street at Kalanianaole Highway carried over 2,100 vpd, total for both directions.

III. Olomana Golf Course Driveway Intersection Improvements

A. DOT-Proposed Improvements

1. Southbound Kalanianaole Highway is proposed to be widened to provide a minimum 125-foot median shelter lane to facilitate the left-turn movement from the Olomana Golf Course Driveway.

2. Northbound Kalanianaole Highway is proposed to be widened to provide an exclusive right-turn lane to the Olomana Golf Course Driveway.

B. Peak Hour Traffic Forecasts

The Year 2022 was used as the Design Year for the proposed project in this analysis. The Year 2022 traffic forecasts were provided by DOT. Table 1 summarizes the design traffic parameters, which were provided by DOT.

Table 1. Design Traffic - Olomana Golf Course to Bellows Field	
2001 Average Daily Traffic (ADT)	21,300 vehicles/day
2002 Average Daily Traffic	21,500 vehicles/day
2022 Average Daily Traffic	25,000 vehicles/day
Design Hourly Volume	2,000 vehicles/hour
% of ADT occurring during the peak hour (K)	8.0%
Directional Distribution of Traffic (D)	55/45
% of Heavy Vehicles During the Peak hour (T)	4.0%
% of Heavy Vehicles During a 24-Hour Period (T_{24})	3.5%

The Year 2022 ADT forecast represents about 0.8 percent annual growth in traffic. A factor of 1.144 was applied uniformly to the existing traffic conditions to estimate the Year 2022 AM and PM peak hour traffic.

C. Year 2022 AM Peak Hour Traffic Analysis

The Olomana Golf Course Driveway is expected to operate at LOS "D", during the Year 2022 AM peak hour of traffic, with the construction of the median shelter lane. The proposed exclusive right-turn lane is not expected to significantly improve traffic operations at the intersection. Figure 3 depicts the Year 2022 AM and PM peak hour traffic and the results of the capacity analysis, without construction of the exclusive right-turn deceleration lane. Figure 4 depicts the Year 2022 AM and PM peak hour capacity analysis, with the construction of the exclusive right-turn deceleration lane.

D. Year 2022 PM Peak Hour Traffic Analysis

During the Year 2022 AM peak hour of traffic, the Olomana Golf Course Driveway is expected to operate at LOS "C", with the construction of the median shelter lane. The proposed exclusive right-turn lane is not expected to improve traffic operations at the intersection.

IV. Traffic Signal Warrant Analysis

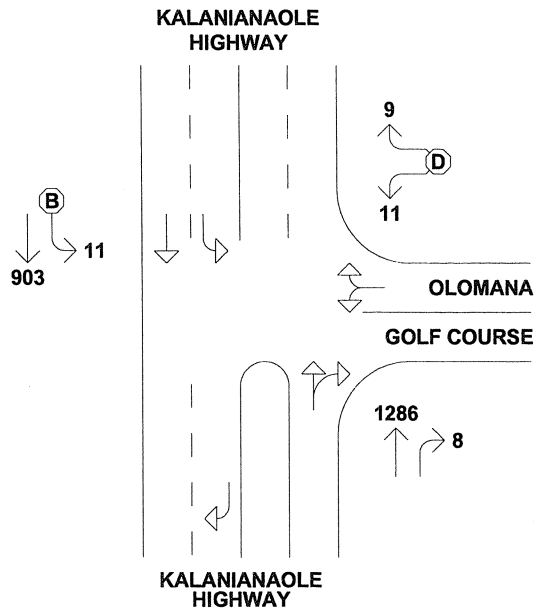
A. Kumuhau Street Intersection

The existing eight-hour vehicular volumes at the intersection of Kalanianaole Highway and Kumuhau Street do <u>not</u> satisfy Warrant 1, Minimum Vehicular Volume. Warrant 2 – Four-Hour Volume is satisfied. Warrant 3 – Peak Hour is satisfied for both delay and minimum vehicular volume. The pedestrian traffic crossing Kalanianaole Highway at Kumuhau Street is too low to satisfy Warrant 4 – Pedestrian Traffic. The traffic signal warrant worksheet for the intersection of Kalanianaole Highway and Kumuhau Street is attached in the Appendix.

State DOT conducted an investigation of Warrant 7, Crash Experience. Their investigation concluded that the intersection of Kalanianaole Highway with Kumuhau Street did not meet the minimum criteria to satisfy Warrant 7.

B. Moole Street Intersection

Warrant 1, Minimum Vehicular Volume and Warrant 2 – Four-Hour Volume are <u>not</u> satisfied by the respective existing eight-hour and four-hour traffic volumes at the Kalanianaole Highway intersection at Moole Street. Warrant 3 – Peak Hour is satisfied for minimum vehicular volume, during the existing AM peak hour of traffic. The pedestrian traffic crossing Kalanianaole Highway at Moole Street again is too low to satisfy Warrant 4 – Pedestrian Traffic. The traffic signal warrant worksheet for the intersection of Kalanianaole Highway and Moole Street is attached in the Appendix.



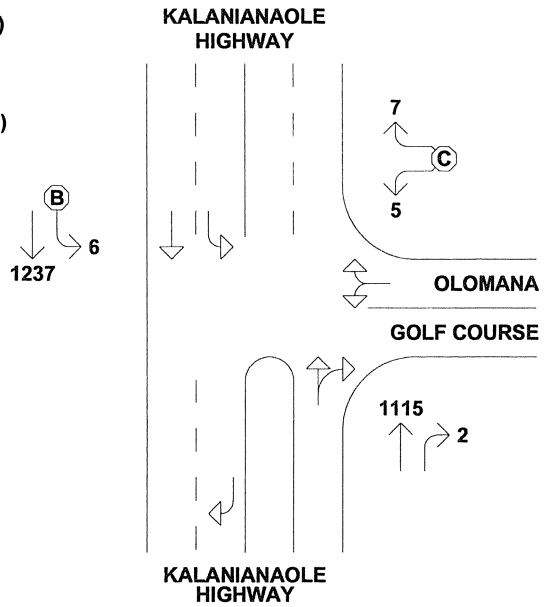
2022 AM PEAK HOUR TRAFFIC W/O DECEL LANE

LEGEND

90 — **TRAFFIC MOVEMENT VOLUME (VPH)**

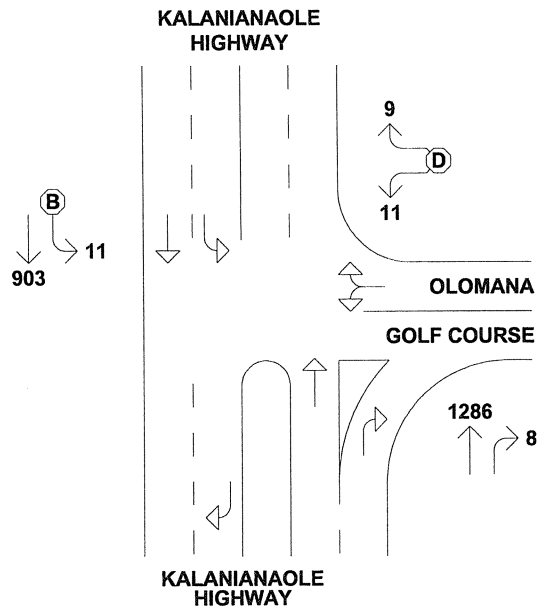
LANE CONTROL

C — **LEVEL OF SERVICE (UNSIGNALIZED)**



2022 PM PEAK HOUR TRAFFIC W/O DECEL LANE

Figure 3. Year 2022 Peak Hour Traffic Without the Proposed Deceleration Lane



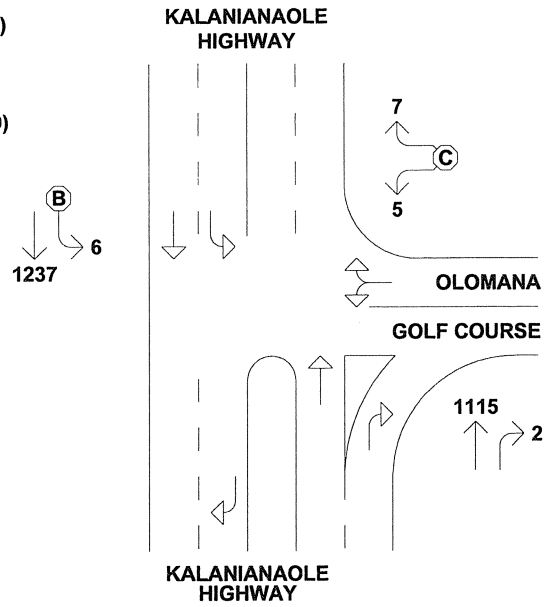
2022 AM PEAK HOUR TRAFFIC WITH DECEL LANE

LEGEND

90 **TRAFFIC MOVEMENT VOLUME (VPH)**

LANE CONTROL

C **LEVEL OF SERVICE (UNSIGNALIZED)**



2022 PM PEAK HOUR TRAFFIC WITH DECEL LANE

Figure 4. Year 2022 Peak Hour Traffic With the Proposed Deceleration Lane

State DOT conducted an investigation of Warrant 7, Crash Experience. Their investigation concluded that the intersection of Kalanianaole Highway with Moole Street did not meet the minimum criteria to satisfy Warrant 7.

V. Recommendations and Conclusions

A. Recommendations

1. Olomana Golf Course Driveway Intersection

a. A minimum storage length of 125 feet is recommended for the proposed median shelter lane on southbound Kalanianaole Highway at the Olomana Golf Course Driveway.

b. An exclusive right-turn lane on northbound Kalanianaole Highway is not recommended at the Olomana Golf Course Driveway at this time.

2. Kumuhau Street Intersection

a. The signalization of the intersection of Kalanianaole Highway and Kumuhau Street is not recommended at this time. The proposed median shelter lane should improve the existing condition to Level of Service "C".

b. Underground conduits should be installed as part of the roadway improvements to accommodate future traffic signalization at the intersection.

3. Moole Street Intersection

a. The signalization of the intersection of Kalanianaole Highway and Moole Street is not recommended at this time.

b. Underground conduits should be installed as part of the roadway improvements to accommodate future traffic signalization at the intersection.

B. Conclusions

Queuing on southbound Kalanianaole Highway extends from the existing traffic signals at Poalima Street, across Kumuhau Street to the Olomana Golf Course Driveway, during the existing PM peak period of traffic. At Moole Street, queuing on Kalanianaole Highway extended in both directions from adjacent signalized intersections at Poalima Street and at Waimanalo Elementary and Middle Schools, during the existing PM peak period.

The proposed median shelter lane on southbound Kalanianaole Highway is expected to improve the left-turn movement from the Olomana Golf Course Driveway. The exclusive right-turn lane on northbound Kalanianaole Highway at the Olomana Golf Course Driveway is not expected to improve intersection operations.

The intersection of Kalanianaole Highway and Kumuhau Street meets Warrants 2 and 3, in accordance with the standards and guidelines of the latest edition of the Manual on Uniform Traffic Control Devices, Federal Highway Administration, U. S. Department of Transportation. Traffic signalization at the intersection of Kalanianaole Highway and Kumuhau Street is not recommended at this time, because the proposed median shelter lane, recommended in the Final Traffic Engineering Report for the Proposed Kalanianaole Highway Improvements Flamingo Road to Aloiloi Street, dated October 15, 2003, is expected to improve existing peak hour conditions to LOS "C".

The intersection of Kalanianaole Highway and Moole Street meets only Warrant 3 of the MUTCD. Traffic signalization at the intersection of Kalanianaole Highway is not recommended at this time. In the opinion of this writer, more than one warrant should be satisfied before considering the installation of traffic signal controls.

TRAFFIC ENGINEERING REPORT ADDENDUM

FOR THE PROPOSED

KALANIANAOLE HIGHWAY IMPROVEMENTS

OLOMANA GOLF COURSE, KUMUHAU STREET, & MOOLE STREET INTERSECTIONS

APPENDIX A

TRAFFIC COUNT DATA

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Olomana** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREETOlomana Golf Course
N-S STREET:Kalanianaole Hwy

PERIOD: AM Peak
NORTH:
TECHNICIAN: KO
DATE: 9/13/04

		Olomana Golf Course						Kalanianaole Hwy							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	HRLY
6:30	6:45	0	0	0	0	0	1	0	183	0	0	140	0	324	
6:45	7:00	0	0	0	0	0	0	0	181	0	0	156	0	337	
7:00	7:15	0	0	0	3	0	1	0	264	0	1	206	0	475	
7:15	7:30	0	0	0	0	0	1	0	273	2	3	178	0	457	1593
7:30	7:45	0	0	0	5	0	4	0	327	2	4	193	0	**535**	1804
7:45	8:00	0	0	0	2	0	2	0	260	3	2	212	0	481	**1948**
8:00	8:15	0	0	0	0	0	4	0	249	1	1	211	0	466	1939
8:15	8:30	0	0	0	0	0	2	0	181	0	0	164	0	347	1829
AM PEAK HOUR															
7:00	**8:00**	**0**	**0**	**0**	**10**	**0**	**8**	**0**	**1124**	**7**	**10**	**789**	**0**	**1948**	**1948**
PHF					**0.50**		**0.50**		**0.86**	**0.88**	**0.63**	**1.02**			
PHF						0.50			0.86			1.01		**0.91**	**PHF**

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Olomana** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREETOlomana Golf Course
N-S STREET Kalanianaole Hwy

PERIOD: PM Peak
NORTH:
TECHNICIAN: KO
DATE: 9/13/04

		Olomana Golf Course						Kalanianaole Hwy							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	HRLY
3:00	3:15	0	0	0	2	0	3	0	188	1	5	204	0	403	
3:15	3:30	0	0	0	3	0	3	0	222	0	3	235	0	466	
3:30	3:45	0	0	0	3	0	3	0	253	2	4	224	0	489	
3:45	4:00	0	0	0	0	0	0	0	274	1	0	257	0	**532**	1890
4:00	4:15	0	0	0	3	0	2	0	238	0	1	279	0	523	2010
4:15	4:30	0	0	0	0	0	3	0	225	1	3	278	0	510	2054
4:30	**4:45**	0	0	0	1	0	1	0	238	0	1	267	0	508	**2073**
4:45	5:00	0	0	0	1	0	1	0	224	0	1	241	0	468	2009
5:00	5:15	0	0	0	2	0	2	0	215	0	2	249	0	470	1956
5:15	5:30	0	0	0	2	0	1	0	209	0	1	198	0	411	1857
PM PEAK HOUR															
3:45	**4:45**	**0**	**0**	**0**	**4**	**0**	**6**	**0**	**975**	**2**	**5**	**1081**	**0**	**2073**	**2073**
PHF									**0.89**	**0.50**		**1.05**			

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Kumuhau** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREET Kalanianaole Hwy
N-S STREET: Kumuhau Street

PERIOD: AM Peak
NORTH:
TECHNICIAN: Richard
DATE: 2/7/02

		Kalanianaole Hwy						Kumuhau Street							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	HRLY
6:30	6:45	0	112	8	1	123	0	21	0	9	0	0	0	274	
6:45	7:00	0	123	5	0	147	0	13	0	9	0	0	0	297	
7:00	7:15	0	132	10	3	159	0	12	0	12	0	0	0	328	
7:15	7:30	0	193	9	4	235	0	17	0	12	0	0	0	470	1369
7:30	7:45	0	211	12	4	244	0	23	0	4	0	0	0	498	1593
7:45	8:00	0	211	26	4	237	0	17	0	6	0	0	0	**501**	1797
8:00	**8:15**	0	199	26	3	203	0	27	0	9	0	0	0	467	**1936**
8:15	8:30	0	153	13	2	171	0	16	0	8	0	0	0	363	1829
AM PEAK HOUR															
7:15	**8:15**	**0**	**814**	**73**	**15**	**919**	**0**	**84**	**0**	**31**	**0**	**0**	**0**	**1936**	**1936**
PHF		**#####**	**0.96**	**0.70**	**0.94**	**0.97**	**#####**	**1.24**	**#####**	**1.29**	**#####**	**#####**	**#####**		
PHF			0.94			0.97			1.25			**#####**		**0.97**	**PHF**

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Kumuhau** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREET Kalanianaole Hwy
N-S STREET Kumuhau Street

PERIOD: Midday
NORTH:
TECHNICIAN: Richard
DATE: 2/6/02

		Kalanianaole Hwy						Kumuhau Street							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	
3:00	3:15	0	180	10	5	177	0	14	0	9	0	0	0	395	
3:15	3:30	0	228	18	1	205	0	24	0	4	0	0	0	480	
3:30	3:45	0	212	20	5	230	0	20	0	5	0	0	0	492	
3:45	4:00	0	222	19	8	239	0	9	0	8	0	0	0	505	1872
4:00	4:15	0	212	29	4	241	0	32	0	5	0	0	0	**523**	2000
4:15	4:30	0	206	24	4	199	0	15	0	5	0	0	0	453	1973
4:30	**4:45**	0	211	24	4	251	0	25	0	6	0	0	0	521	**2002**
4:45	5:00	0	178	28	5	199	0	11	0	6	0	0	0	427	1924
5:00	5:15	0	211	25	8	205	0	14	0	4	0	0	0	467	1868
5:15	5:30	0	196	23	6	206	0	18	0	8	0	0	0	457	1872
PM PEAK HOUR															
3:45	**4:45**	**0**	**851**	**96**	**20**	**930**	**0**	**81**	**0**	**24**	**0**	**0**	**0**	**2002**	**2002**
PHF			**1.00**	**0.83**	**1.25**	**0.96**		**0.63**		**1.20**					

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Moole** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREETKalanianaole Highway
N-S STREET:Moole Street

PERIOD: AM Peak
NORTH:
TECHNICIAN: Kiyo
DATE: 2/8/02

		Kalanianaole Highway						Moole Street							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	HRLY
6:30	6:45	1	115	3	1	116	1	12	0	4	2	0	4	259	
6:45	7:00	2	80	1	3	118	0	11	0	2	2	0	3	222	
7:00	7:15	0	133	10	3	154	0	12	0	5	0	0	6	323	
7:15	7:30	2	152	14	3	185	1	17	0	3	4	1	3	385	1189
7:30	7:45	3	192	9	4	183	4	28	0	4	6	0	14	**447**	1377
7:45	8:00	5	170	14	5	186	2	20	0	5	0	0	12	419	1574
8:00	**8:15**	3	178	9	4	140	1	11	0	10	0	0	2	358	**1609**
8:15	8:30	4	159	9	2	118	2	5	0	0	3	0	5	307	1531
AM PEAK HOUR															
7:15	**8:15**	**13**	**692**	**46**	**16**	**694**	**8**	**76**	**0**	**22**	**10**	**1**	**31**	**1609**	**1609**
PHF		**1.08**	**0.90**	**1.28**	**1.00**	**0.95**	**0.50**	**0.68**	**#####**	**1.38**	**0.42**	**#####**	**0.55**		
PHF			0.92			0.94			0.77			0.53		**0.90**	**PHF**

TRAFFIC COUNT DATA **FILE NAME: Kal Hwy Moole** Sec 3

PROJECT: Kalanianaole Hwy Improvements
LOCATION: Waimanalo
E-W STREETKalanianaole Highway
N-S STREET Moole Street

PERIOD: Midday
NORTH:
TECHNICIAN: RSO
DATE: 2/6/02

		Kalanianaole Highway						Moole Street							
TIME		EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	TOTAL	
3:00	3:15	6	138	7	5	159	3	5	1	5	1	1	1	332	
3:15	3:30	2	178	10	2	176	4	10	1	3	2	1	3	392	
3:30	3:45	8	184	10	4	223	4	6	0	4	0	1	3	447	
3:45	4:00	2	171	8	8	208	2	6	1	6	3	2	4	421	1592
4:00	4:15	8	180	16	6	215	3	16	0	4	2	1	3	**454**	1714
4:15	4:30	13	161	14	9	186	0	9	0	5	1	1	9	408	1730
4:30	**4:45**	3	181	13	6	219	1	13	0	8	0	1	4	449	**1732**
4:45	5:00	9	181	8	8	169	1	6	0	6	6	0	5	399	1710
5:00	5:15	12	178	17	8	178	4	14	0	4	4	1	8	428	1684
5:15	5:30	3	190	13	4	167	8	15	0	8	2	0	4	414	1690
PM PEAK HOUR															
3:45	**4:45**	**26**	**693**	**51**	**29**	**828**	**6**	**44**	**1**	**23**	**6**	**5**	**20**	**1732**	**1732**
PHF		**0.81**	**0.96**	**0.80**	**1.21**	**0.96**	**0.50**	**0.69**	**#####**	**1.44**	**0.75**	**1.25**	**1.67**		
PHF			0.94			0.96			0.85			1.29		**0.95**	**PHF**

The Traffic Management Consultant

Site: Kalanianaole Hwy at Kumuhau Street
Approaches: Kalanianaole Highway - Eastbound + Westbound

* Wednesday, November 17, 2004=1917, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly															1,564	1,824	2,000	1,711	1,421	788	662	585	403	226
:00															407	430	463	**481**	392	208	171	163	117	62
:15															392	449	**513**	423	364	223	168	150	104	68
:30															382	464	**513**	428	351	185	171	136	104	55
:45															383	481	**511**	379	314	172	152	136	78	41

PM Peak Hr 16:15 17:15 2,018 PHF= 0.983

* Thursday, November 18, 2004=12414, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	**24 Hr**
Hrly	128	91	73	115	223	717	1,244	1,997	1,471	1,274	1,218	1,312	1,276	1,449	1,648	1,879	2,131	1,942	1,420	816	684	614	400	228	24,350
:00	34	19	20	28	35	122	292	**435**	404	290	293	331	307	354	414	466	479	**549**	393	249	166	157	120	75	**8 Hr**
:15	40	26	22	29	36	133	290	**496**	391	306	306	306	334	356	367	415	**548**	485	382	223	173	138	98	52	12,855
:30	27	17	16	19	68	205	307	**576**	354	347	332	345	306	358	451	514	**561**	521	334	167	156	182	103	50	**4 Hr**
:45	27	29	15	39	84	257	355	**490**	322	331	287	330	329	381	416	484	**543**	387	311	177	189	137	79	51	7,600

AM Peak Hr 7:00 8:00 1,997 PHF= 0.867 PM Peak Hr 16:15 17:15 2,201 PHF= 0.981

* Friday, November 19, 2004=6916 (Incomplete) , 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	132	88	69	119	217	685	1,168	1,854	1,500	1,227	1,335	1,300	1,367	1,493	192									
:00	38	27	20	27	25	102	260	381	**424**	282	312	317	343	384	190									
:15	38	17	17	21	41	134	283	**519**	406	306	320	332	314	386	2									
:30	28	19	17	39	64	210	310	**479**	337	329	352	295	355	382	0									
:45	28	25	15	32	87	239	315	**475**	333	310	351	356	355	341	0									

AM Peak Hr 7:15 8:15 1,897 PHF= 0.914

The Traffic Management Consultant
Event Counts

Site: Kalanianaole Hwy at Moole St
Approaches: Kalanianaole Hwy Eastbound + Westbound

* Monday, November 15, 2004=319 (Incomplete) , 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly																1,647	1,735	1,395	1,179	688	545	461	299	173
:00																374	**495**	377	345	167	130	139	84	46
:15																370	**455**	341	299	204	159	115	84	44
:30																409	**420**	331	274	151	124	102	79	47
:45																**494**	365	346	261	166	132	105	52	36

PM Peak Hr 15:45 16:45 1,864 PHF= 0.941

* Tuesday, November 16, 2004=486, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24 Hr
Hrly	92	67	70	71	172	463	917	1,683	1,198	1,039	1,059	1,074	1,042	1,211	1,451	1,548	1,820	1,439	1,199	692	560	471	361	209	19,908
:00	21	20	17	20	25	82	203	**371**	356	283	270	255	264	251	365	341	**530**	382	356	200	133	120	104	55	
:15	29	16	18	19	36	96	188	**433**	320	228	262	252	285	298	380	357	**452**	356	320	175	154	114	94	61	
:30	22	12	18	15	38	121	253	**471**	256	259	284	292	233	311	334	385	**473**	341	283	167	140	123	92	48	
:45	20	19	17	17	73	164	273	**408**	266	269	243	275	260	351	372	**465**	365	360	240	150	133	114	71	45	

AM Peak Hr 7:00 8:00 1,683 PHF= 0.893

PM Peak Hr 15:45 16:45 1,920 PHF= 0.906

* Wednesday, November 17, 2004=146, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	135	85	49	76	170	521	908	1,620	1,208	992	972	1,004												
:00	35	25	19	15	19	83	211	**372**	360	241	245	266												
:15	41	19	6	20	41	108	197	**451**	314	248	244	267												
:30	27	21	8	22	51	139	238	**393**	272	256	261	256												
:45	32	20	16	19	59	191	262	**404**	262	247	222	199												

AM Peak Hr 7:00 8:00 1,620 PHF= 0.898

The Traffic Management Consultant
Site: Kalanianaole Highway at Moole St/Kumuhau St
Approach: South Leg - Northbound

* Monday, November 15, 2004=716 (Incomplete) , 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-		87	98	96	96	75	88	56	50	42	16	12
:00	-	-	-	-	-	-	-	-	-	-	-	-		20	24	16	**26**	18	25	18	15	17	0	3
:15	-	-	-	-	-	-	-	-	-	-	-	-		11	34	31	**24**	17	16	14	11	7	5	8
:30	-	-	-	-	-	-	-	-	-	-	-	-		36	22	22	**24**	19	19	10	12	10	4	0
:45	-	-	-	-	-	-	-	-	-	-	-	-		20	18	**27**	22	21	28	14	12	8	7	1

PM Peak 1330 - 1430 (114), PM PHF=0.79 PM Peak Hr 15:15 16:15 101 PHF= 0.815

* Tuesday, November 16, 2004=1209, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24 Hr
Hrly	4	6	3	2	15	61	88	130	100	48	64	51	53	74	75	81	70	69	53	43	42	33	30	14	1,209
:00	0	1	0	0	0	8	20	**30**	25	8	15	13	13	17	28	22	12	19	14	14	13	7	9	8	
:15	0	2	0	0	5	11	29	**34**	20	16	17	18	14	12	9	19	19	11	15	11	9	8	7	2	
:30	3	2	2	0	4	17	25	**32**	30	12	13	14	9	23	14	16	19	20	11	10	10	6	7	2	
:45	1	1	1	2	6	25	14	**34**	25	12	19	6	17	22	24	24	20	19	13	8	10	12	7	2	

AM Peak Hr 7:00 8:00 130 PHF= 0.956 PM Peak Hr 15:00 16:00 81 PHF= 0.844

* Wednesday, November 17, 2004=1131, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	5	2	5	1	14	59	73	90	50	46	45													
:00	1	1	0	0	2	6	24	12	**16**	16	8													
:15	3	1	1	0	3	19	18	**26**	11	8	13													
:30	1	0	3	-1	3	10	21	**32**	13	15	13													
:45	0	0	1	2	6	24	10	**20**	10	7	11													

AM Peak Hr 7:15 8:15 94 PHF= 0.734

The Traffic Management Consultant

Site: Kalanianaole Highway at Moole Street
Approach: North Leg - Southbound

* Monday, November 15, 2004=352 (Incomplete) , 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	-	-	-	-	-	-	-	-	-	-	-	-			36	44	47	49	48	49	15	22	17	4
:00	-	-	-	-	-	-	-	-	-	-	-	-			16	10	15	**14**	14	10	3	8	3	1
:15	-	-	-	-	-	-	-	-	-	-	-	-			10	13	4	**15**	12	14	4	4	9	2
:30	-	-	-	-	-	-	-	-	-	-	-	-			3	11	**13**	9	12	12	3	4	2	1
:45	-	-	-	-	-	-	-	-	-	-	-	-			7	10	**15**	11	10	13	5	6	3	0

PM Peak Hr 16:30 17:30 57 PHF= 0.95

* Tuesday, November 16, 2004=761, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00	24 Hr
Hrly	5	4	5	1	11	38	41	54	58	47	37	36	44	36	50	50	57	43	41	35	26	14	13	15	761
:00	4	0	0	0	3	9	9	16	**13**	12	12	7	9	3	11	16	8	**9**	13	4	9	4	3	8	
:15	0	0	4	1	2	5	11	13	**16**	16	7	6	11	10	17	13	**20**	5	10	13	1	4	7	0	
:30	1	4	1	0	0	10	11	18	**10**	9	8	11	8	12	14	7	**16**	15	12	7	6	2	2	7	
:45	0	0	0	0	6	14	10	7	**19**	10	10	12	16	11	8	14	**13**	14	6	11	10	4	1	0	

AM Peak Hr 8:00 9:00 58 PHF= 0.763

PM Peak Hr 16:15 17:15 58 PHF= 0.725

* Wednesday, November 17, 2004=339, 15 minute drops

Time	0:00	1:00	2:00	3:00	4:00	5:00	6:00	7:00	8:00	9:00	10:00	11:00	12:00	13:00	14:00	15:00	16:00	17:00	18:00	19:00	20:00	21:00	22:00	23:00
Hrly	7	5	3	4	14	31	41	55	53	38	34	40												
:00	3	0	1	0	1	4	9	7	**18**	9	8	9												
:15	3	3	0	0	2	7	10	**20**	17	13	10	10												
:30	0	2	1	0	6	9	14	**22**	10	3	7	11												
:45	1	0	1	4	5	11	8	**6**	8	13	9	10												

AM Peak Hr 7:15 8:15 66 PHF= 0.75

TRAFFIC ENGINEERING REPORT ADDENDUM

FOR THE PROPOSED

KALANIANAOLE HIGHWAY IMPROVEMENTS

OLOMANA GOLF COURSE, KUMUHAU STREET, & MOOLE STREET INTERSECTIONS

APPENDIX B

CAPACITY ANALYSIS WORKSHEETS

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	8	1124	7	10	789
Peak Hour Factor	0.50	0.50	0.86	0.88	0.63	1.00
Hourly flow rate (vph)	20	16	1307	8	16	789
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2132	1311			1315	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2132	1311			1315	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	62	92			97	
cM capacity (veh/h)	52	192			519	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	36	1315	16	789
Volume Left	20	0	16	0
Volume Right	16	8	0	0
cSH	77	1700	519	1700
Volume to Capacity	0.47	0.77	0.03	0.46
Queue Length 95th (ft)	48	0	2	0
Control Delay (s)	87.5	0.0	12.2	0.0
Lane LOS	F		B	
Approach Delay (s)	87.5	0.0	0.2	
Approach LOS	F			

Intersection Summary			
Average Delay	1.6		
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	6	975	2	5	1081
Peak Hour Factor	0.92	0.92	0.89	0.50	0.92	1.00
Hourly flow rate (vph)	4	7	1096	4	5	1081
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2189	1098			1100	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2189	1098			1100	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	97			99	
cM capacity (veh/h)	49	257			627	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	11	1100	5	1081
Volume Left	4	0	5	0
Volume Right	7	4	0	0
cSH	95	1700	627	1700
Volume to Capacity	0.11	0.65	0.01	0.64
Queue Length 95th (ft)	9	0	1	0
Control Delay (s)	47.7	0.0	10.8	0.0
Lane LOS	E		B	
Approach Delay (s)	47.7	0.0	0.1	
Approach LOS	E			

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	814	73	15	919	84	31
Peak Hour Factor	0.96	0.70	0.94	0.97	1.00	1.00
Hourly flow rate (vph)	848	104	16	947	84	31
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			952		1879	900
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			952		1879	900
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			98		0	91
cM capacity (veh/h)			722		77	337

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	952	963	115
Volume Left	0	16	84
Volume Right	104	0	31
cSH	1700	722	97
Volume to Capacity	0.56	0.02	1.19
Queue Length 95th (ft)	0	2	195
Control Delay (s)	0.0	0.7	232.1
Lane LOS		A	F
Approach Delay (s)	0.0	0.7	232.1
Approach LOS			F

Intersection Summary			
Average Delay	13.5		
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	1072	121	20	918	127	38
Peak Hour Factor	1.00	0.83	1.00	0.96	0.63	1.00
Hourly flow rate (vph)	1072	146	20	956	202	38
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1218		2141	1145
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1218		2141	1145
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			97		0	84
cM capacity (veh/h)			573		52	243

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	1218	976	240
Volume Left	0	20	202
Volume Right	146	0	38
cSH	1700	573	59
Volume to Capacity	0.72	0.03	4.05
Queue Length 95th (ft)	0	3	Err
Control Delay (s)	0.0	1.1	Err
Lane LOS		A	F
Approach Delay (s)	0.0	1.1	Err
Approach LOS			F

Intersection Summary			
Average Delay	984.8		
Intersection Capacity Utilization	80.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	13	667	44	21	927	11	104	0	30	13	1	42
Peak Hour Factor	1.00	0.90	1.00	1.00	0.95	0.50	0.68	1.00	1.00	0.42	1.00	0.55
Hourly flow rate (vph)	13	741	44	21	976	22	153	0	30	31	1	76
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	998			785			1895	1829	763	1848	1840	987
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	998			785			1895	1829	763	1848	1840	987
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	98			97			0	100	93	40	99	75
cM capacity (veh/h)	694			834			38	73	404	51	72	300

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	798	1019	183	108
Volume Left	13	21	153	31
Volume Right	44	22	30	76
cSH	694	834	44	124
Volume to Capacity	0.02	0.03	4.12	0.87
Queue Length 95th (ft)	1	2	Err	137
Control Delay (s)	0.5	0.8	Err	115.9
Lane LOS	A	A	F	F
Approach Delay (s)	0.5	0.8	Err	115.9
Approach LOS			F	F

Intersection Summary			
Average Delay	874.2		
Intersection Capacity Utilization	81.5%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Volume (veh/h)	27	726	53	25	713	5	52	1	27	10	8	32
Peak Hour Factor	0.81	0.96	0.80	1.00	0.96	0.50	0.69	1.00	1.00	0.75	1.00	1.00
Hourly flow rate (vph)	33	756	66	25	743	10	75	1	27	13	8	32
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	753			822			1690	1659	789	1681	1687	748
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	753			822			1690	1659	789	1681	1687	748
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			97			0	99	93	80	91	92
cM capacity (veh/h)	857			807			60	91	390	66	87	413

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	856	778	103	53
Volume Left	33	25	75	13
Volume Right	66	10	27	32
cSH	857	807	78	143
Volume to Capacity	0.04	0.03	1.33	0.37
Queue Length 95th (ft)	3	2	201	39
Control Delay (s)	1.0	0.8	309.3	44.4
Lane LOS	A	A	F	E
Approach Delay (s)	1.0	0.8	309.3	44.4
Approach LOS			F	E

Intersection Summary			
Average Delay	20.0		
Intersection Capacity Utilization	70.5%	ICU Level of Service	C
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	8	1124	7	10	789
Peak Hour Factor	0.50	0.50	0.86	0.88	0.63	1.00
Hourly flow rate (vph)	23	18	1490	9	18	899
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2430	1494			1499	
vC1, stage 1 conf vol	1494					
vC2, stage 2 conf vol	936					
vCu, unblocked vol	2430	1494			1499	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	88			96	
cM capacity (veh/h)	200	149			441	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	41	1499	18	899
Volume Left	23	0	18	0
Volume Right	18	9	0	0
cSH	174	1700	441	1700
Volume to Capacity	0.24	0.88	0.04	0.53
Queue Length 95th (ft)	22	0	3	0
Control Delay (s)	32.0	0.0	13.5	0.0
Lane LOS	D		B	
Approach Delay (s)	32.0	0.0	0.3	
Approach LOS	D			

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	77.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	6	975	2	5	1081
Peak Hour Factor	0.92	0.92	0.89	0.50	0.92	1.00
Hourly flow rate (vph)	5	7	1249	5	6	1232
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2496	1251			1253	
vC1, stage 1 conf vol	1251					
vC2, stage 2 conf vol	1245					
vCu, unblocked vol	2496	1251			1253	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	96			99	
cM capacity (veh/h)	227	208			548	

Direction, Lane #	WB 1	NB 1	SB 1	SB 2
Volume Total	12	1253	6	1232
Volume Left	5	0	6	0
Volume Right	7	5	0	0
cSH	216	1700	548	1700
Volume to Capacity	0.06	0.74	0.01	0.72
Queue Length 95th (ft)	5	0	1	0
Control Delay (s)	22.7	0.0	11.6	0.0
Lane LOS	C		B	
Approach Delay (s)	22.7	0.0	0.1	
Approach LOS	C			

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	10	8	1124	7	10	789
Peak Hour Factor	0.50	0.50	0.86	0.88	0.63	1.00
Hourly flow rate (vph)	23	18	1490	9	18	899
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2426	1490			1490	
vC1, stage 1 conf vol	1490					
vC2, stage 2 conf vol	936					
vCu, unblocked vol	2426	1490			1490	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	89	88			96	
cM capacity (veh/h)	201	150			445	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	41	1490	9	18	899
Volume Left	23	0	0	18	0
Volume Right	18	0	9	0	0
cSH	175	1700	1700	445	1700
Volume to Capacity	0.23	0.88	0.01	0.04	0.53
Queue Length 95th (ft)	22	0	0	3	0
Control Delay (s)	31.8	0.0	0.0	13.4	0.0
Lane LOS	D			B	
Approach Delay (s)	31.8	0.0		0.3	
Approach LOS	D				

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	77.4%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	4	6	975	2	5	1081
Peak Hour Factor	0.92	0.92	0.89	0.50	0.92	1.00
Hourly flow rate (vph)	5	7	1249	5	6	1232
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	TWLTL					
Median storage veh)	5					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2494	1249			1249	
vC1, stage 1 conf vol	1249					
vC2, stage 2 conf vol	1245					
vCu, unblocked vol	2494	1249			1249	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	98	96			99	
cM capacity (veh/h)	227	209			550	

Direction, Lane #	WB 1	NB 1	NB 2	SB 1	SB 2
Volume Total	12	1249	5	6	1232
Volume Left	5	0	0	6	0
Volume Right	7	0	5	0	0
cSH	216	1700	1700	550	1700
Volume to Capacity	0.06	0.73	0.00	0.01	0.72
Queue Length 95th (ft)	5	0	0	1	0
Control Delay (s)	22.7	0.0	0.0	11.6	0.0
Lane LOS	C			B	
Approach Delay (s)	22.7	0.0		0.1	
Approach LOS	C				

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

TRAFFIC ENGINEERING REPORT ADDENDUM

FOR THE PROPOSED

KALANIANAOLE HIGHWAY IMPROVEMENTS

OLOMANA GOLF COURSE, KUMUHAU STREET, & MOOLE STREET INTERSECTIONS

APPENDIX C

TRAFFIC SIGNAL WARRANT ANALYSIS WORKSHEETS

TRAFFIC SIGNAL WARRANTS

Project: Kalanianaole Highway Improvements
Prepared By: The Traffic Management Consultant

Major Street: Kalanianaole Highway — Critical Approach Speed 25 mph — No. of Lanes 1
Minor Street: Kumuhau Street — Critical Approach Speed 25 mph — No. of Lanes 1

Critical speed on major street (mph)	≥	40	☐
			or
Population in built up area of isolated community	≤	10,000	☐

WARRANT 1 - Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	Minimum Vehicular Volume			Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major Street- 1 Lane (Both Approaches)	500	400	350	1,312	1,276	1,449	1,648	1,879	2,131	1,942	1,420
Minor Street-1 Lane (One Direction Only)	150	120	105	80	70	99	138	112	165	154	129

Condition B - Interruption of Continuous Traffic

(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	Minimum Vehicular Volume			Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major Street- 1 Lane (Both Approaches)	750	600	525	1312	1276	1449	1648	1879	2131	1942	1420
Minor Street-1 Lane (One Direction Only)	75	60	53	80	70	99	138	112	165	154	129

WARRANT 2 - Four Hour Volume

(Ref.: MUTCD, Figures 4C-1 & 4C-2)

100% Satisfied	**YES** ☑	**NO** ☐
70% Satisfied	**YES** ☑	**NO** ☐

	Minimum Volume		Hourly Vehicular Volumes			
STREET - APPROACH LANES	100%	70%	2:00 PM	3:00 PM	4:00 PM	5:00 PM
Major Street - 1 Lanes (Both Approaches)	1100	770	1,648	1,879	2,131	1,942
Minor Street - 1 Lanes (One Direction Only)	80	60	138	112	165	154

TRAFFIC SIGNAL WARRANTS
Major Street: **Kalanianaole Highway**
Minor Street: **Kumuhau Street**

WARRANT 3 - Peak Hour

Category A - Peak Hour Delay **Satisfied (PM)** **YES** ☑ **NO** ☐

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four (4) vehicle-hours (veh-hrs) for one-lane approach; and — Approach Delay (veh-hrs) = 4.2 YES ☑ NO ☐

2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic; and — Approach Volume (vph) = 112 YES ☑ NO ☐

3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches — Entering Volume (vph) = 1,840 YES ☑ NO ☐

Category B - Vehicular Volume **100% Satisfied** **YES** ☑ **NO** ☐
(Ref.: MUTCD, Figures 4C-3 & 4C-4) **70% Satisfied** **YES** ☑ **NO** ☐

	Minimum Volume		Hourly Volumes
STREET - APPROACH LANES	100%	70%	3:00 PM
Major Street - 1 Lane (Both Approaches)	1500	1000	1,879
Minor Street - 1 Lane (One Direction Only)	100	75	112

WARRANT 4 - Pedestrian Traffic

Satisfied **YES** ☐ **NO** ☑

1. The pedestrian volume exceed 190 pedestrians per hour (ped/hr); and — Pedestrian Volume (ped/hr) = 2 YES ☐ NO ☑

2. There are fewer than 60 gaps per hour adequate for pedestrian crossings. — Gaps per hour = 12 YES ☑ NO ☐

Source: Figure 14-11, pp.270-272, Manual of Transportation Studies, ITE, H. Douglas Robertson, et al, Modified in accordance with the Manual on Uniform Traffic Control Devices, Millenium Edition, Federal Highways Administration, U.S. Department of Transportation

TRAFFIC SIGNAL WARRANTS

Project: Kalanianaole Highway Improvements
Prepared By: The Traffic Management Consultant

Major Street: Kalanianaole Highway — Critical Approach Speed 25 mph — No. of Lanes 1
Minor Street: Moole Street — Critical Approach Speed 25 mph — No. of Lanes 1

Critical speed on major street (mph)	≥	40	☐
		or	
Population in built up area of isolated community	≤	10,000	☐

WARRANT 1 - Eight-Hour Vehicular Volume

Condition A - Minimum Vehicular Volume

(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	Minimum Vehicular Volume			Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major Street- 1 Lane (Both Approaches)	500	400	350	1,074	1,042	1,211	1,451	1,548	1,820	1,439	1,199
Minor Street-1 Lane (One Direction Only)	150	120	105	51	53	74	75	81	70	69	53

Condition B - Interruption of Continuous Traffic

(Ref.: MUTCD, Table 4C-1)

100% Satisfied	**YES** ☐	**NO** ☑
80% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☐	**NO** ☑

	Minimum Vehicular Volume			Hourly Vehicular Volumes							
STREET-APPROACH LANES	100%	80%	70%	11:00 AM	12:00 PM	1:00 PM	2:00 PM	3:00 PM	4:00 PM	5:00 PM	6:00 PM
Major Street- 1 Lane (Both Approaches)	750	600	525	1074	1042	1211	1451	1548	1820	1439	1199
Minor Street-1 Lane (One Direction Only)	75	60	53	51	53	74	75	81	70	69	53

WARRANT 2 - Four Hour Volume

(Ref.: MUTCD, Figures 4C-1 & 4C-2)

100% Satisfied	**YES** ☐	**NO** ☑
70% Satisfied	**YES** ☑	**NO** ☐

	Minimum Volume		Hourly Vehicular Volumes			
STREET - APPROACH LANES	100%	70%	1:00 PM	2:00 PM	3:00 PM	4:00 PM
Major Street - 1 Lanes (Both Approaches)	1100	770	1,211	1,451	1,548	1,820
Minor Street - 1 Lanes (One Direction Only)	80	60	74	75	81	70

TRAFFIC SIGNAL WARRANTS
Major Street: Kalanianaole Highway
Minor Street: Moole Street

WARRANT 3 - Peak Hour

Category A - Peak Hour Delay (2002 Data) — **Satisfied** YES ☐ NO ☑

1. The total delay experienced for traffic on one minor street approach controlled by a STOP sign equals or exceeds four (4) vehicle-hours for one-lane approach; and — Approach Delay (veh-hrs) = 0.7 — YES ☐ NO ☑
2. The volume on the same minor street approach equals or exceeds 100 vph for one moving lane of traffic; and — Approach Volume (vph) = 96 — YES ☐ NO ☑
3. The total entering volume serviced during the hour equals or exceeds 800 vph for intersections with four or more approaches — Entering Volume (vph) = 1,462 — YES ☑ NO ☐

Category B - Vehicular Volume (2004 Data) — **100% Satisfied** YES ☑ NO ☐
(Ref.: MUTCD, Figures 4C-3 & 4C-4) — **70% Satisfied** YES ☑ NO ☐

	Minimum Volume		Hourly Volumes
STREET - APPROACH LANES	100%	70%	7:00 AM
Major Street - 1 Lane (Both Approaches)	1500	1000	1,683
Minor Street - 1 Lane (One Direction Only)	100	75	130

WARRANT 4 - Pedestrian Traffic

Satisfied YES ☐ NO ☑

1. The pedestrian volume exceed 190 pedestrians per hour (ped/hr); and — Pedestrian Volume (ped/hr) = 11 — YES ☐ NO ☑
2. There are fewer than 60 gaps per hour adequate for pedestrian crossings. — Gaps per hour = 15 — YES ☑ NO ☐

Source: Figure 14-11, pp.270-272, Manual of Transportation Studies, ITE, H. Douglas Robertson, et al, Modified in accordance with the Manual on Uniform Traffic Control Devices, Millenium Edition, Federal Highways Administration, U.S. Department of Transportation

APPENDIX D

HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)

(Rev. 11/68)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
MEMORANDUM

HWY-TS 2.2426

TO: HWY-DS **DATE:** November 14, 2003

ATTN: SCOT URADA

FROM: HWY-T

SUBJECT: TRAFFIC ACCIDENT ANALYSIS FOR KALANIANAOLE HIGHWAY, MP 2.2 – 2.8

We have conducted a traffic accident analysis for Kalanianaole Highway, MP 2.2 – 2.8 as part of the Highway Safety Improvement Program (HSIP) under Title 23, United States Code, Section 152, and have identified no high hazard locations within the limits of the project.

Although accident history is not significant, improving the roadway alignment would mitigate the types of accidents occurring.

If there are any questions, please call the Traffic Safety Section at 692-7685.

JH:ss

(Rev. 11/68)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
MEMORANDUM

HWY-TS 2.5175

TO: HWY-DS **DATE:** August 18, 2004

ATTN: VINCENT LLORIN

FROM: HWY-T A. Yalui

SUBJECT: TRAFFIC ACCIDENT ANALYSIS FOR KALANIANAOLE HIGHWAY IMPROVEMENTS, WAIMANALO BEACH PARK TO OLOMANA GOLF COURSE.

The Traffic Branch has conducted a traffic safety analysis for the subject project under its Highway Safety Improvement Program (HSIP) of Title 23, United States Code, Section 152. This traffic safety analysis is protected under Title 23, U.S.C., Sections 402(k) and 409, and is intended for highway safety and educational purposes only. No potential areas of concern have been identified within the limits of the project.

Although accident history is not significant, we recommend the following improvements:

1) We noticed a number of single vehicle, run-off the road collisions. To address this, we recommend reviewing all roadside features throughout the limits of the project.

2) Intersection ahead signs should be installed at appropriate locations throughout the limits of the project to warn motorists of approaching intersections and the possibility of turning or entering traffic.

3) A two-way left-turn lane (TWLTL) would assist the left-turning vehicles to and from intersections and driveways. A TWLTL would also reduce the number of vehicles congesting the through lanes and discourage motorists from driving on the shoulders illegally to pass the turning vehicles. Acceleration and deceleration lanes should also be considered to reduce driver error when making turns.

If there are any questions, please call the Traffic Safety Section at 692-7685.

JH:ss

c: HWY-TD

(Rev. 11/68)

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
MEMORANDUM

HWY-TS 2.7743

TO: HWY-DS **DATE:** May 20, 2005

ATTN: VINCENT LLORIN

FROM: HWY-T G. Jalusi

SUBJECT: KALANIANAOLE HIGHWAY IMPROVEMENTS, OLOMANA GOLF COURSE AREA AND POLO FIELDS.

The Traffic Branch has conducted a traffic safety study for the subject area under its Highway Safety Improvement Program (HSIP) of Title 23, United States Code, Section 152. This traffic safety study is protected under Title 23, U.S.C., Sections 402(k) and 409, and is intended for highway safety and educational purposes only.

We have studied the two locations on Kalanianaole Highway at Olomana Golf Course and the Polo Fields utilizing accident data from the 3 most recent years of data available and have found the following:

1. Olomana Golf Course Area (Milepost 2.2 – 2.6) -
   Night to day accident rate is higher than statewide average.
   Majority of the accidents that occurred at this location were recorded on the accident report forms as having lit-spot or lit-continuous conditions at the time of the accident. If these conditions are true, the night to day accident rate should not be considered in the warrant for areas where lighting already exists.

2. Polo Fields Area (Milepost 3.9 – 4 .6) -
   Night to day accident rate is lower than statewide average.

Please note that this study alone does not warrant any highway lighting. This study was conducted to contribute to the factors necessary to determine if highway lighting is warranted. We recommend a full study be completed to determine the validity of the warrant.

If there are any questions, please call the Traffic Safety Section at 692-7685.

APPENDIX E

HIGHWAY ILLUMINATION CALCULATIONS

Kalanianaole Highway Improvements
Waimanalo Beach Park to Olomana Golf Course

Federal Aid Project No. STP-072-1(41)

8-Dec-05 24120/A

Roadway Illumination Calculations Summary

Roadway Illumination Requirements:

Classification:	**Major / Residential**
Average Maintained fc:	**0.8**
Avg to Min Uniformity ratio:	**3:1**

Roadway Locations	Optimized Calculation Layout File Name	Max. Pole Spacing (ft) (located 4'-0" from edge of travelway)	(One Side spacing) 30' luminaire mounting height, 8' bracket arm Photometric Data M-C-II, GE 1005				
			footcandles			**uniformity ratio**	
			average	maximum	minimum	max / min	**avg / min**
Two 11'-0" travel lanes (no left turn lane)	Layout 1A	**154.0**	**0.97**	2.20	0.40	5.50	**2.43**
Inbound 11'-0" travel lane (with left turn lane)	Layout 1	**155.0**	**0.97**	2.20	0.40	5.50	**2.43**
Left turn lane, 10'-0"	Layout 2	**168.0**	**0.95**	2.10	0.40	5.25	**2.38**
Outbound 11'0" travfel lane (with left turn lane)	Layout 3	**138.0**	**0.80**	1.20	0.60	2.00	**1.33**

For Report, used average spacing of approximately 140'-0" (taking into account possible pole spacing distances between intersections)

Roadway Optimizer - Layout #1A

two 11'-0" travel lanes (no left turn lane)

Luminaire Label: GE1005
Luminaire Description: (not specific to a single catalog number)
File Name: GE1005.IES
Luminaire Arrangement: SINGLE
Arm Length = 8 Ft
Lumens Per Lamp = 16000
Number Of Lamps = 1
Total Light Loss Factor = 0.76

Layout Information:

R-Table: R3 (Slightly Specular), Q0=0.07
Calculation Method: IES

Layout Type: One Row, Near Side; 1RNS
Luminaire Spacing (Within Row) = 154 Ft
Roadway Width = 11 Ft
Setback = 4 Ft
Lanes Per Roadway = 2

Luminaire Location Summary:
Coordinates in Ft

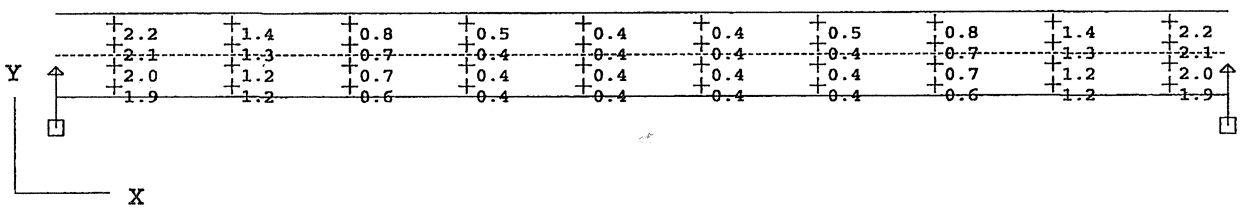
X-Coord	Y-Coord	Z-Coord	Orient	Tilt
-154	-4	30	90	0
0	-4	30	90	0
154	-4	30	90	0
308	-4	30	90	0
462	-4	30	90	0

Total Number of locations = 5
Average Tilted Lamp Correction Factor Applied = 1

AGI32/Roadway Optimizer - copyright 1999-2004 by Lighting Analysts, Inc.

Roadway Optimizer - Layout #1A

Illuminance Grid:



Numerical Summary:
Luminaire Spacing (Within Row) = 154 Ft
Grid begins at: X = 7.7 Y = 1.375 Z = 0
Point Spacing Left-To-Right = 15.4 Ft
Point Spacing Top-To-Bottom = 2.75 Ft
Values in Fc

Average = 0.97 Maximum = 2.2 Minimum = 0.4
Avg/Min = 2.43
Max/Min = 5.50

Longitudinal Uniformity (Min/Max) per row starting with top row:
0.18 0.19 0.2 0.16

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Roadway Optimizer - Layout #1

inbound 11' travel lane

Luminaire Label: GE1005
Luminaire Description: (not specific to a single catalog number)
File Name: GE1005.IES
Luminaire Arrangement: SINGLE
Arm Length = 8 Ft
Lumens Per Lamp = 16000
Number Of Lamps = 1
Total Light Loss Factor = 0.76

Layout Information:

R-Table: R3 (Slightly Specular), Q0=0.07
Calculation Method: IES

Layout Type: One Row, Near Side; 1RNS
Luminaire Spacing (Within Row) = 155 Ft
Roadway Width = 11 Ft
Setback = 4 Ft
Lanes Per Roadway = 1

Luminaire Location Summary:
Coordinates in Ft

X-Coord	Y-Coord	Z-Coord	Orient	Tilt
-155	-4	30	90	0
0	-4	30	90	0
155	-4	30	90	0
310	-4	30	90	0
465	-4	30	90	0

Total Number of locations = 5
Average Tilted Lamp Correction Factor Applied = 1

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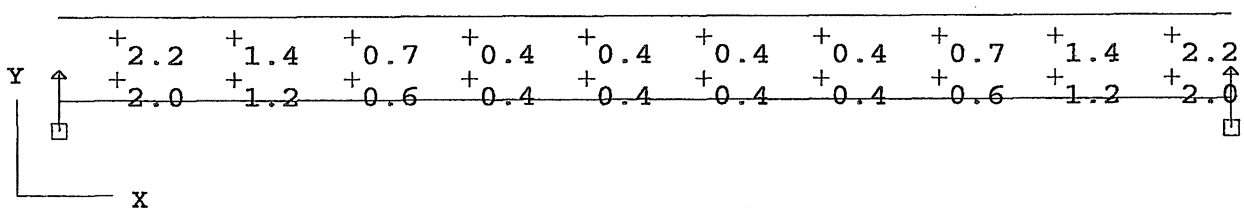
Roadway Optimizer - Layout #1

Illuminance Grid:



Numerical Summary:
Luminaire Spacing (Within Row) = 155 Ft
Grid begins at: X = 7.75 Y = 2.75 Z = 0
Point Spacing Left-To-Right = 15.5 Ft
Point Spacing Top-To-Bottom = 5.5 Ft
Values in Fc

Average = 0.97 Maximum = 2.2 Minimum = 0.4
Avg/Min = 2.43
Max/Min = 5.50

Longitudinal Uniformity (Min/Max) per row starting with top row:
0.18 0.2

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Roadway Optimizer - Layout #2

10' left turn lane

Luminaire Label: GE1005
Luminaire Description: (not specific to a single catalog number)
File Name: GE1005.IES
Luminaire Arrangement: SINGLE
Arm Length = 8 Ft
Lumens Per Lamp = 16000
Number Of Lamps = 1
Total Light Loss Factor = 0.76

Layout Information:

R-Table: R3 (Slightly Specular), Q0=0.07
Calculation Method: IES

Layout Type: One Row, Near Side; 1RNS
Luminaire Spacing (Within Row) = 168 Ft
Roadway Width = 10 Ft
Setback = 15 Ft
Lanes Per Roadway = 1

Luminaire Location Summary:
Coordinates in Ft

X-Coord	Y-Coord	Z-Coord	Orient	Tilt
-168	-15	30	90	0
0	-15	30	90	0
168	-15	30	90	0
336	-15	30	90	0
504	-15	30	90	0

Total Number of locations = 5
Average Tilted Lamp Correction Factor Applied = 1

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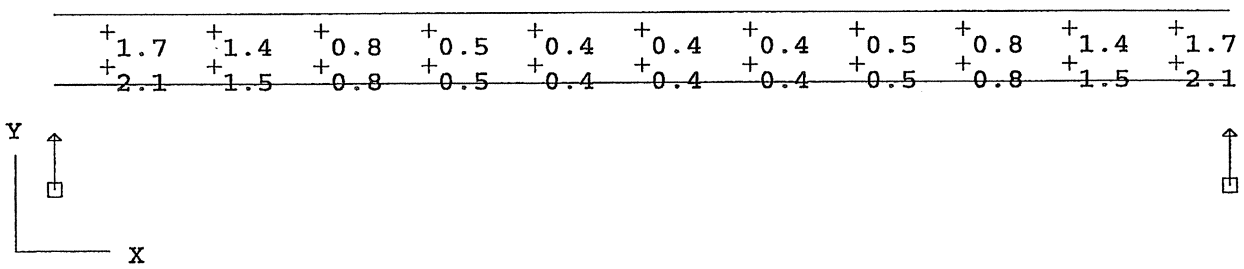
Roadway Optimizer - Layout #2

Illuminance Grid:



Numerical Summary:
Luminaire Spacing (Within Row) = 168 Ft
Grid begins at: X = 7.6365 Y = 2.5 Z = 0
Point Spacing Left-To-Right = 15.273 Ft
Point Spacing Top-To-Bottom = 5 Ft
Values in Fc

Average = 0.95 Maximum = 2.1 Minimum = 0.4
Avg/Min = 2.38
Max/Min = 5.25

Longitudinal Uniformity (Min/Max) per row starting with top row:
0.24 0.19

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Roadway Optimizer - Layout #3

outbound 11' travel lane

Luminaire Label: GE1005
Luminaire Description: (not specific to a single catalog number)
File Name: GE1005.IES
Luminaire Arrangement: SINGLE
Arm Length = 8 Ft
Lumens Per Lamp = 16000
Number Of Lamps = 1
Total Light Loss Factor = 0.76

Layout Information:

R-Table: R3 (Slightly Specular), Q0=0.07
Calculation Method: IES

Layout Type: One Row, Near Side; 1RNS
Luminaire Spacing (Within Row) = 138 Ft
Roadway Width = 11 Ft
Setback = 26 Ft
Lanes Per Roadway = 1

Luminaire Location Summary:
Coordinates in Ft

X-Coord	Y-Coord	Z-Coord	Orient	Tilt
-138	-26	30	90	0
0	-26	30	90	0
138	-26	30	90	0
276	-26	30	90	0
414	-26	30	90	0

Total Number of locations = 5
Average Tilted Lamp Correction Factor Applied = 1

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Roadway Optimizer - Layout #3

Illuminance Grid:

0.8	0.8	0.7	0.6	0.6	0.6	0.6	0.7	0.8	0.8
1.2	1.2	0.8	0.7	0.6	0.6	0.7	0.8	1.2	1.2

Numerical Summary:
Luminaire Spacing (Within Row) = 138 Ft
Grid begins at: X = 6.9 Y = 2.75 Z = 0
Point Spacing Left-To-Right = 13.8 Ft
Point Spacing Top-To-Bottom = 5.5 Ft
Values in Fc

Average = 0.8 Maximum = 1.2 Minimum = 0.6
Avg/Min = 1.33
Max/Min = 2.00

Longitudinal Uniformity (Min/Max) per row starting with top row:
0.75 0.5

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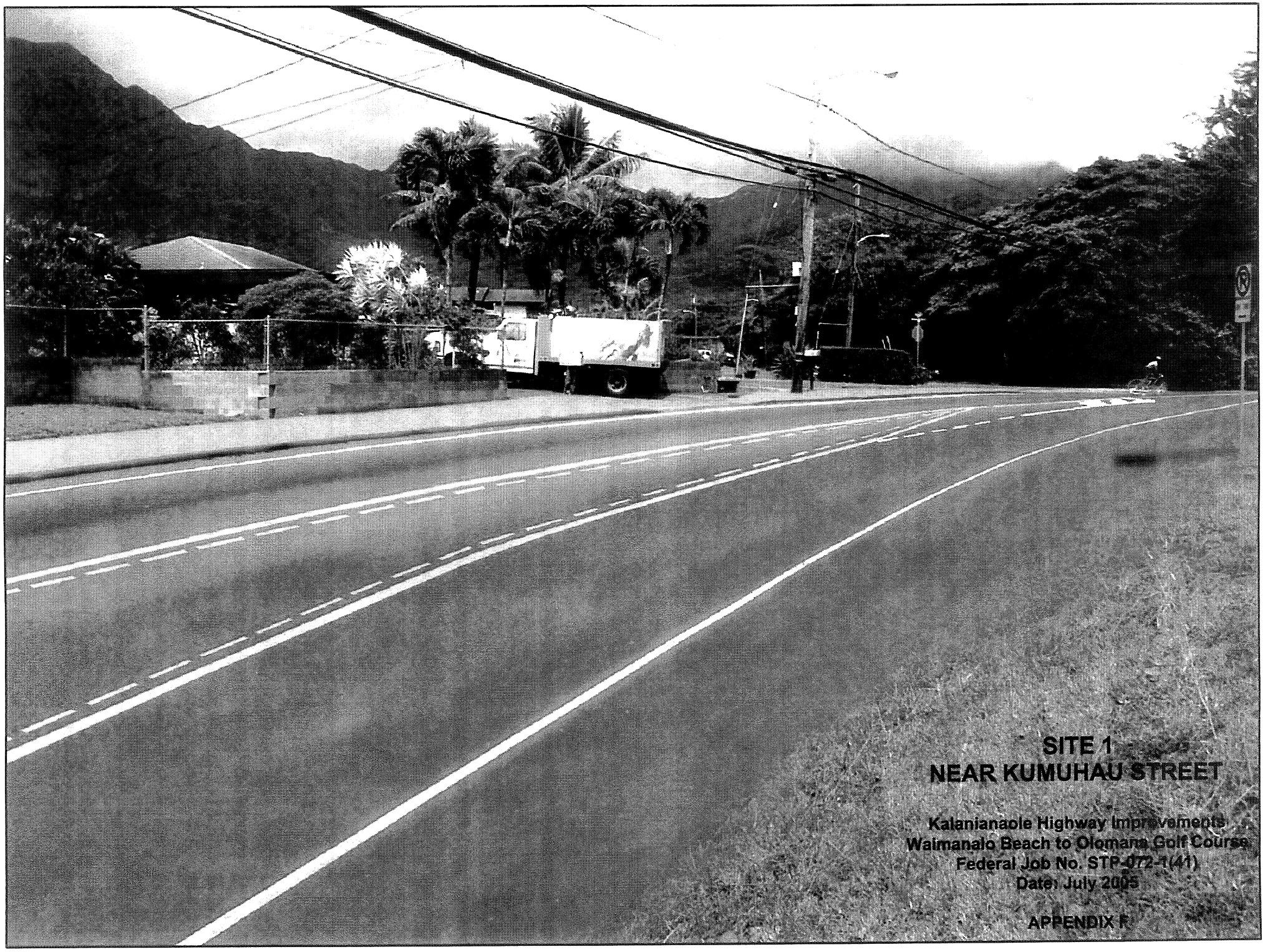
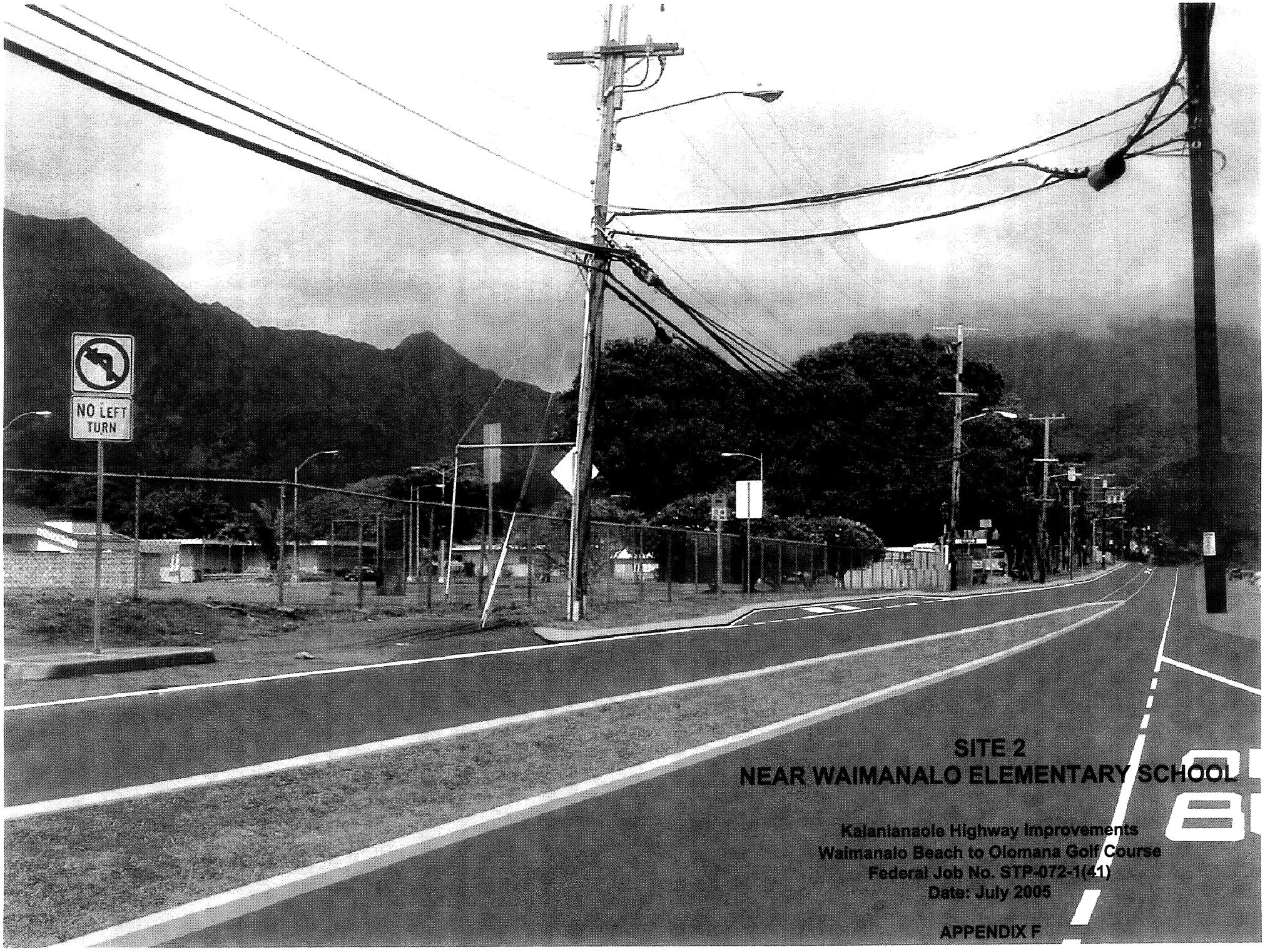
APPENDIX F

RENDERINGS

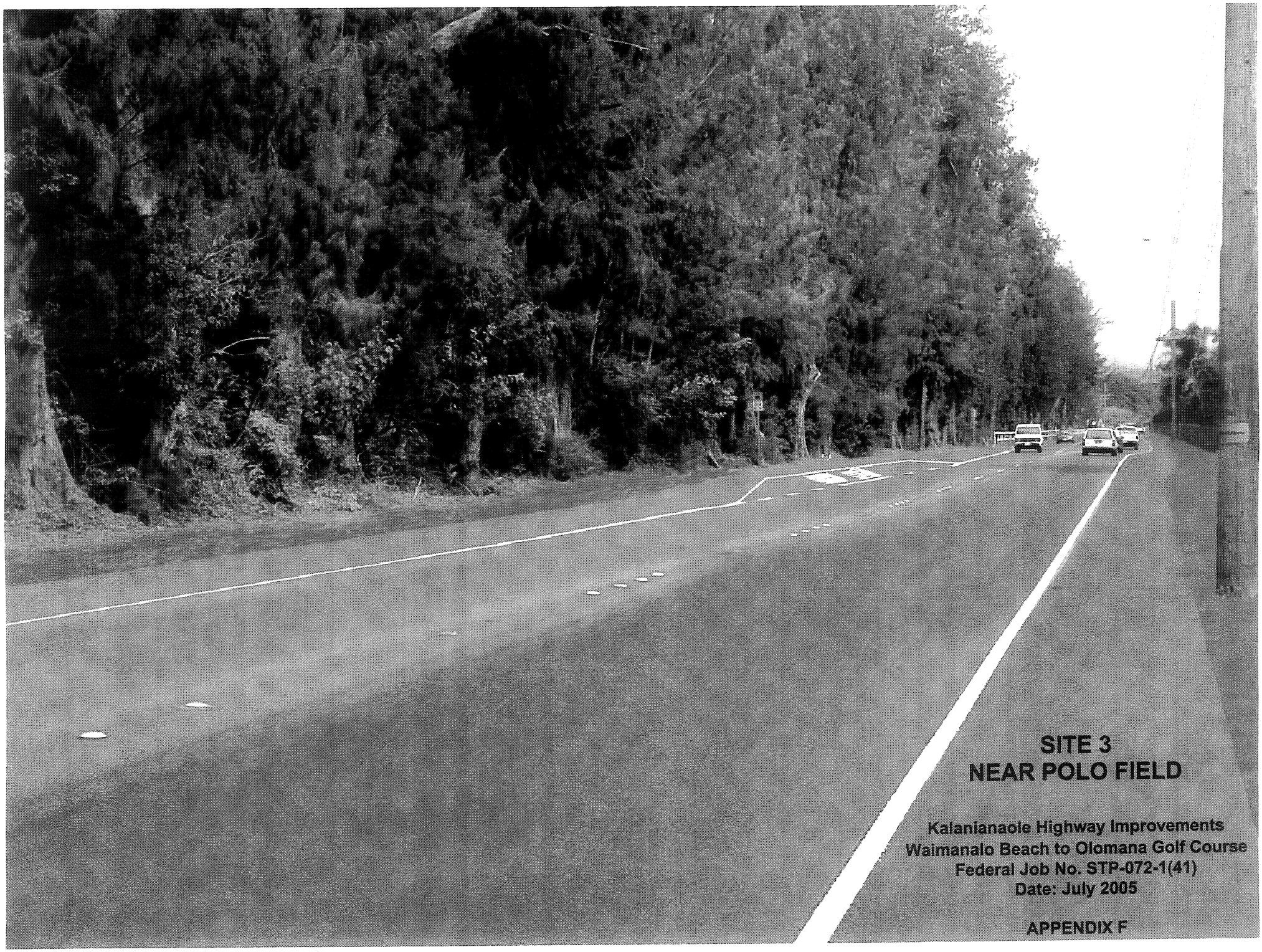

SITE 1
NEAR KUMUHAU STREET
Kalanianaole Highway Improvements
Waimanalo Beach to Olomana Golf Course
Federal Job No. STP-072-1(41)
Date: July 2005
APPENDIX F



SITE 2
NEAR WAIMANALO ELEMENTARY SCHOOL

Kalanianaole Highway Improvements
Waimanalo Beach to Olomana Golf Course
Federal Job No. STP-072-1(41)
Date: July 2005

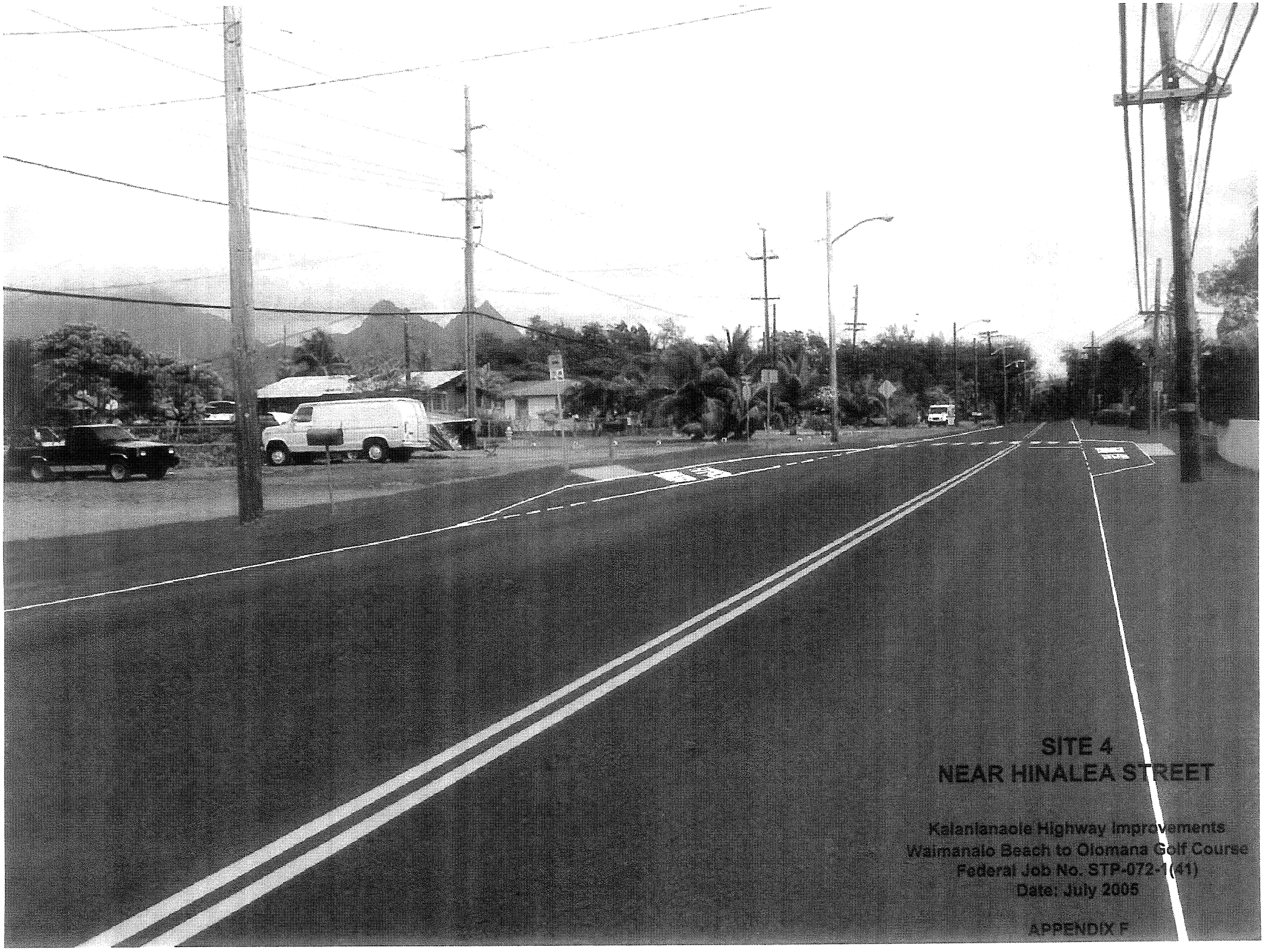
APPENDIX F



SITE 3
NEAR POLO FIELD

Kalanianaole Highway Improvements
Waimanalo Beach to Olomana Golf Course
Federal Job No. STP-072-1(41)
Date: July 2005

APPENDIX F


SITE 4
NEAR HINALEA STREET
Kalanianaole Highway Improvements
Waimanalo Beach to Olomana Golf Course
Federal Job No. STP-072-1(41)
Date: July 2005
APPENDIX F