Final Environmental Assessment

Volume II of II

PROPOSED MAUI MEDICAL PLAZA PROJECT AND RELATED IMPROVEMENTS AT TMK (2) 3-7-011:028 KAHULUI, MAUI, HAWAII

Prepared for:

Kanaha Professional Plaza, LLC

June 2011

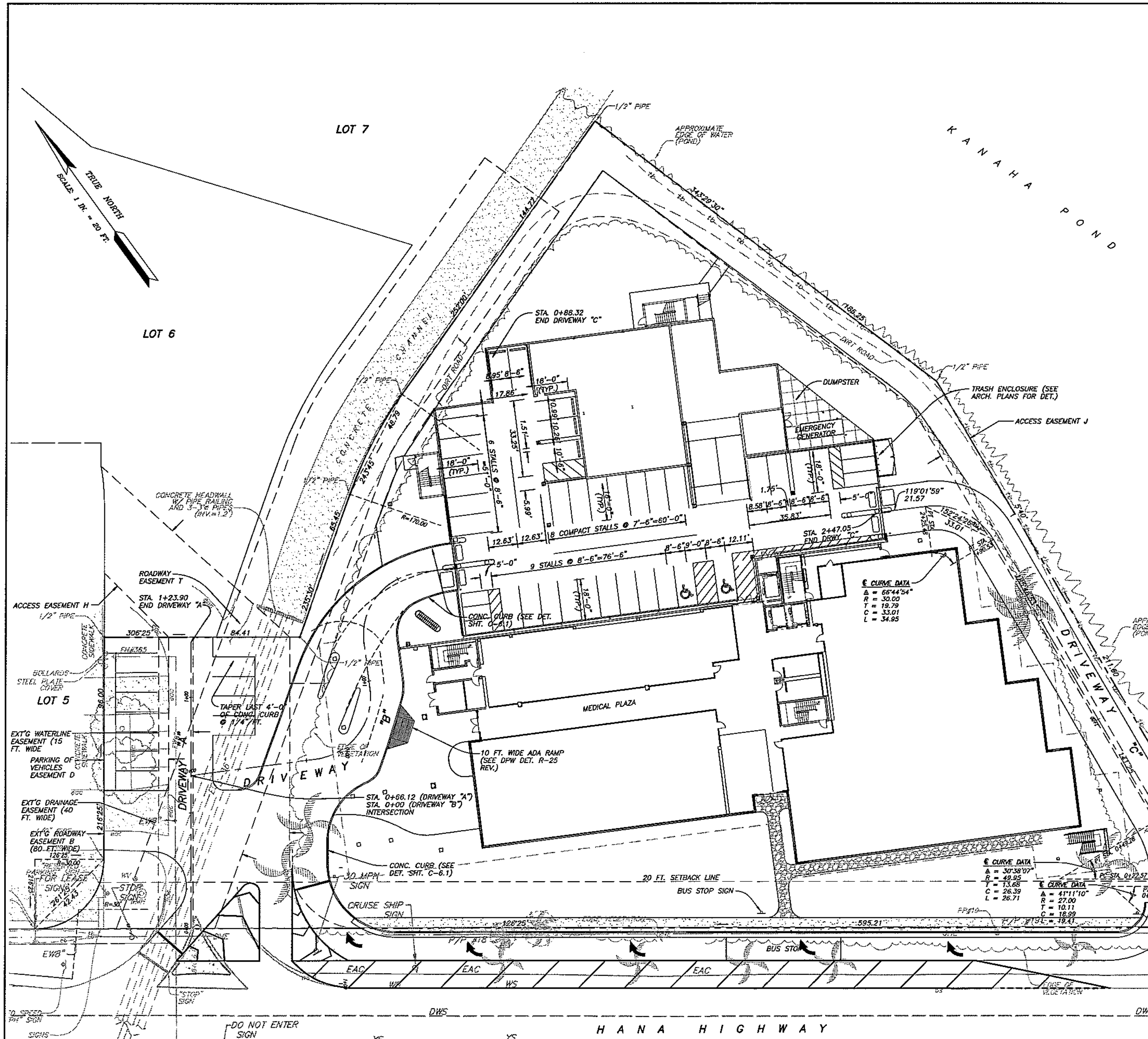
MUNEKIYO HIRAGA, INC.

VOLUME II OF II

LIST OF APPENDICES

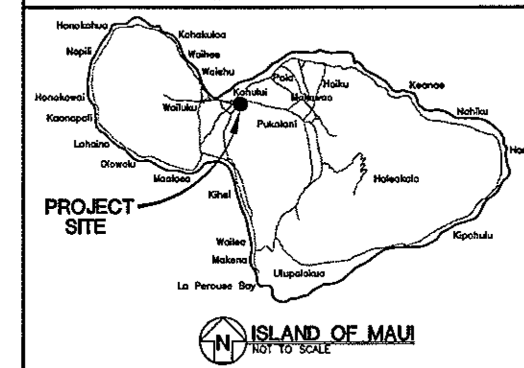
APPENDIX A.

Preliminary Development and Landscaping Plans

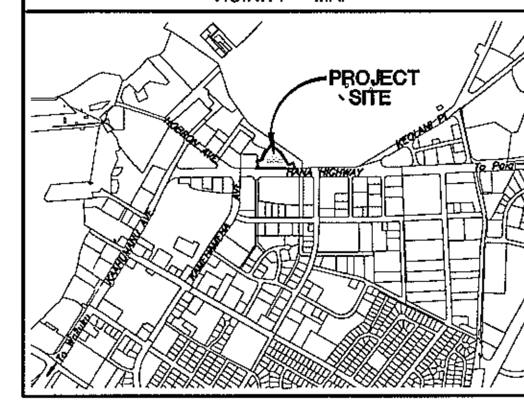


SITE PLAN
SCALE: 1 IN. = 20 FT.

LOCATION MAP



VICINITY MAP



APPROVED BY

DIRECTOR, DEPARTMENT OF PUBLIC WORKS AND ENVIRONMENTAL MANAGEMENT COUNTY OF MAUI	DATE
DIRECTOR, DEPARTMENT OF WATER SUPPLY COUNTY OF MAUI (APPROVAL LIMITED TO IMPROVEMENTS TO BE DEDICATED TO THE DEPARTMENT OF WATER SUPPLY)	DATE
CHIEF, HIGHWAYS DIVISION STATE DEPARTMENT OF TRANSPORTATION (APPROVAL GRANTED FOR WORK WITHIN THE STATE HIGHWAY RIGHT-OF-WAY ONLY) APPROVAL LETTER NO. HWY-M_______ DATED_______ ID NO. _______.	DATE

OTOMO ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS
305 S. HIGH STREET, STE. 102
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 242-0032
FAX: (808) 242-5779

STACY A. OTOMO
LICENSED PROFESSIONAL ENGINEER
No. 5115-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" AS DEFINED UNDER SECTION 16-115-2 OF THE HAWAII ADMINISTRATIVE RULES, PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS.

Stacy A. Otomo 4-27-10
SIGNATURE DATE

NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

MAUI MEDICAL PLAZA
TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII
SITE PLAN

REVISION	DATE	NOTE
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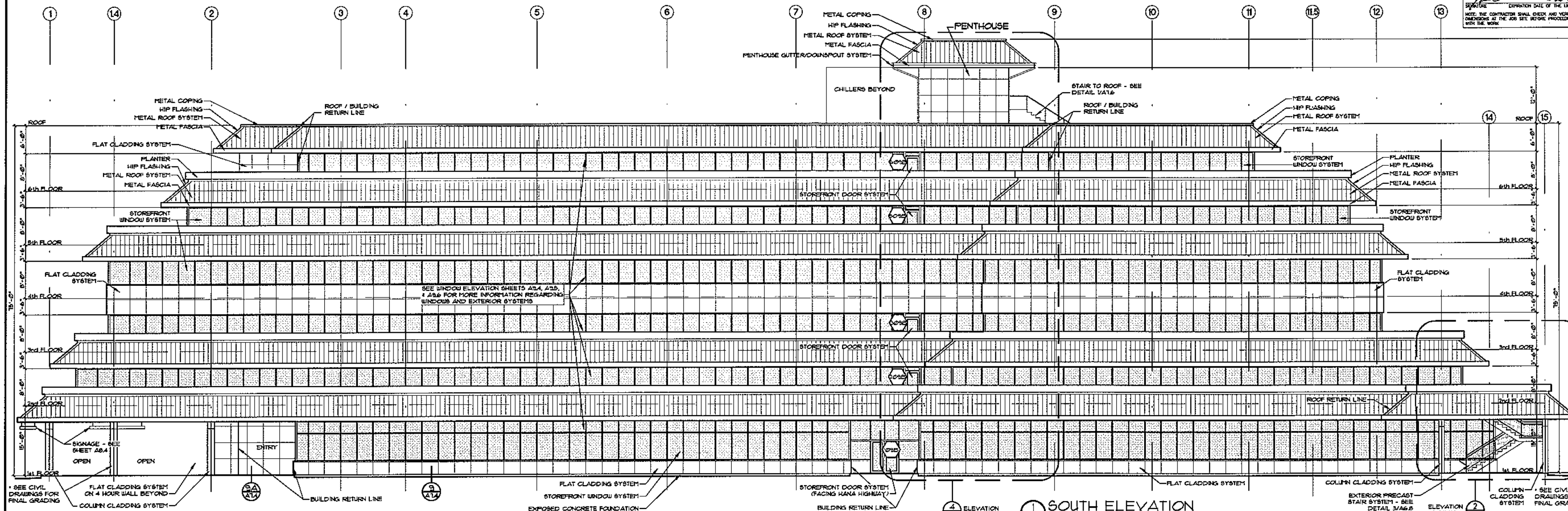
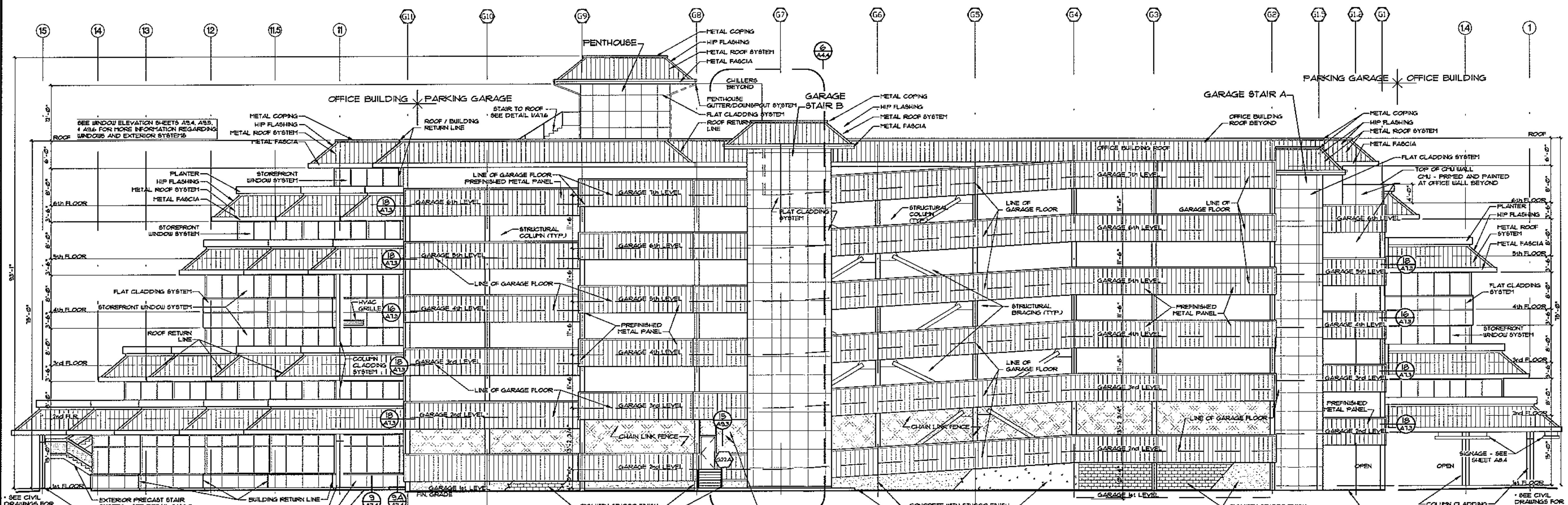
DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: SITE-00
DATE: 4-27-10 (PERMIT SUBMITTAL)

SHEET NO.
C1.1
OF SHEETS



1 SOUTH ELEVATION
A4.1 3/32" = 1'-0"



2 NORTH ELEVATION
A4.1 3/32" = 1'-0"

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SIGNATURE — EXPIRATION DATE OF THE LICENSE: 4-30-10

NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

HAWAII, USA — LICENSED PROFESSIONAL ARCHITECT No. 5769 — HARRISON G. FAGG

HARRISON G FAGG & ASSOCIATES - ARCHITECTS & ENGINEERS

JACK CLARK - SHERRIL F. BURKE - MICHAEL J. BURKE - JEFFREY WINKLER • MEMBER OF THE AMERICAN INSTITUTE OF ARCHITECTS

DRAWN BY	JOB NO.	DRAWING TITLE	JOB TITLE
JC	2637	NORTH & SOUTH ELEVATIONS	MAUI MEDICAL PLAZA
CHECKED BY HGF	DATE: 6-1-07 REV: 11-15-10		

HGFA ARCHITECTS

800 GRANITE TOWER, BILLINGS, MONTANA 59101 - PH (406) 248-7811 - FAX (406) 259-9278 - Email HGFA@hgfa.net

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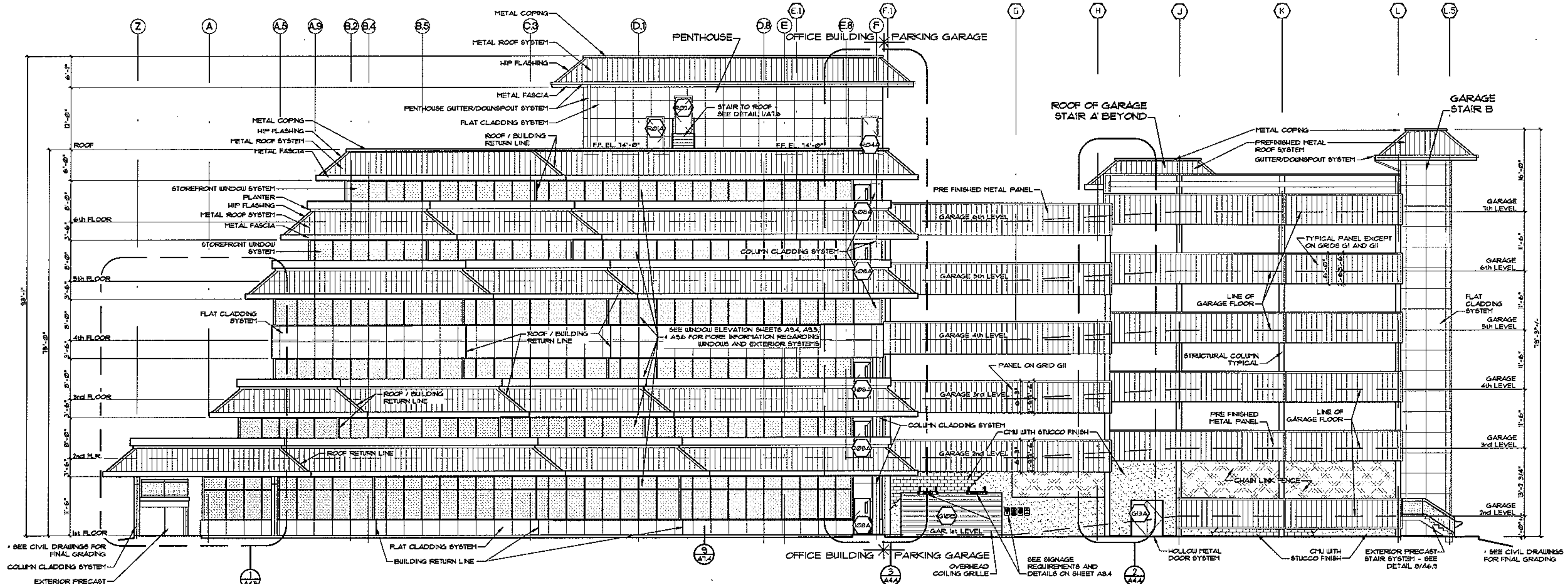
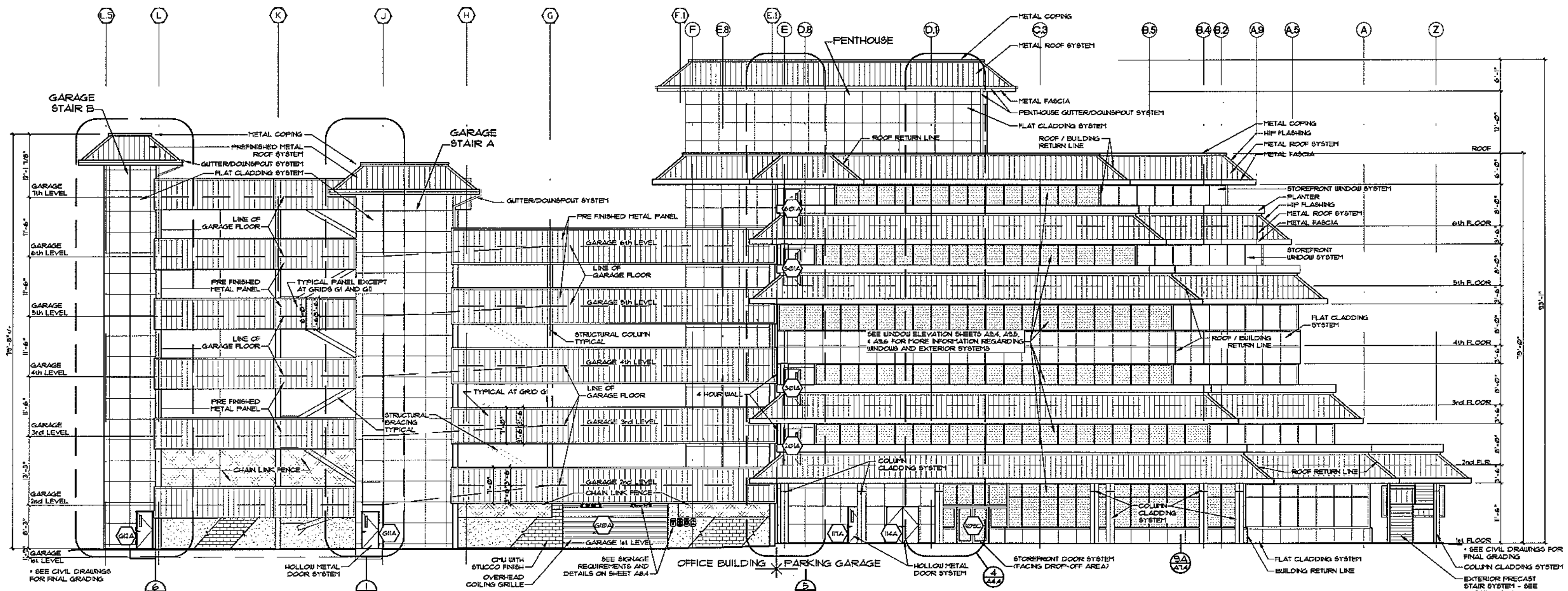
SHEET
A4.1
OF
63



EAST ELEVATION
3/32" = 1'-0"



WEST ELEVATION
3/32" = 1'-0"

HAWAII, U.S.A. LICENSED PROFESSIONAL ARCHITECT No. 5769 HARRISON G. FAGG

4-30-10

HARRISON G FAGG & ASSOCIATES - ARCHITECTS & ENGINEERS

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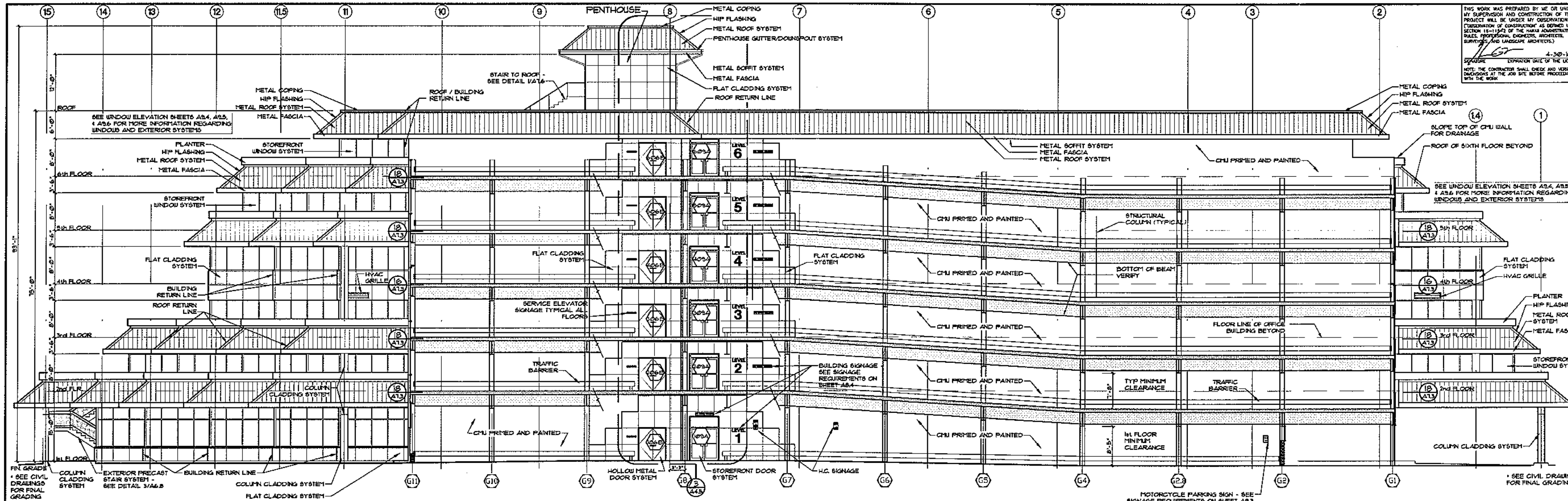
DRAWN BY JC	JOB NO. 2637	DRAWING TITLE EAST & WEST ELEVATIONS
CHECKED BY HGF	DATE: 8-1-07 REV: 11-15-10	JOB TITLE MAUI MEDICAL PLAZA

SHEET A4.2 OF 63



1 NORTH OFFICE BUILDING ELEVATION
A4.3 3/32" = 1'-0"

EXTERIOR MATERIAL LIST

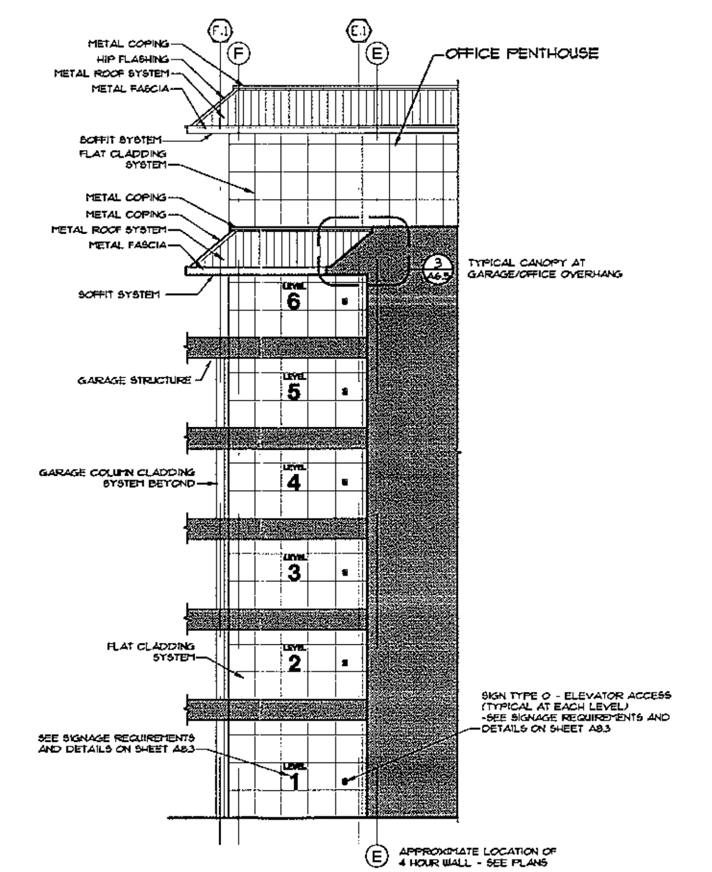
* SEE FLOOR PLANS, BUILDING AND WALL SECTIONS.

OFFICE BUILDING

SINGLE-PLY ROOFING	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATIONS STYLE: 60 MIL TPO COLOR: WHITE
METAL COPING	MANUF.: CENTRIA STYLE: SEE DETAIL 2/A6.1 GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: SELECTED BY ARCHITECT * NOTE: CENTRIA CAN MANUFACTURE OR FURNISH MATERIAL - CONTRACTORS CHOICE
METAL ROOF SYSTEM & ACCESSORIES	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
DRIP EDGE	MANUF.: CENTRIA STYLE: AS REQUIRED GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
METAL FASCIA	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
SOFFIT SYSTEM	MANUF.: CENTRIA STYLE: IW-15A GAUGE: 22 GA. PANEL COVERAGE: 12"(W) x 1-1/2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
GUTTER SYSTEM	DESIGN: INTEGRAL GUTTER SYSTEM SEE DETAIL 4/A6.1 GAUGE: 22 GA. - G90 GALVANIZED STEEL WITH 60 MIL MEMBRANE LINER * NOTE: FRONT OF GUTTER TO BE MIN. 1" LOWER THAN BACK OF GUTTER
DOWNSPOUT SYSTEM	(CONCEALED SYSTEM) SEE MECHANICAL FOR GUTTER DOWNSPOUT LAYOUT AND MATERIAL SPECIFICATION
PENTHOUSE GUTTER/DOWNSPOUT SYSTEM	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
METAL FLASHING (LOCATIONS : AT BASE OF PLANTER, SOFFIT AND ANY OTHER AREA ADJACENT TO ROOF)	MANUF.: CENTRIA STYLE: AS REQUIRED GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT * NOTE: CENTRIA CAN MANUFACTURE OR FURNISH MATERIAL - CONTRACTORS CHOICE
PLANTER	MATERIAL: PREFABRICATED FIBERGLASS TROUGH - SEE DETAIL 3/A6.1 FINISH: SMOOTH COLOR: SELECTED BY ARCHITECT
FLAT CLADDING SYSTEM (FCS)	MANUF.: CITADEL ARCHITECTURAL PRODUCTS STYLE: PANEL 20 PANEL THICKNESS: ⅛" TEXTURE: SMOOTH PROFILE: ½" REVEAL MOULDING - 2 PIECE FINISH: PREMIUM ANODIZED COLOR: AS SELECTED BY ARCHITECT
PRE FINISHED METAL SIDING (LOCATION : AT EXTERIOR WALKWAYS)	MANUF.: CENTRIA STYLE: CS-260 AND CS-660 GAUGE: 22 GA. PANEL COVERAGE: 12"(W) AND 16"(W) x (L) x 1-1/2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
COLUMN CLADDING SYSTEM (CCS)	MANUF.: CITADEL ARCHITECTURAL PRODUCTS STYLE: PANEL 20 PANEL THICKNESS: ⅛" TEXTURE: SMOOTH PROFILE: ½" REVEAL MOULDING - 2 PIECE FINISH: PREMIUM ANODIZED COLOR: AS SELECTED BY ARCHITECT
STOREFRONT WINDOW SYSTEM	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATION STYLE: ALUMINUM 2" x 4-1/2" FLUSH GLAZE FINISH: FLUOROPOLYMER COATING WITH PERMADIZE FINISH COLOR: AS SELECTED BY ARCHITECT
STOREFRONT DOOR SYSTEM	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATION STYLE: ALUMINUM MEDIUM STYLE FINISH: FLUOROPOLYMER COATING WITH PERMADIZE FINISH COLOR: AS SELECTED BY ARCHITECT
WINDOW GLAZING	MANUF.: VERSALUX STYLE: VERSALUX 2000R THICKNESS: ¼" GLASS WITH ½" AIR SPACE - PROVIDE TEMPERED GLASS IN LOCATIONS REQUIRED BY CODE COLOR: GREEN
STOREFRONT DOOR GLAZING	MANUF.: VERSALUX STYLE: VERSALUX 2000 THICKNESS: ¼" TEMPERED COLOR: GREEN
HOLLOW METAL DOOR	STYLE: INSULATED STEEL FRAME: GALVANIZED STEEL (PRE-PRIMED) PAINT APPLICATION: 2 COATS - PAINT AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
FERROUS METAL	SEE STAIR DETAILS FOR MATERIALS REQUIRED PRE-FINISH: GALVANIZE PAINT APPLICATION: 2 COATS - PAINT AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
WELDED WIRE MESH	MANUF.: McNICHOLS CO. STYLE: SQUARE WELDED WIRE MESH MESH SIZE: 4" X 4" WIRE DIAMETER: 0.148" PRE-FINISH: GALVANIZE PAINT APPLICATION: 2 COATS - PAINT AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
PRECAST CONCRETE PAVERS (AT EXTERIOR WALKS)	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATION SIZE: 24" X 24" FINISH: SEE SPECIFICATION COLOR: AS SELECTED BY ARCHITECT

PARKING GARAGE

SINGLE-PLY ROOFING	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATIONS STYLE: 60 MIL TPO COLOR: WHITE
METAL COPING	MANUF.: CENTRIA STYLE: SEE DETAIL 2/A6.1 GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: SELECTED BY ARCHITECT * NOTE: CENTRIA CAN MANUFACTURE OR FURNISH MATERIAL - CONTRACTORS CHOICE
METAL ROOF SYSTEM & ACCESSORIES	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
DRIP EDGE	MANUF.: CENTRIA STYLE: AS REQUIRED GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
METAL FASCIA	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
GUTTER/DOWNSPOUT SYSTEM	MANUF.: CENTRIA STYLE: SOP 200 GAUGE: 24 GA. PANEL COVERAGE: 18"(W) x 2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
SOFFIT SYSTEM	MANUF.: CENTRIA STYLE: IW-15A GAUGE: 22 GA. PANEL COVERAGE: 12"(W) x 1-1/2"(H) FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT
METAL FLASHING (LOCATIONS : AT SOFFIT AND ANY OTHER AREA ADJACENT TO ROOF)	MANUF.: CENTRIA STYLE: AS REQUIRED GAUGE: 24 GA. FINISH: VERSACORE ULTRA PF - SUNDANCE COLOR SERIES COLOR: AS SELECTED BY ARCHITECT * NOTE: CENTRIA CAN MANUFACTURE OR FURNISH MATERIAL - CONTRACTORS CHOICE
FLAT CLADDING SYSTEM (FCS)	MANUF.: CITADEL ARCHITECTURAL PRODUCTS STYLE: PANEL 20 PANEL THICKNESS: ⅛" TEXTURE: SMOOTH PROFILE: ½" REVEAL MOULDING - 2 PIECE FINISH: PREMIUM ANODIZED COLOR: AS SELECTED BY ARCHITECT
PRE FINISHED METAL PANEL	MANUF.: CENTRIA STYLE: CS-660 GAUGE: 22 GA. PANEL COVERAGE: 12"(W) AND 16"(W) x (L) x 1-1/2"(H) COLOR: AS SELECTED BY ARCHITECT FINISH: BOTH SIDES - VERSACORE ULTRA PF - LINER SIDE : PRISMATIC COLOR SERIES - EXTERIOR SIDE : SUNDANCE COLOR SERIES
COLUMN CLADDING SYSTEM (CCS)	MANUF.: CITADEL ARCHITECTURAL PRODUCTS STYLE: PANEL 20 PANEL THICKNESS: ⅛" TEXTURE: SMOOTH PROFILE: ½" REVEAL MOULDING - 2 PIECE FINISH: PREMIUM ANODIZED COLOR: AS SELECTED BY ARCHITECT
HOLLOW METAL DOOR	STYLE: INSULATED STEEL FRAME: GALVANIZED STEEL (PRE-PRIMED) PAINT APPLICATION: 2 COATS - PAINT AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
FERROUS METAL	SEE STAIR DETAILS AND MISC. LOCATIONS FOR MATERIALS REQUIRED PRE-FINISH: GALVANIZE PAINT APPLICATION: 2 COATS - PAINT AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
WELDED WIRE MESH	MANUF.: McNICHOLS CO. STYLE: SQUARE WELDED WIRE MESH MESH SIZE: 4" X 4" WIRE DIAMETER: 0.148" PRE-FINISH: GALVANIZE PAINT APPLICATION: 2 COATS - PAINT COLOR: AS SELECTED BY ARCHITECT
STUCCO FINISH ON CONCRETE AND CMU	STYLE: PRE MIXED, FIBER REINFORCED, ONE-COAT CEMENT STUCCO FINISH: ACRYLIC FINISH COLOR: AS SELECTED BY ARCHITECT
CHAIN LINK FENCE	2" STEEL WIRE FABRIC - 9 GAUGE - TWIST KNUCKLES FINISH: GALVANIZED WITH VINYL COATING COLOR: AS SELECTED BY ARCHITECT
OVERHEAD COILING GRILLES	MANUF.: FOR APPROVED MANUFACTURERS SEE SPECIFICATION STYLE: FACE OF WALL MOUNTED SIZE: SEE DRAWINGS MATERIAL: ALUMINUM
SIGNAGE	SEE SHEET A8.3 FOR SIGNAGE REQUIREMENTS
CMU	8"x 8" x 16" CONCRETE MASONRY UNITS TEXTURE: STANDARD FINISH: PRIMED AND PAINTED AS SPECIFIED COLOR: AS SELECTED BY ARCHITECT
STRUCTURAL COLUMN (SC) STRUCTURAL BRACING (SB)	SEE STRUCTURAL FOR EPOXY FINISH SYSTEM



2 WEST OFFICE BUILDING ELEVATION
A4.3 3/32" = 1'-0" (AT GARAGE ENTRY TO OFFICE/ SERVICE ELEVATOR TO OFFICE)

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4-30-10 EXPIRATION DATE OF THE LICENSE
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HAWAII, USA LICENSED PROFESSIONAL ARCHITECT No. 5769 HARRISON G. FAGG

HARRISON G FAGG & ASSOCIATES - ARCHITECTS & ENGINEERS
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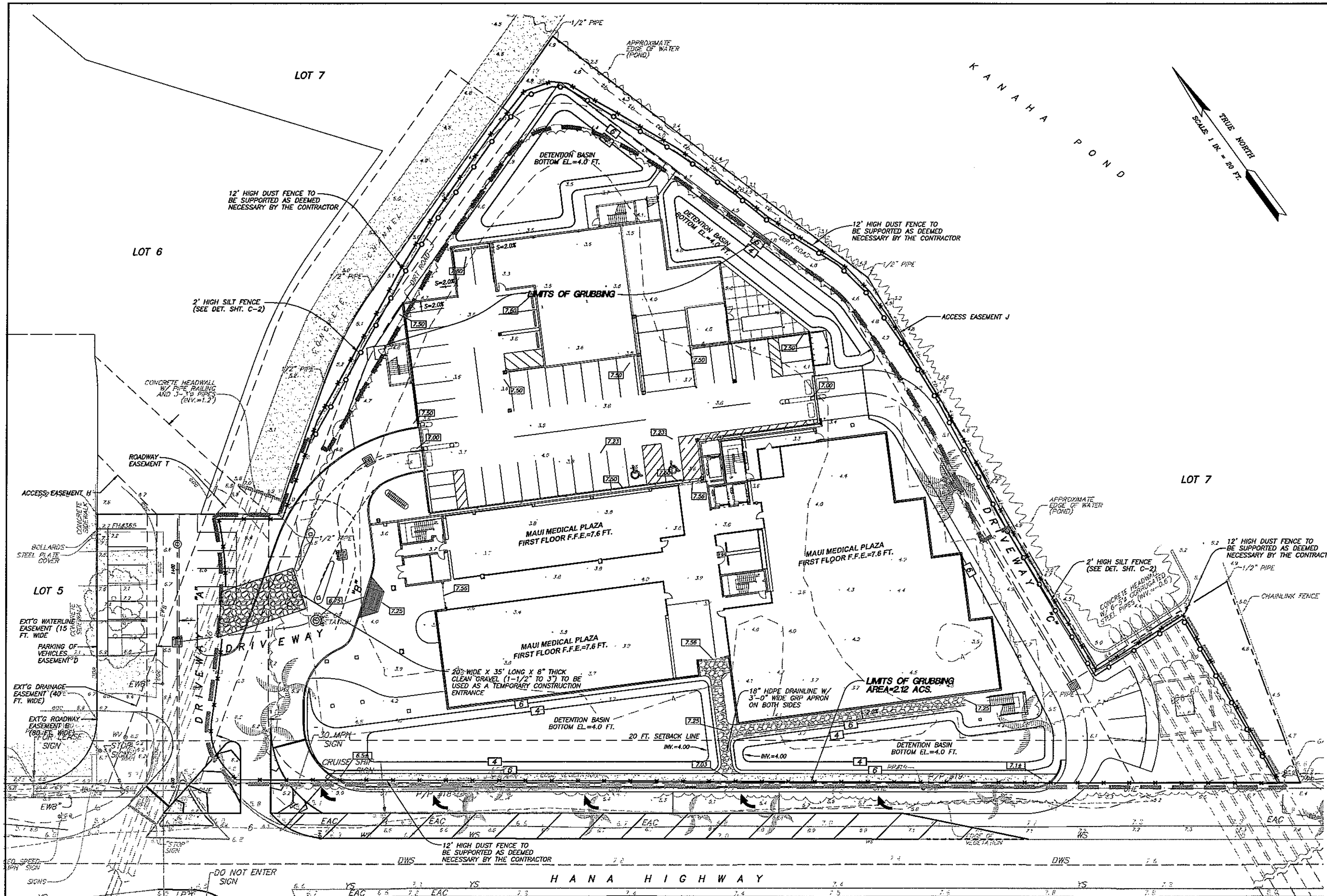
HGFA ARCHITECTS
800 GRANITE TOWER, BILLINGS, MONTANA 59101 • PH (406) 248-7811 • FAX (406) 259-9278 • Email HGFA@hgfa.net

DRAWN BY JC | JOB NO. 2637 | DRAWING TITLE: NORTH ELEVATION | JOB TITLE: MAUI MEDICAL PLAZA
CHECKED BY HGF | DATE: 8-1-07 REV: 11-15-10

SHEET A4.3 OF 63



LEGEND:

300.0	EXISTING GRADE SPOT ELEVATION
300	EXISTING CONTOUR LINE
300	FINISH GRADE CONTOUR LINE
	DIRECTION OF EXISTING ONSITE RUNOFF
	12' HIGH DUST FENCE
	2' HIGH SILT FENCE
	TEMPORARY CONSTRUCTION ACCESS

GRADING & BMP PLAN

SCALE: 1 IN. = 20 FT.

APPROXIMATE EARTHWORK QUANTITIES

THE EARTHWORK QUANTITIES SHOWN HEREIN ARE FOR SECURING THE GRADING PERMIT ONLY. THE CONTRACTOR SHALL VERIFY THE QUANTITIES AND COMPLETE THE GRADING AS SHOWN ON THE PLAN.

CLEARING AND GRUBBING = 2.12 ACRES±
EMBANKMENT = 7,040 C.Y.
EXCAVATION = 158 C.Y.

OTOMO ENGINEERING, INC.
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Stacy A. Otomo 4-27-10
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MAUI MEDICAL PLAZA

TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII

GRADING & BMP PLAN

REVISION	DATE	NOTE
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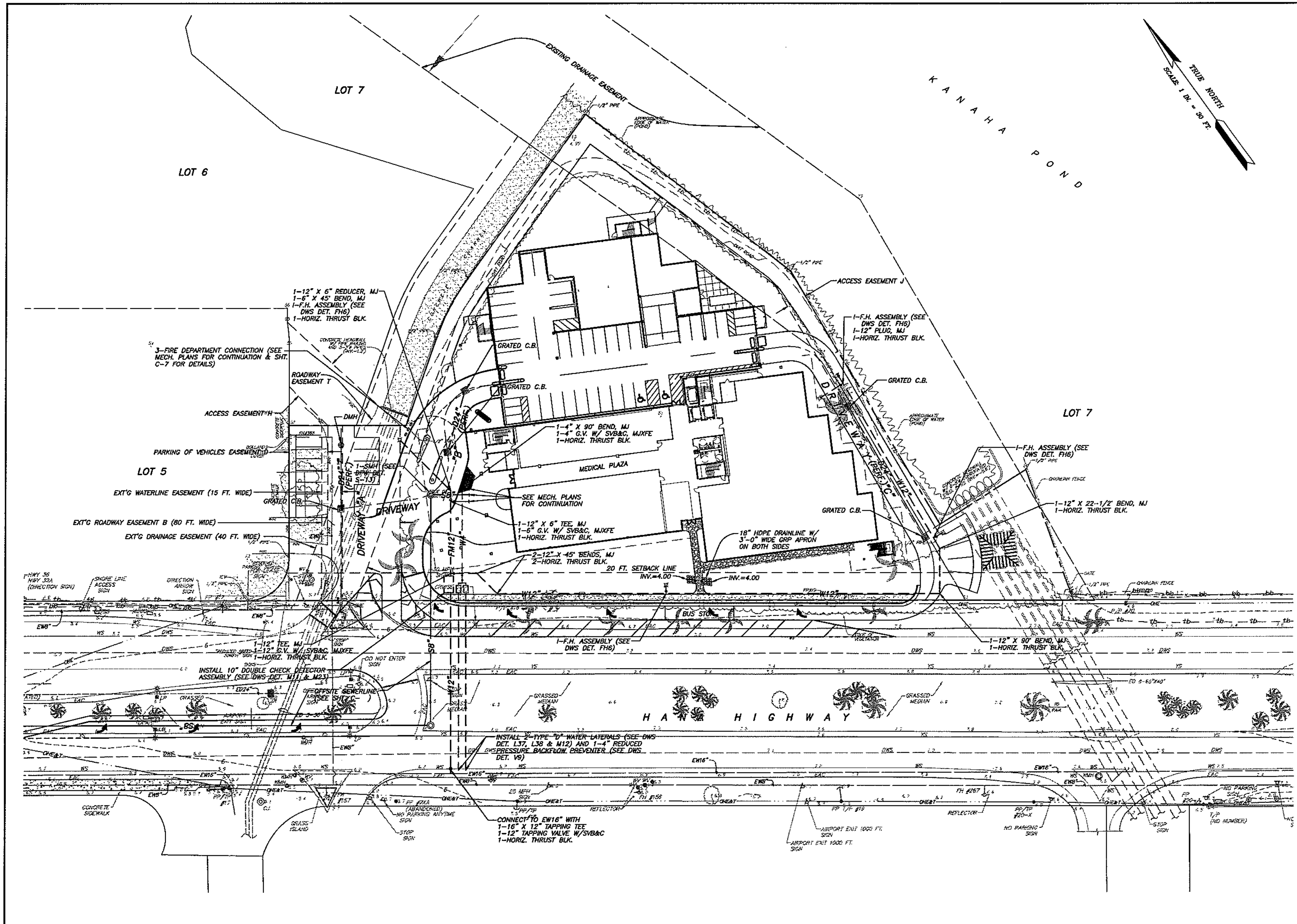
DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: GRAD-00
DATE: 4-27-10 (PERMIT SUBMITTAL)

SHEET NO.
C-2.1
OF SHEETS



UTILITY PLAN

SCALE: 1 IN. = 30 FT.

OTOMO ENGINEERING, INC.
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Stacy A. Otomo — 4-27-10
SIGNATURE — DATE

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MAUI MEDICAL PLAZA

TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII

UTILITY PLAN

REVISION	DATE	NOTE
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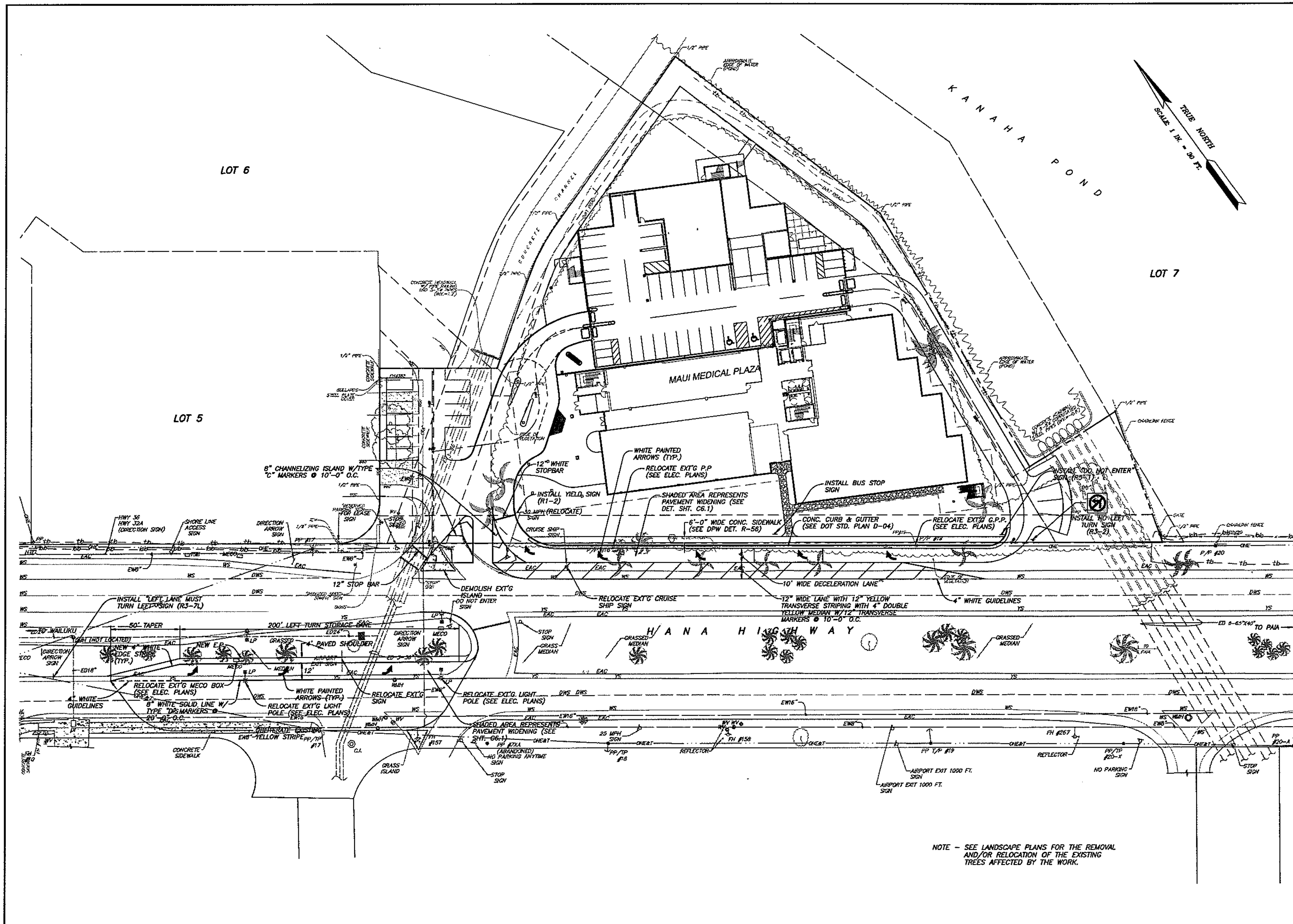
DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: UTIL-00
DATE: 4-27-10 (PERMIT SUBMITTAL)

SHEET NO.
C-3.1
OF SHEETS



NOTE – SEE LANDSCAPE PLANS FOR THE REMOVAL AND/OR RELOCATION OF THE EXISTING TREES AFFECTED BY THE WORK.

HANA HIGHWAY WIDENING & STRIPING PLAN
SCALE: 1 IN. = 30 FT.

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KAHULUI, MAUI, HAWAII

HANA HIGHWAY WIDENING & STRIPING PLAN

REVISION	DATE	NOTE
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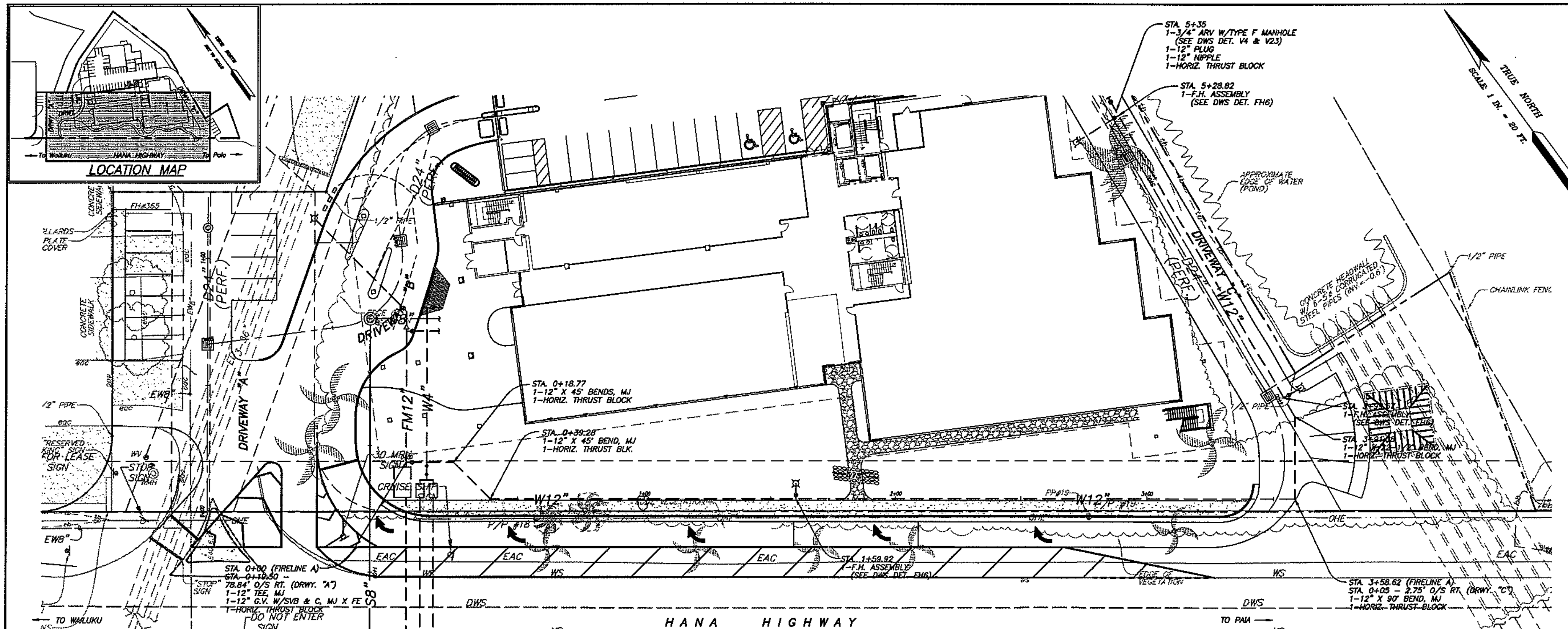
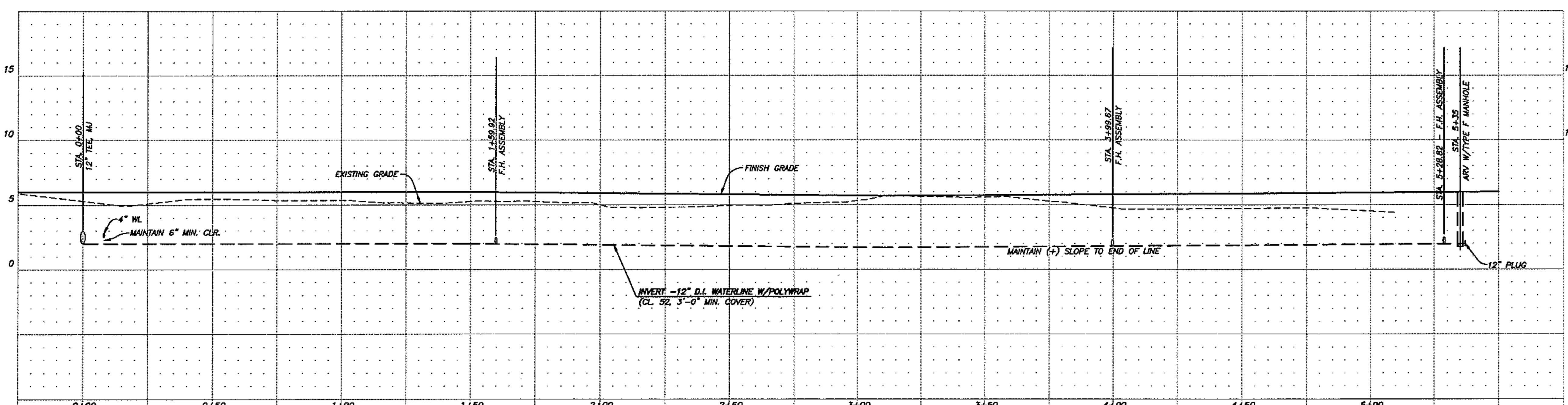
DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: STRIPE-00
DATE: 4-27-10 (PERMIT SUBMITTAL)

SHEET NO.
C-4.1
OF SHEETS



PLAN – FIRELINE A
SCALE: 1 IN. = 20 FT.



PROFILE – FIRELINE A
SCALE-HORIZ.: 1 IN. = 20 FT.
VERT.: 1 IN. = 4 FT.

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No. 5115-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" AS DEFINED UNDER SECTION 16-115-2 OF THE HAWAII ADMINISTRATIVE RULES, PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS.

Stacy A. Otomo — 4-27-10
SIGNATURE — DATE

NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

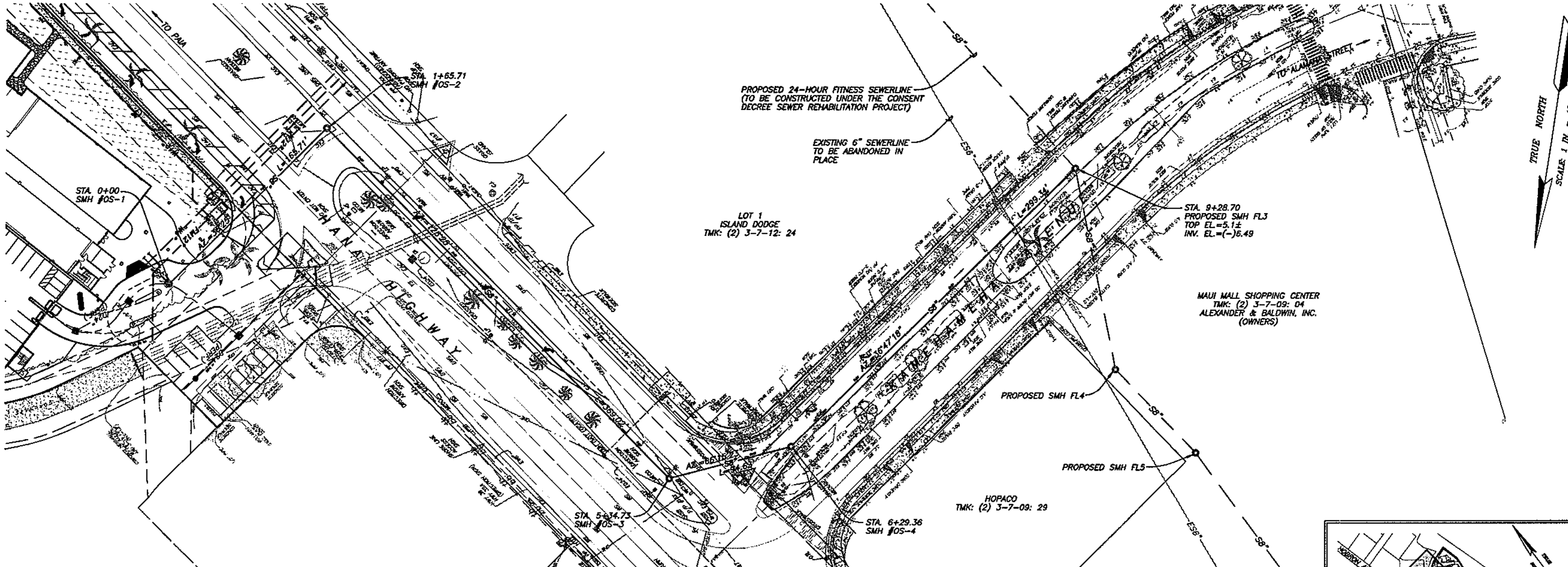
MAUI MEDICAL PLAZA
TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII

PLAN & PROFILE – FIRELINE A

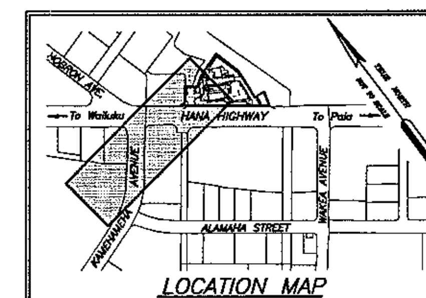
REVISION	DATE	NOTE
△		
△		
△		
△		
△		
△		
△		

DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: PP-FL-A
DATE: 4-27-10 (PERMIT SUBMITTAL)

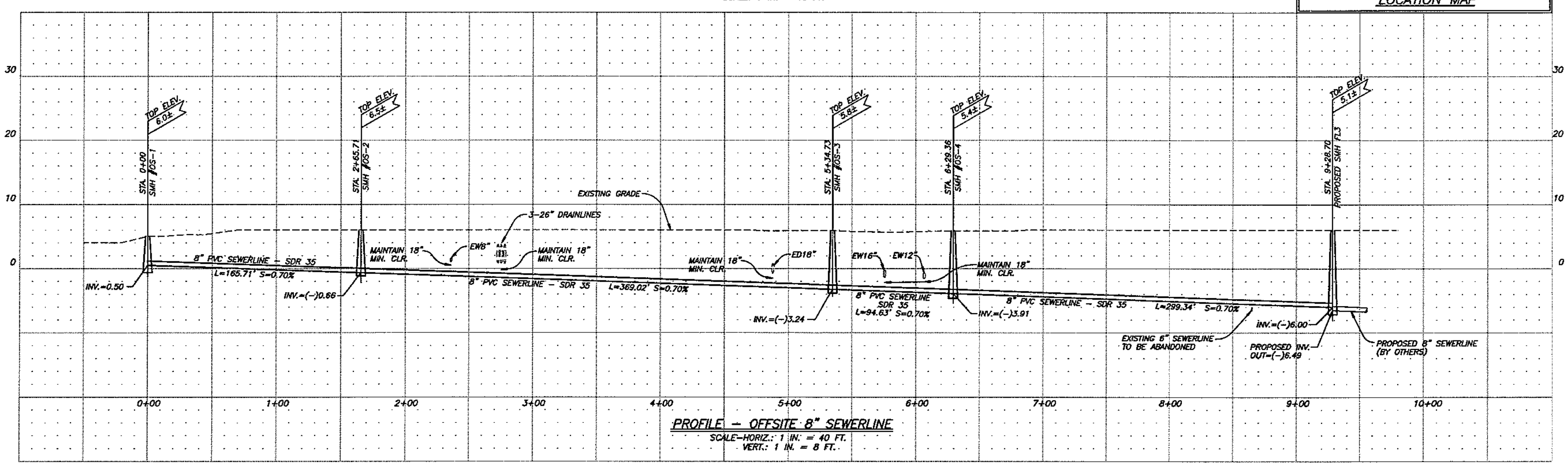
SHEET NO.
C-5.1
OF SHEETS



PLAN – OFFSITE 8" SEWERLINE
SCALE: 1 IN. = 40 FT.



LOCATION MAP



PROFILE – OFFSITE 8" SEWERLINE
SCALE–HORIZ.: 1 IN. = 40 FT.
VERT.: 1 IN. = 8 FT.

OTOMO ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS
305 S. HIGH STREET, STE. 102
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 242-0032
FAX: (808) 242-5779

STACY A. OTOMO
LICENSED PROFESSIONAL ENGINEER
No. 5115-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" AS DEFINED UNDER SECTION 16-115-2 OF THE HAWAII ADMINISTRATIVE RULES, PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS.)

Stacy A. Otomo 4-27-10
SIGNATURE DATE

NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

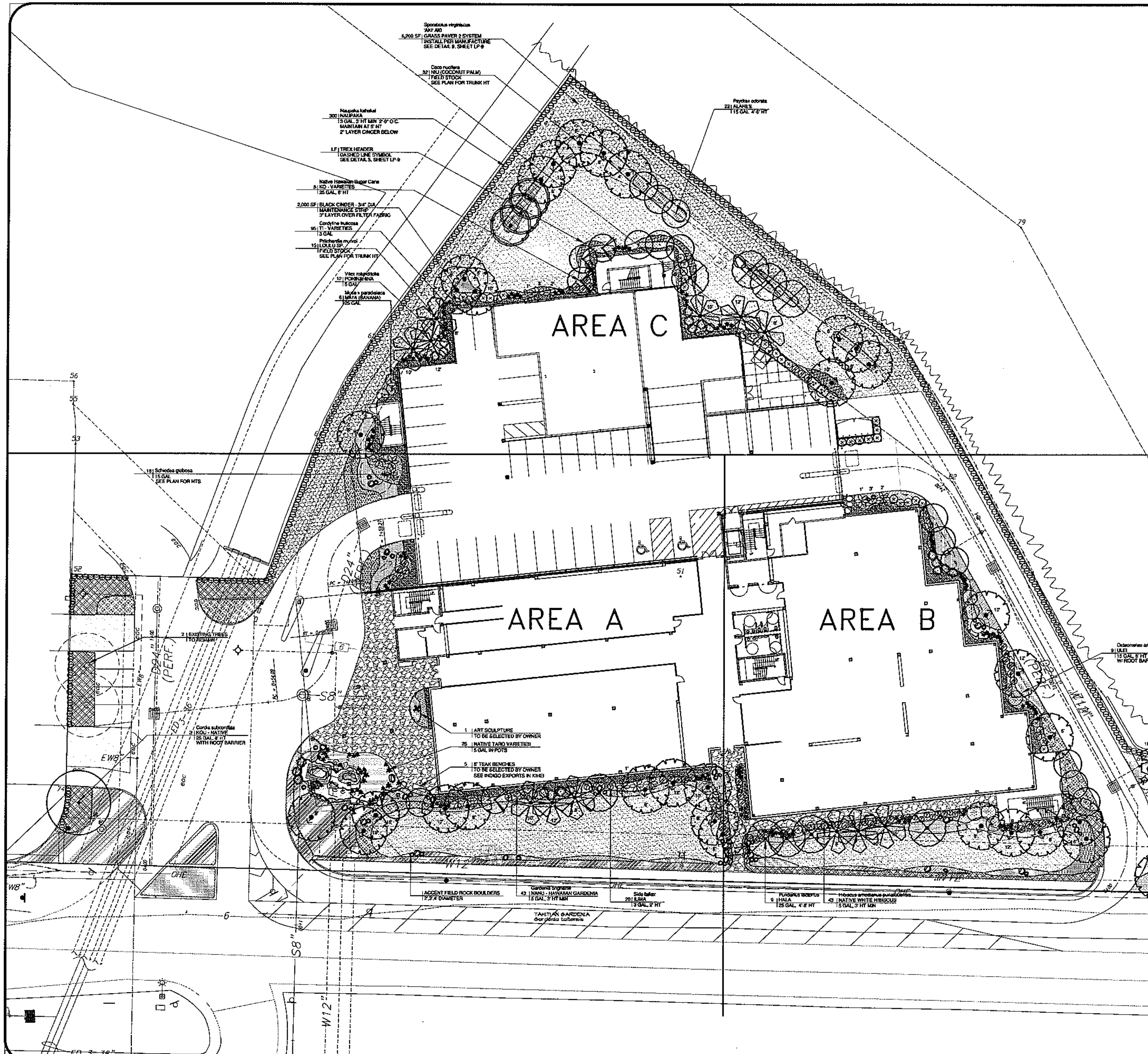
MAUI MEDICAL PLAZA
TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII

PLAN & PROFILE – OFFSITE 8" SEWERLINE

REVISION	DATE	NOTE

DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: PP-SL
DATE: 4-27-10 (PERMIT SUBMITTAL)

SHEET NO.
C-5.2
OF SHEETS



HARDSCAPE LEGEND

SYM.	TYPE	SIZE	QTY.	NOTES
	BLACK RIVER ROCK 2" OVER FILTER FABRIC	1"- 3"	#### S.F.	-
	GRASS PAVER 2	PLASTIC	#### S.F.	-
	QUARTZITE PAVING RANDUM PATTERN	2' X 2'	#### S.F.	-
	SCULPTURE SELECTED BY OWNER	3/4"	#### E.A.	-
	ACCENT BOULDERS	1'-3' DIA.	#### E.A.	-
	TREX PLASTIC HEADER	-	#### L.F.	-
	LANDSCAPE MOUNDING 2' INTERVALS	1' HT.	#### C.Y.	-
	STEPPING STONES	18" DIA	#### E.A.	-

GROUND COVER LEGEND

SYM.	COMMON/ BOTANICAL	SIZE	QTY.	NOTES
	'EKI 'UKI Danolla sandwicensis	1 GAL	00	PLANT 12" O.C.
	BACOPA Bacopa monnieri	4" POTS	00	PLANT 12" O.C.
	HINAHINA Heliotropium anomalum	4" POTS	00	PLANT 12" O.C.
	NEHE Lipochaeta integrifolia	4" POTS	00	PLANT 12" O.C.
	ILIE'E PLUMBAGO Plumbago zeylanica	1 GAL	00	PLANT 18" O.C.
	ILIMA PAPA Sida fallax	4" POTS	00	PLANT 18" O.C.
	HINAHINA Heliotropium anomalum	1 GAL	00	PLANT 12" O.C.
	NATIVE RED HIBISCUS Koki'o'ula'ula	1 GAL	00	PLANT 12" O.C.
	LAUA'E FERN Phymatosorus grossus	4" POTS	00	PLANT 12" O.C.
	KUPUKUPU FERN Nephrolepis exaltata	4" POTS	00	PLANT 12" O.C.
	PA'UOHI'IAKA Jacquemontia ovalifolia	4" POTS	00	PLANT 12" O.C.
	PORTULACA Portulaca grandiflora	4" POTS	00	PLANT 12" O.C.
	AKIA Wikstroemia uva-ursi	1 GAL	00	PLANT 18" O.C.

MAXWELL
DESIGN GROUP
LANDSCAPE ARCHITECTURE
PLANNING
2670 Wai Wai Place
Kihei, Maui, HI 96753
Office: 808-891-0629
Fax: 808-891-1869
Email: mdghawaii@hawaii.rr.com
www.landscapearchitect.net

BRYAN P. MAXWELL
LICENSED PROFESSIONAL LANDSCAPE ARCHITECT
No. LA 8901
HAWAII, USA

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. OBSERVATION OF CONSTRUCTION AS DEFINED IN SECTION 16-115-2, OF THE HAWAII ADMINISTRATIVE RULES, DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS, STATE OF HAWAII, RELATING TO ENGINEERS, ARCHITECTS, LAND SURVEYORS, AND LANDSCAPE ARCHITECTS.

SIGNATURE

PREPARED FOR:

MAUI
MEDICAL
PLAZA
151 HANA HIGHWAY
KAHULUI, MAUI, HAWAII
T.M.K. (2) 3-7-011:028

SHEET TITLE
LANDSCAPE
PLANTING PLAN
SITE

REVISIONS

NO	DESCRIPTION	DATE	BY
△			

JOB NUMBER	DATE
3945	22 AUGUST 2010
DESIGNED BY	CHECKED BY
BPM	BPM

SHEET SCALE
1"=20'

LP-1

APPENDIX B.

Jurisdictional Determination Letter from Department of the Army, U.S. Army Corps of Engineers

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

REPLY TO
ATTENTION OF:

April 25, 2008

Regulatory Branch

File Number POH-2006-531

Mr. Robert McDaniel III
Maui Medical Plaza at Kanaha
350 Hukilike Street, Suite D
Kahului, HI 96732

Dear Mr. McDaniel:

This letter responds to your jurisdictional determination request dated May 8, 2007 for Corps verified wetlands located on the parcel where the proposed Maui Medial Plaza at Kanaha is sited at 151 Hana Highway, Kahului, Maui Island, Hawaii 96732 (TMK: (2) 3-7-11: 28). We have reviewed the information you provided under the Corps' authority to issue Department of the Army (DA) permits pursuant to Section 10 of the Rivers and Harbors Act (RHA) of 1899 (33 U.S.C. 403) and Section 404 of the Clean Water Act (CWA) (33 U.S.C. 1344).

Based on the information provided in the document *"Request for Jurisdictional Determination and Wetland Permit Application"* complied by Mr. John Vuich of Malama Environmental, LLC and dated March 7, 2007, subsequent information submittals forwarded by you at the Corps request; and a site visit conducted on March 17-18, 2008 by Ms. Joy Anamizu of my staff and a representatives from both the U.S. Environmental Protection Agency (EPA) and the State of Hawaii, Department of Health, Clean Water Branch, we have determined the wetlands on the subject property are jurisdictional waters of the U.S.

On October 25, 2007, we issued a verification letter for the wetlands delineated on the property. Based on the information provided in Robert Hobdy's report *"Wetlands Determination for the Kanaha Industrial Subdivision Project, Kanaha, Kahului, Maui"* dated June 2006, we accepted the recommended 4 foot elevation contour as the delineated boundary for wetland (Enclosure 1). A topographic survey map completed by R. T. Tanaka Engineers, Inc. better depicts two separate areas that are below the 4 ft mean sea level (Enclosure 2). Any work activities that will involve the discharge and/or placement of fill and/or dredge material into waters of the U.S., which also include these wetlands and the adjacent drainage canals, will require a DA permit.

Enclosed is a copy of the final approved jurisdictional determination form for your project and a *Notification of Administrative Appeal Options and Process and Request for Appeal* form (Form F). Please review and submit a completed Form F within 60 calendar days from date of this letter. Information regarding the appeal process is available at following link at http://www.pod.usace.army.mil/Regulatory/fedreg.pdf.

Should you have any questions regarding this jurisdictional determination or any other requisite materials you need to aid in the processing of permit, please contact Ms. Joy Anamizu of my staff by phone at 808-438-7023, by fax at 808-438-4060, or by electronic mail at *joy.n.anamizu@usace.army.mil* and reference Corps **File No. POH-2006-531** in all future correspondence.

Sincerely,

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

Copy furnished (w/o enclosures):
Dr. Wendy Wiltse, U.S. Environmental Protection Agency, Region IX, Honolulu Branch, P.O. Box 50003, Honolulu, HI 96850
Mr. Roland Asakura, Department of Health, Clean Water Branch - Maui, Maui District Health Office, 54 High Street, Room 300, Wailuku, HI 96793
Mr. Edward Chen, Department of Health, Clean Water Branch, P.O. Box 3378, Honolulu, HI 96801-3378
Dr. Fern P. Duvall II, Department of Land and Natural Resources, Division of Forestry & Wildlife, 54 South High Street, Room 101, Wailuku, HI 96793
Mr. John Nakagawa, State Office of Planning, Coastal Zone Management Program, P.O. Box 2359, Honolulu, HI 96804
Mr. Michael Molina, U.S. Fish and Wildlife Service, 300 Ala Moana Blvd. Room 3-122, P.O. Box 50088, Honolulu, HI 96858-0001
Mr. John Vuich, Environmental Consultant, Malama Environmental, LCC, P.O. Box 880487, Pukalani, HI 96788-0487
Mr. Peter A. Horowitz, Attorney at Law, 305 High Street, Suite 101, Wailuku, HI 96793
Ms. Patricia Billington, CEPOH-OC
Mr. Thom Lichte, CEPOD-PDC

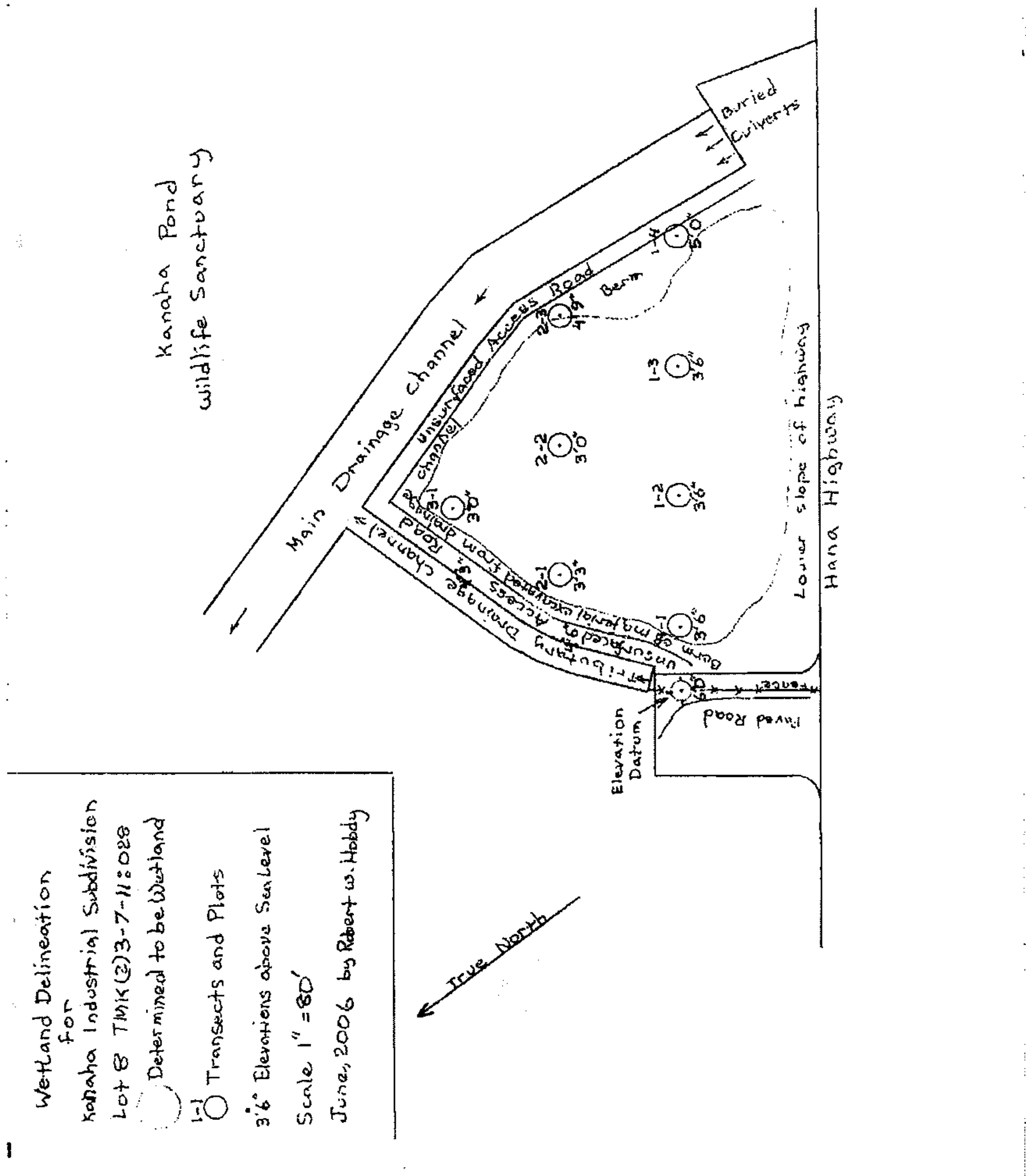
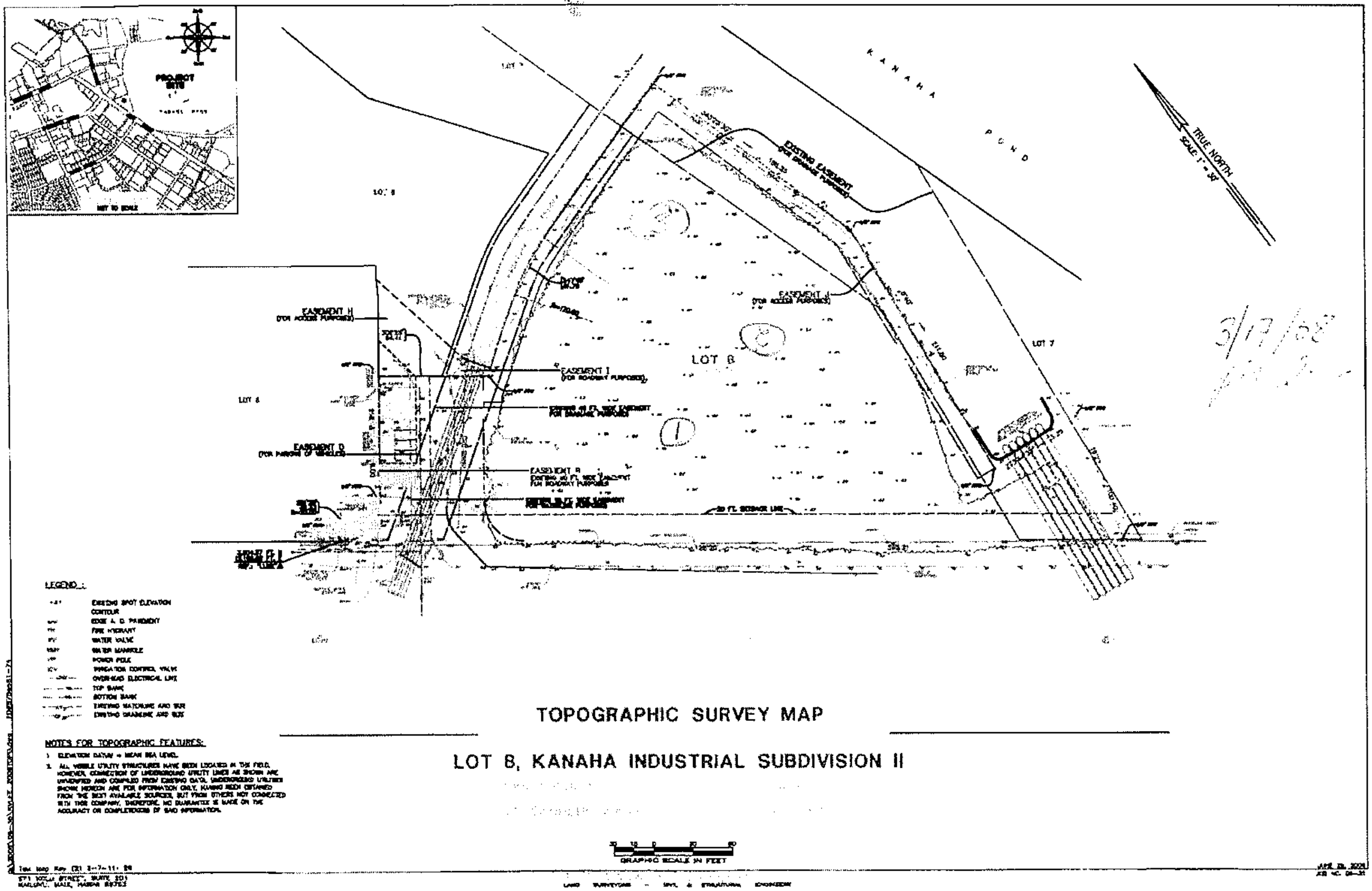


Figure 9

Enclosure 1



Enclosure 2

4

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April 25, 2008

B. DISTRICT OFFICE, FILE NAME, AND NUMBER: HONOLULU (CEPOH-EC-R); Maui Medical Plaza at Kanaha, Maui, HI; POH-2006-531

C. PROJECT LOCATION AND BACKGROUND INFORMATION:

State:Hawaii County/parish/borough: Maui City: Kahului
Center coordinates of site (lat/long in degree decimal format): Lat. 20.89055° N, Long. 156.459644° W.
Universal Transverse Mercator: Zone 4
Name of nearest waterbody: unnamed drainage canal (RPW) that indirectly (physically plugged by boards) to the Pacific Ocean
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Pacific Ocean
Name of watershed or Hydrologic Unit Code (HUC): Kahului

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc...) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: 28 March 2008
☒ Field Determination. Date(s): 16 August, 2006; 17-18 March 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** "*navigable waters of the U.S.*" within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☐ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☒ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: linear feet: width (ft) and/or acres.
      Wetlands: approximatly less than 2.499 acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): 4 ft above mean sea level elevation contour.

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

---

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. **TNW**
   Identify TNW: .

   Summarize rationale supporting determination: .

2. **Wetland adjacent to TNW**
   Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. **Characteristics of non-TNWs that flow directly or indirectly into TNW**

   (i) **General Area Conditions:**
   Watershed size: 14,479.48858acres
   Drainage area: unknown acres
   Average annual rainfall: 18.8 inches
   Average annual snowfall: 0.0 inches

   (ii) **Physical Characteristics:**
   (a) Relationship with TNW:
   ☒ Tributary flows directly into TNW.
   ☐ Tributary flows through Pick List tributaries before entering TNW.

   Project waters are Pick List river miles from TNW.
   Project waters are Pick List river miles from RPW.
   Project waters are Pick List aerial (straight) miles from TNW.
   Project waters are Pick List aerial (straight) miles from RPW.
   Project waters cross or serve as state boundaries. Explain: .

   Identify flow route to TNW[5]: The wetland (COE verified letter issued Oct, 25 2007) identified for this JD form is on a parcel (the review area) that is adjacent to a RPW tributary (a drainage canal). Under typical every day weather

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

conditions, the RPW contains waters do not have a continuous surface connection with the receiving TNW (Pacific Ocean). Only under inclement weather conditions do the RPW and TNW connect. Surface separation of the RPW from the TNW is attributed to a beach sand berm that is located between the two waterbodies, and inhibits regular exchange/flow/mixing of RPW and TNW waters under ordinary weather conditions.

The beach sand berm that separates the RPW from the TNW is outfitted with three (3) ~4-ft diameter culverts in order to prevent flooding of upland areas adjacent to the RPW. The ocean-facing ends of culverts are fitted with plywood boards to inhibit accreting beach sand from blocking the openings. These boards are removed to allow for drainage during heavy rain events. The in-land facing ends of the culverts were observed to overhang over the surface of ponded waters at the downstream end of the RPW, directly behind the sand berm. During normal weather conditions, RPW waters are not transferred through the culverts due to the aforementioned elevation difference.

Tributary stream order, if known:

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural

☒ Artificial (man-made). Explain: The tributary consists of a man-made drainage ditch which, according to the applicant, was originally designed to drain uplands, the areas south of the Hana Highway, for commercial development. About 75% of the upstream portion of the drainage ditch is straight and the remaining 25% near the terminal end naturally meanders. For this JD, the tributary is defined as the 0.50 miles of the drainage ditch (RPW) that "flows" towards (see "Manipulated" below) the Pacific Ocean (TNW).

☒ Manipulated (man-altered). Explain: The terminal end of the tributary consists of culverts that are fitted with removable plywood boards to prevent accreting beach sand from them. In the event of a storm event or increased-flow conditions, the plywood boards are removed to allow for the drainage of the tributary waters into the sea.

Tributary properties with respect to top of bank (estimate):

Average width: estimated 50 feet

Average depth: estimated 5 feet

Average side slopes: **2:1**.

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☒ Concrete
☐ Cobbles	☐ Gravel	☒ Muck
☐ Bedrock	☒ Vegetation. Type/% cover: aquatic and hydrophytic plants/75%	

☒ Other. Explain: Actual composition is not known; silt and muck checked above are a best guess estimate.

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: The general condition of the 0.50 mile of the tributary evaluated appeared to be fair -- measured from beach sand berm (downstream end) to the Hana Highway (upstrream portion of the drainage canal). The banks of the upstream portion of the tributary (upstream 0.25 mi) was heavily vegetated with hydrophytic plants. The following downstream portion (middle 0.1 mi) is concrete lined. The banks of the final meandering portion of the tributary (downstream 0.15 mi) is lined with erosion control fabric and sparsely vegetated with hydrophytic and uplands vegetation. From photos provided by the applicant, the banks/sides of the tributary (drainage ditch) are absent of signs of scouring, shelving, litter and debris, and sediment deposition). Overall, the tributary's condition and structural stability appeared normal and without From on-site observations, there appears to be faint traces of visible physical evidence that indicates the tributary is not regularly exposed to subject to regular high flowing waters or storm events.

Presence of run/riffle/pool complexes. Explain: None

Tributary geometry: **Relatively straight**

Tributary gradient (approximate average slope): 50 %

(c) Flow:

Tributary provides for: **Seasonal flow**

Estimate average number of flow events in review area/year: **2-5**

Describe flow regime: Under typical weather conditions, the tributary appears to function as a retention pond. No visible signs of gravitational flow, that is movement of waters in the upstream to downstream direction, were observed. It was only during periods of high wind conditions on 17-18 March did the tributary's waters appear to exhibit "flow" or movement. Otherwise no visible movement (i.e., visible surface currents, eddies, ripples, waves) were noted.

Other information on duration and volume: It is important to note, however, that the tributary is known to flow on occasion -- during seasons of increased rain (winter months). Two interviews with local persons of the area (F. Duvall and an un-named landscaper) indicated that only during high rain events did the tributary receive enough water where it required an individual, a maintenance representative from Alexander & Baldwin Properties, an adjacent landowner, to remove the plywood culvert doors so that excess stormwaters can flow out to sea.

Surface flow is: **Confined.** Characteristics: During typical weather conditions, as observed on 17-18 March 2008, surface waters appeared to be confined within the excavated depression of the drainage canal.

Subsurface flow: **Unknown**. Explain findings: Water samples were taken at various locations along the tributary. These samples were tested for salinity and although they were found brackish (State of HI standard for brackish waters are > 0.5 parts per thousand (ppt), but < 32 ppt of dissolved inorganic ions), samples were found and almost "fresh". The ocean water sampled from the beach had a salinity reading of 30 ppt (State of HI standard for saline/salt waters contain concentrations of inorganic ions > 32ppt). Based on the salinity measurements, the presence of ions in samples taken along the tributary, and a low concentration of salts in the ocean sample, it is believed there may be a dynamic hydrologic exchange between the waters of the RPW tributary and the receiving TNW (Pacific Ocean), and that under normal weather conditions, RPW-TNW mixing is very limited, but not irrefutably absent.

☒ Dye (or other) test performed: The water samples collected were tested for presence/absence of salinity with salt concentrations measured manually with a refractometer and an electronic device..

Tributary has (check all that apply):

☒ Bed and banks

☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☒ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☒ Discontinuous OHWM.[7] Explain: From photos provided by the applicant, a clear OHWM is visible on the two concrete-lined portions of the tributary: 1) on culverts at the upstream end of the tributary (at the beginning end of 0.50 mi length of tributary, near the review area), and 2) on the concrete-lined portion of the tributary (the middle portion of the 0.50 mi length of the tributary). Presence of an OHWM was verified at both locations during the 17-18 March 2008 field visit. .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:

Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.). Explain: On 17-18 March 2008, the general condition of the tributary waters along its entire length is considered poor due to its brownish-green color. The dark color of the water is attributed to several factors which include: presence of algae/bacteria growth, a nutrient waste source (waste from fishes in the canal), and turbid suspended sediment caused by natural mixing from wind-generated waves that blew over the surface the tributary's waters. A sample of water taken at the confluence of the drainage canals yielded a turbidity measurement of 23.9 NTUs and a pH measurement of 8.3; both of which are above of the State of Hawaii standards. The presence of oily films on the surface of the tributary waters could not be observed during the site visit because of the wave action/ripples at the waters' surface which were caused by the windy weather conditions. While oily films could not be observed on the canals' waters, they were present on the surface waters of test pits dug within the wetlands inside of the review area. Finally, a substantial amount of solid waste (i.e., tires, bottles, man-made objects, trash) was also observed within the tributary waters..

Identify specific pollutants, if known: See above.

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) **Biological Characteristics. Channel supports (check all that apply):**

☐ Riparian corridor. Characteristics (type, average width): .

☐ Wetland fringe. Characteristics: .

☒ Habitat for:

☒ Federally Listed species. Explain findings: Over 50% of the RPW tributary evaluated for this JD boarders the Kanaha Pond Wildlife Sanctuary (KPWS). This portion of the tributary has habitat that is similar to areas within the KPWS that are actively managed for the recovery of ESA-listed waterfowl such as Hawaiian Stilt (Himantopus mexicanus knudseni), Hawaiian Coot (Fulica alai), Hawaiian Duck (Anas wyvilliana) along with several species of migratory waterfowl and State-listed protected birds. The KPWS is also designated critical habitat for ESA-listed Blackburn's sphinx moth (Manduca blackburni). On 18 March 2008 at approximately 3:00 PM, several Hawaiian Stilts were observed on the KWPS side of the RPW tributary just south (approx. 30-40 ft) of the confluence of the two drainage canals

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☒ Fish/spawn areas. Explain findings: The RPW tributary provides habitat for non-native fish species (common and golden tilapia, guppies, mosquito fish, etc.) and invertebrates (apple snails) that are used as a food resources by wildlife and aquatic waterfouwl that frequent KPWS and the inhabit the surrounding area.

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☒ Other environmentally-sensitive species. Explain findings: Several Black-Crowned Night Heron (Nycticorax nycticoras), a State-listed protected specie, were also observed along various locations of the tributary during the 17-18 March 2008 site visit.

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☒ Aquatic/wildlife diversity. Explain findings: Although a variety of floral and faunal species were observed during a brief survey of the tributary, these were noted as mostly introduced/alien types. Ecologic diveristy, although limited, is present due to the presence of different types of hydrophytic vegetation and aquatic wildlife species. .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) **Physical Characteristics:**

(a) General Wetland Characteristics:

Properties:

Wetland size: less than 2.499 acres

Wetland type. Explain: Based on USFW Cowardian system, the area is classified as PEM1F. P = palustrine (system); EM = emergent (class); 1= persistent (subclass); F = semi-permanently flooded (non-tidal water regime).

Wetland quality. Explain: Based on observations made during the 17-18 March 2008 site visit, the wetland located on the review area was found to be of poor biological quality. The living vegetation within the wetland (vegetation not affected by recent land-clearing activities) consisted primarily of an invasive facultative (FAC) species (Pluchia indica) and an invasive salt-tolerant facultative wet (FACW) grass (Distichlis spicata). Both plant types did not appear to and are not known to provide any benefit or habitat for sensitive aquatic waterfowl/wildlife. The soils within the wetlands were also re-evaluated during the site visit. Several test pits were dug to an average depth of 15 inches below the surface and soils are generally characterized as consisting of low chroma jaucus sand underneath a 3 to 4 inch surface clay layer. The clay layer was found moist and both the transitional clay-sand and lower sand layers beneath were saturated within the upper 12 inches which indicates a positive presence of hydrology. Other typical hydrology indicators (i.e. water marks, drift lines, etc.) were not noticeable during the site visit because of recent disturbance (vegetation clearings) conducted at the site. The surface clay layer, in addition to the site's naturally low elevation and a high water table, allows for sufficient moisture retention in well-drained and nutrient poor sandy soils (the ground's surface contained a light layer of organic matter) to support proliferation of invasive FAC/FACW vegetation species. The presence of the three constituents: vegetation, hydrology, and hydric soils that the Corps uses to define a wetland were again re-verified during this site visit.

Although the wetlands on site are considered of low biologic/ecologic quality, we have found during our site visit that they do provide an environmental benefit to the watershed and all downstream receiving waters. These wetlands, including those in the nearby vicinity of the tributary, filter and reduce the amount of chemicals (pollutants, debris, solid waste, etc) that are in the surrounding area from entering the water resources in the nearby area. Because of this, they are assessed as having value for the protective function they perform in conserving the water quality of downstream receiving waters.

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Project wetlands cross or serve as state boundaries. Explain: No.

(b) General Flow Relationship with Non-TNW:

Flow is: **No Flow**. Explain: During the March 2008 site visit (and during typical weather conditions), we re-verified the wetland within the review area is absent of surface and ponded waters.

Although the wetlands do not abut the drainage canals and they are at an elevation much lower than the canals, no visible evidence was found to indicate whether or not any (flowing) waters that result from storm events are likely to spill over from the wetlands on site and drain into the drainage canals (RPW tributary) boarding the subject parcel. On the contrary, the manager of the KPWS, Dr. Fern Duvall, has stated that during storm events, waters from the tributary often overflow into the adjacent KPWS wetland, but not spill over from the KPWS into the tributary. He also indicated that trash and debris material that washes down from the upper parts of the tributary often accumlate on the outside of the KPWS fence that separates it from the tributary. This statement was verified during the field visit when large amounts of plastic trash and debris within the drainage canal (likely washed down from the uplands during the last storm) were found along the outside of the KPWS perimeter fence that separates the Kanaha Pond from the tributary.

We've noted and have taken into consideration that review area has likely been subject to years of illegal dumping, trash accumulation by homeless persons illegally residing on the parcel, and fly away trash from vehicles that utilize the Hana Highway; however, despite these sources of solid waste, it is reasonable to presume, based on Dr. Duvall's accounts, that during storm events, rain and storm water washes garbage and debris downstream in the tributary, which may also be washed into review area's wetlands, as is done on the opposite KPWS side of the tributary.

Surface flow is: **Overland sheetflow**

Characteristics: Based on observations made in the field on March 2008, the wetland is absent of surface waters that connect with the RPW tributary (drainage ditch). Under typical weather conditions, there are no surface flow exchanges between the wetland and the tributary. An observed change in surface elevations for areas surrounding the review area indicates that any surface flow or overland sheetflow that would result during heavy rain events would have an impact the review area's wetland is understood to be discreet (from the surrounding higher elevated areas to the wetland) and confined (to the lower depressed areas within the wetland). It is reasonable to presume a portion of the overland sheetflow from the Hana Highway would drain towards the low lying or depressed areas within the parcel, in this case, the wetlands. Under severe weather conditions when upland flow exceeds the drainage capacity of the tributary, storm waters from the tributary are likely drain from the tributary into the review area since storm waters are known to also drain from the tributary to the Kanaha Pond (see "Flow is" above).

Subsurface flow: **No**. Explain findings:

☒ Dye (or other) test performed: Tests for salinity and tidal influence were also conducted during the March 2008 on-site visit to verify previous observations and data. Past wetland delineations and verifications of the parcel have indicated that the wetland within the review area is subject to tidal influence. Recent tidal observations conducted by the applicant's consultant indicate otherwise. Salinity readings from water sampled from test pits yielded a range from 2 to 10 ppt (considered brackish by HI standards). The readings for these samples were higher than those samples taken at various points along the tributary; the higher salinity concentrations are likely attributed to leaching of salts/minerals from the soil coupled by low volume of ground water in the pits. Water levels in the test pits were also observed for changes pre- and post- high and low tides. No significant changes in water levels were observed in the test pits and at various points along the tributary with even taking into account a time lag due to elevation and distance from the shore.

(c) Wetland Adjacency Determination with Non-TNW:

☐ Directly abutting

☒ Not directly abutting

☐ Discrete wetland hydrologic connection. Explain:

☐ Ecological connection. Explain:

☒ Separated by berm/barrier. Explain: The wetland within the review area is located at the center of the parcel where the ground surface elevation (topograhpy) is lower than the berm that separates it from the RPW tributary – for this JD, the 2 canals boarding the review area are being considered as a single RPW tributary because they are connected. The berm that separates the wetland from the tributary has an access road 10-15 ft wide on it. At various points from the edge of the tributary (at the water's edge) to the depressed area on the inside of the wetlands (the opposite side of the berm/access road) the distance was was measured between 23-40 ft..

(d) Proximity (Relationship) to TNW

Project wetlands are **1 (or less)** river miles from TNW.

Project waters are **1 (or less)** aerial (straight) miles from TNW.

Flow is from: **Wetland to/from navigable waters.**

Estimate approximate location of wetland as within the **2-year or less** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: It is important to highlight that the review area (subject parcel) is located in an industrialized/commercial area. North and downstream of the review area is a petroleum fuel refinery. South, upstream, and boarding the review area is the Hana Highway. During the March 2008 site visit, a notable change in elevation was observed between the higher highway road and the lower lying parcel area. Although weather conditions that day could not demonstrate, it is reasonably foreseeable to anticipate that petroleum and oil-based pollutants from cars traveling on the highway would likely wash off from the road and into review area during heavy rain events – the road is designed and constructed so that sheetflow drains from and off the road. It is also reasonable to presume pollutants from cars (oil, gas, fluids, trash, etc.) migrate from the road with the sheetflow. Again, due to design and gravity, the polluted sheetflow then migrates from the road and on to subject parcel where it would temporarily pool and/or drain into the ground. Temporary pooling of pollutants would occur in low lying areas, such as the wetlands, where quick drainage is inhibited due to a 3-4 inch layer of clay (accumulated fine sediment). In other areas where sand is prevalent at the surface and a clay layer is not as abundant, efficient drainage is anticipated. As a result, a higher concentration of pollutants is expected to be present within the wetland area and was observed with the presence of oily films on the surface waters of pits dug there.

Identify specific pollutants, if known: Although no information on specific pollutants (the site was not tested for petroleum, oils, or other hazardous chemicals) within the wetland is available, large amounts of solid waste (trash, debris, household garbage, etc.) has accumulated on site as a result of natural storms or by human means/sources.

(iii) Biological Characteristics. Wetland supports (check all that apply):

☐ Riparian buffer. Characteristics (type, average width): .

☒ Vegetation type/percent cover. Explain: Invasive and alien vegetation species were found remaining in the non-cleared areas within the wetland: %50 FAC Pluchia indica (invasive) and 35% FACW Distichlis spicata. While these two plant species are indicative of wetlands flora, they do not support or provide habitat for federally ESA-listed or state-listed species, other environmentally-sensitive species, or provide aquatic diversity. .

☐ Habitat for:

☐ Federally Listed species. Explain findings: .

☐ Fish/spawn areas. Explain findings: .

☐ Other environmentally-sensitive species. Explain findings: .

☒ Aquatic/wildlife diversity. Explain findings: Very little wildlife diveristy was noted within the wetlands. Only introduced bird species, rats, and various invertebrates (primarily insects) were observed during the May 2008 site visit.

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **3**

Approximately (> 34.62) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
1. Kitagawa Wetland (No)	< 1 acre (~ 0.12)	No	
2. Kanaha Wildlife Refuge (No)	> 1 acre (33.0)	No	
3. subject wetlands (No)	> 1 acre (1.5)	No	

Summarize overall biological, chemical and physical functions being performed: Biological: Both wetlands #1 and #2 described above provide habitat for protected waterfowl. Chemical: All wetlands identified above contribute to reducing the amount of pollutants that drain from the surrounding higher elevated areas into the adjacent tributary, which periodically discharges out to sea. Physical: All wetlands identified above function to protect the structural integrity of tributary by providing flood storage for storm waters that drain within the watershed.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: Not applicable.

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: Not applicable.

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: By design, the RPW tributary (drainage canal) functions to drain and has the capacity to store storm waters from the upland areas within the watershed. In order to prevent flooding of the lower lying area areas adjacent to the tributary, excess water from heavy rain events is periodically discharged into the TNW (Pacific Ocean). All adjacent wetlands, which include the subject wetland within the reivew area, the Kanaha Pond, and the Kitagawa wetland, that are adjacent to the RPW tributary filter the pollutants that wash in from the surrounding developed industrial/commercial areas that drains into the RPW tributary, and function to reduce the amount of pollutants that reach the TNW. The RPW tributary (including the Kanaha wetland and the Kitagawa wetland) has the capacity to hold (drained storm/sheetflow) waters for a period of more than a 3 month periord (more than seasonal). which is long enough for support the growth of aquatic vegetation and provide habitat for fish and other species that are used by the surrounding protected wildlife in the RWP. The vegetated growth along the portions of the tributary (and within the adjacent wetlands) also assist in attenuating the pollutants to protect receiving ocean waters. This feature along with the beach sand berm provide allows for protection of downstream ocean waters, which found in good/fair condition -- enough to support alge growth and fish populations that were observed seaweed on beach and rocks for crabs on the jetty and fishermen on the beach..

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
☐ TNWs: linear feet width (ft), Or, acres.
☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. **Non-RPWs[8] that flow directly or indirectly into TNWs.**
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. **Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.**
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. **Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.**
☒ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: **~1.5** acres.

6. **Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.**
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. **Impoundments of jurisdictional waters.[9]**
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.

☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]

☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):

☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: see other below.
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☒ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☒ Data sheets prepared by the Corps: 17-18 March 2008.
☐ Corps navigable waters' study: .
☐ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☐ USGS 8 and 12 digit HUC maps.

[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☒ U.S. Geological Survey map(s). Cite scale & quad name: Honolulu District TIG mapping resources.
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: Honolulu District TIG mapping resources.
☒ National wetlands inventory map(s). Cite name: Honolulu District TIG mapping resources.
☐ State/Local wetland inventory map(s): .
☐ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): Honolulu District TIG mapping resources.
or ☒ Other (Name & Date):Taken during site visit on 17-18 March 2008.
☒ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☒ Other information (please specify): Report entitled, "Request for Jurisdictional Determination and Wetland Permit Application for the Maui Medical Plaza at Kanaha" prepared by Malama Environmental, LCC., dated May 7, 2007 .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL		
Applicant: Robert McDaniel for Ben Brown	File Number: POH-2006-531	Date: April 25, '08

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
X	APPROVED JURISDICTIONAL DETERMINATION	D
	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://usace.army.mil/inet/functions/cw/cecwo/reg or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: Joy Anamizu, (808) 438-7023	If you only have questions regarding the appeal process you may also contact: Thom Lichte (808) 438-3063

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_______________________ Signature of appellant or agent.	Date:	Telephone number:

APPENDIX B-1.

Final Wetland Mitigation Plan

MAUI MEDICAL PLAZA AT KANAHĀ
ALTERNATE WETLAND MITIGATION PLAN

Location:
WAIHE'E DISTRICT, MAUI
STATE OF HAWAI`I

Prepared for:

Maui Medical Plaza at Kanahā
350 Hukilike Street, Suite D
Kahului, Hawai`i 96732

23 November 2009

Prepared by:

Penny Levin, Conservation Planner
224 Ainahou Place
Wailuku, Hawai`i 96793
(808) 285-3947 (cell)
pennysfh@hawaii.rr.com

PROJECT LOCATION:	Wailuku District, Island of Maui, Hawai'i. Lot 8: TMK: (2) 3-7-011:028; mitigation site TMK (2) 3-2-10:1 and 2
ZONING:	Lot 8: State - Urban; Community Plan - Heavy Industrial; County - M2 Industrial. Mitigation site – Urban (state); Interim district and Agriculture (county)
ESTIMATED ACREAGE:	Lot 8: Total on-site acreage: 2.5 acres (108,900sqft) Wetland loss: .94ac Total off-site wetland acreage: 5 acres
MITIGATION PRIMARY GOAL:	*Enhance and rehabilitate existing wetland ecosystem function in five degraded acres of Waihe'e Coastal Dunes and Wetland Refuge.*
	Lot 8 is a severely disturbed site of minimal wetland value in its current state. Off-site wetland mitigation is proposed for the Maui Medical Plaza at Kanahā development at the Waihe'e Coastal Dunes and Wetland Refuge. Mitigation will remove invasive species and re-establish native plants on approximately five (5) acres within the wetland portions of the Refuge. An out-of-watershed mitigation approval is sought due to recent FAA restrictions on activity in the initially proposed mitigation site adjacent to Lot 8.
LAND OWNER(S):	Lot 8: Kanahā Professional Plaza LLC Mitigation site: Maui Coastal Land Trust
RESPONSIBLE PARTY:	Kanahā Professional Plaza LLC
CONTACT:	Robert T. McDaniel III (808) 283-8811 Fax: (808) 876-0861 Bob@MauiMedicalPlaza.com
ADDRESS:	350 Hukilike Street, Suite D Kahului, Hawai'i 96732
REVIEWING AGENCY(S):	US Army Corps of Engineers Environmental Protection Agency US Fish and Wildlife Service DLNR-DOFAW Maui

Applicable State and Federal Recovery Plans:

Draft Revised Recovery Plan for Hawaiian Waterbirds: Second Draft of Second Revision, USFWS May 2005; *Manduca blackburni* Recovery Plan 2005; Nene Recovery Plan 2004

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Waihe'e Coastal Dunes and Wetlands Refuge boundary map and aerial
USGS/NRCS topographical, soils and T&E species maps
Waihe'e Refuge archaeological sites map, including fishpond location

APPENDIX B: SUPPORTING DOCUMENTS

Letter from Maui Coastal Land Trust (11/23/09)

1. PROPOSED ACTIVITY SUMMARY

This document is supplementary to the wetland mitigation plan submitted by the Maui Medical Plaza at Kanahā (MMPK) on July 31, 2009 and proposes an alternate site and work. For descriptions of the MMPK medical facility project and other relevant background information referral to the original plan is made. On-site engineering for Lot 8 will continue to address drainage and water infiltration functionality, environmental issues and ecosystem continuity between Kanahā wetland and Lot 8 that were described in the original document.

The proposed alternate mitigation site is located at TMK (2) 3-2-10:1 and 2, and is known as the Waihe'e Coastal Dunes and Wetland Refuge. The site, zoned Urban by the state and Interim and Agriculture by the County of Maui is a permanently protected dune and wetland habitat of 277 acres approximately 10 miles from the development site (Lot 8). The alternative site was selected due to unforeseen circumstances arising from FAA concerns at Kanahā Pond Wildlife Sanctuary which rendered the originally proposed mitigation plan inoperative. Wetland mitigation will occur within the boundaries of the Refuge in coordination with the Maui Coastal Land Trust. *This alternate compensatory mitigation plan is for off-site mitigation action at the Waihe'e Coastal Dunes and Wetland Refuge only.*

The Maui Coastal Land Trust, a 501(c)(3) non-profit established in 2000, has a mission to acquire, preserve, and protect coastal lands in Maui Nui for the integrity of the natural environment and the enjoyment of current and future generations. In July 2004, MCLT, with the assistance of the County of Maui, USFWS and the general public, purchased the privately owned 277 acres along 1.25 miles of the Waihe'e coastline, Central Maui in support of this mission. MCLT holds title to the property and oversees management of the land for perpetual stewardship. Maui County and the State of Hawai'i hold Conservation Easements to assure perpetual protection of the land. While the parcel is protected, a rehabilitation and management plan, and staff and funding for the selected mitigation acreage, is not in place. In 2005, a portion of the wetlands was briefly under the NRCS Wetlands Reserve Program (less than 2 years); however, the Refuge is no longer a part of that program. None of the five acres selected for mitigation were formerly served under the WRP. A grazing program under NRCS EQIP is currently operating in some upland portions of the parcel along Halewaiu road as a means of creating a managed firebreak between the Refuge and the adjoining Waihe'e community; this mitigation proposal does not conflict or overlap with this effort.

TMK (2) 3-2-10:1 and 2 are located within the coastal zone makai (seaward) of Kahikili Highway, Waihe'e, Maui between Waihe'e Park and Waihe'e Stream. The mitigation site falls within Maui Watershed Unit 20020000 2-08 (Waiehu) and contains a palustrian wetland with only intermittent seasonal standing water at this time due to historic changes in the larger watershed and to the property, including the presence of a drainage canal (Dairy Canal) within the boundaries of the wetland/fishpond that was installed by the Waihe'e Dairy, former owner of the property from the early 1900's through the 1960s.

Dense stands of invasive species are one significant impact that can be addressed on the property. Non-native vegetation causes soil hardening, severely impairs natural saturation and inundation and provides habitat for rats, mongoose, egrets and other predators that remain the number one threat to Hawaii's endangered waterbirds (FWS 2005:44)

A one (1) acre site mauka (behind) of the dunes along a recorded historical water flow which formerly contributed to makai (seaward) wetland health will be cleared of invasive vegetation to improve hydrology into the receiving wetland on the makai side of the dune. An additional four (4) acres within the wetland itself will be cleared of invasive species and outplanted with appropriate native species to rehabilitate wetland acreage within known wetland boundaries (see Map 1 for location of these sites).

Implementation and long term monitoring and management are supported with dedicated resources; a perpetual obligation in agreement with MCLT for the five acres will be attached to Lot 8. This partnership with MCLT provides funding and resource support for the organization at a time of severe budget and staff constraints that have affected the Trust's ability to further rehabilitation work in the wetland which is heavily dependent on volunteers.

This supplement to the MMPK mitigation plan is written in response to Clean Water Act (CWA) Section 404 requirements for permit applicants preparing compensatory mitigation and adaptive management plans based on 2008 guidelines (Authority 33 U.S.C. 401 et seq; 33 U.S.C. 1344; Pub. L. 108-136, 33 CFR 332 and 325 Final Ruling for Compensatory Mitigation for Losses of Aquatic Resources, April 10, 2008 (73 FR 19594); US-ACE Regulatory Guidance Letter No. 08-03), and Honolulu District Joint Agency Compensatory Mitigation and Monitoring Guidelines (PNN 200400448, 14 Feb 2005).

2. MITIGATION GOALS AND OBJECTIVES

The Mitigation Site (off-site) is a distinct parcel in an adjacent watershed to Lot 8; mitigation goals and objectives are however similar to those in the original proposed plan.

The mitigation goals and objectives are consistent with national and state guidance and policy on surface water runoff retention and wetland habitat recovery in coastal areas. They are also supportive of national, statewide and site specific goals under the USFWS Revised Recovery Plan for Hawaiian Waterbirds (2005) for improving the overall waterbird habitat availability and quality of supporting wetlands on public and private lands in Maui.

The primary mitigation goal addresses the issue of wetland functionality and quality within the Waihe'e Coastal Dunes and Wetland Refuge. **All compensatory mitigation actions occur off-site and out-of-watershed.**

A. *Enhance and rehabilitate existing wetland ecosystem function and structure in 5 degraded acres of the Waihe'e Coastal Dunes and Wetland Refuge prior to construction on Lot 8.*

Objective 1: Rehabilitate wetland habitat in five degraded acres in the Waihe'e Refuge by improving wetland inundation capacity through the removal of alien tree, shrub and grass species from one (1) acre above the dune to improve water percolation capacity through the dune to the primary wetland below; and in four acres within the primary wetland.

Objective 2: Improve the overall functionality of the four (4) acres within the primary wetland to support Hawaii's endangered waterbird needs by providing food sources, hiding and nesting materials and sites, through the outplanting of native (indigenous and/or endemic) hydrophitic sedge, upland shrub and tree species appropriate to Central Maui wetlands.

Objective 3: Ensure the long term health of wetland ecosystem function within the five (5) acres through carefully engineered mitigation and best management practices (BMPs), regular monitoring for regeneration of invasive species and unnecessary site disturbance during and after project implementation for a minimum of five years.

3. LOCATION

The mitigation site is a 5 acre portion of TMK (2) 3-2-10:1 and 2 (Waihe'e Coastal Dunes and Wetland Refuge) owned by the Maui Coastal Land Trust and located in the ahupua'a (district) of Waihe'e and the watershed of Waiehu (Unit 20020000 2-08). It is bounded on the mauka (west) side by Kahekili Highway and some residential portions of Waihe'e town. The parcel is bounded to the north by Waihe'e stream and the south by Hale Waiu Road, Hawaiian Homes residential properties and Waihe'e Park and Municipal Golf Course. Its shoreline is east facing.

Figure 1. *Maui Watersheds Unit 2-08 Waiehu*

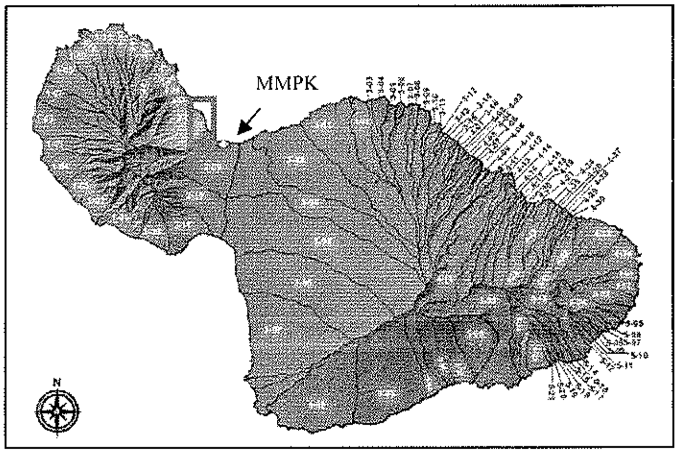
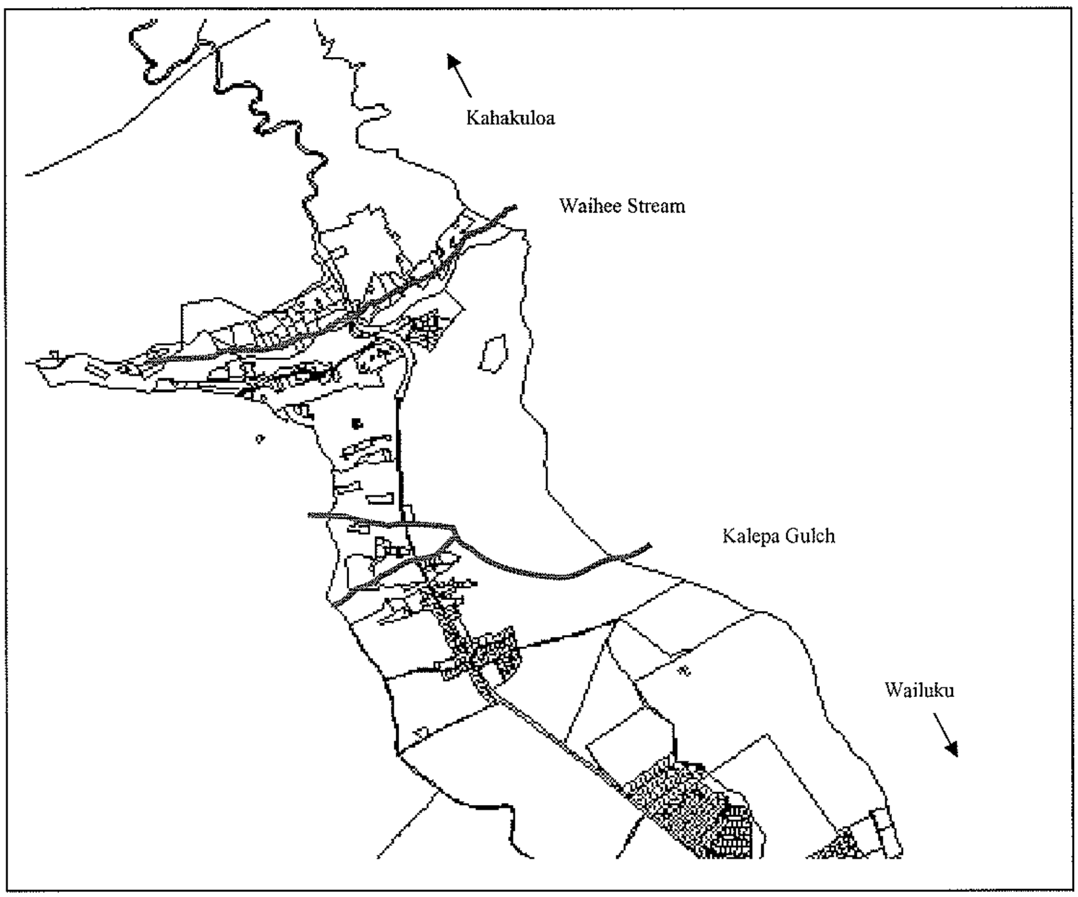


Fig 2. TMK Location map: Parcel (2) 3-2-10:1 and 2



4. AQUATIC RESOURCES AND BASELINE SITE INFORMATION

4.1 WETLAND TYPE AND FUNCTION

TMK (2) 3-2-10:1 and 2 is a 277 acre parcel of which an estimated 27 acres are classified as a palustrian (P) wetland with a mixed freshwater and brackish groundwater regime as identified by the NRCS in 2005. Salt-crusted soils are found in the makai portions of the pond and freshwater seeps in the more inland portions. A seven (7) acre ancient fishpond lies within the larger wetland (see Appendix A: Waihe'e Refuge Archaeological map) and the two are integrated water bodies. These wetlands lay at the makai (seaward) base of the last remaining intact high dunes in Maui. An undetermined number of acres mauka (inland; upland) of the dunes which were former taro growing lands are lotic fringe palustrine wetlands that lay between a gulch and traditional 'auwai (water channel or irrigation ditch) that still runs.[1] A recently hand cleared test area revealed sandy loam, silty clay and sandy, clay loam soils that became immediately saturated upon removal of invasive species. Three weeks later, honohono grass (*Commelina diffusa*), a FACW species dominated the site.

Four acres in the primary wetland and one acre in the upland lotic fringe wetland have been selected for mitigation action. These sites meet the criteria defining wetland ecosystems under the U.S. Army Corps of Engineers (1987 Manual) and the Environmental Protection Act, including soils, hydrophytic vegetation, and a frequency and duration of soil saturation and inundation sufficient to support wetland flora within the context of Hawai'i's unique seasonal conditions and habitats.

The Waihe'e wetlands were historically fed by rain, streams, springs and seeps through the dunes originating from upland ground and surface water flows. Evidence that water from Waihe'e Stream (Kahakuloa side of the parcel) was brought into the wetlands is found in the documention on USGS maps of an old water course through the dune and the existence of a traditional 'auwai which ran from taro patches along the perimeters of the wetland and around Waihe'e point to Waihe'e Stream. The outgoing waters of the taro patches would have fed the wetland and the fishpond and then exited to the ocean.[2] A second 'auwai near Kalepa Gulch that once fed taro patches above the dune continues to run. Old taro systems played a role in sediment and flood attenuation and reduction and groundwater recharge, as well as providing habitat for native flora and fauna. In the case of the mauka taro system, this ponding mechanism may have assisted seepage through the sandier dune soils. Existing

[1] The extent of the area is undetermined due to the current density of tall vegetation. Several acres are expected given local information regarding the placement of old taro growing lands in the area. Isolated rock wall systems that encompassed taro patches are found in several parts of the property where drainages formerly existed but have since been interrupted by development above the parcel and changes in surface and groundwater flows.

[2] This is one of the rare cases in Hawai'i where water was not returned to the stream from the taro patch. In this case, because water was drawn from the stream so close to where the mouth of the stream entered the ocean already, sending it through the wetland/fishpond would not have had significant impact on the stream or stream biota. The original exit of the fishpond at the coastline was a few hundred feet distance from where Waihe'e Stream met the ocean (this no longer functions).

USGS maps show an intermittent water course through the dune in the approximate location of this 'auwai and the gulch (see Fig. 3 and Appendix A).

Natural seepage through the dune from upland areas is currently compromised on several levels:

- Extensive water diversion of mauka (upland) streams;
- The placement of Kahekili highway between uplands and the parcel (soil hardening);
- The installation of a drainage canal (Dairy Canal) by the Waihe'e Dairy inside the wetland, which was redredged in the 1990's by a subsequent owner prior to acquisition of the property by the land trust;
- A thick growth of non-native tree, shrub and grass species which remains in the primary wetland (makai side of the dune) and takes up water coming through the base of the dune; and,
- On the mauka side of the dune, the same type of dense vegetation which prevents water from Kalepa Gulch and a second traditional 'auwai and former taro patch system from slowing and percolating through dune soils and reaching the primary wetlands.

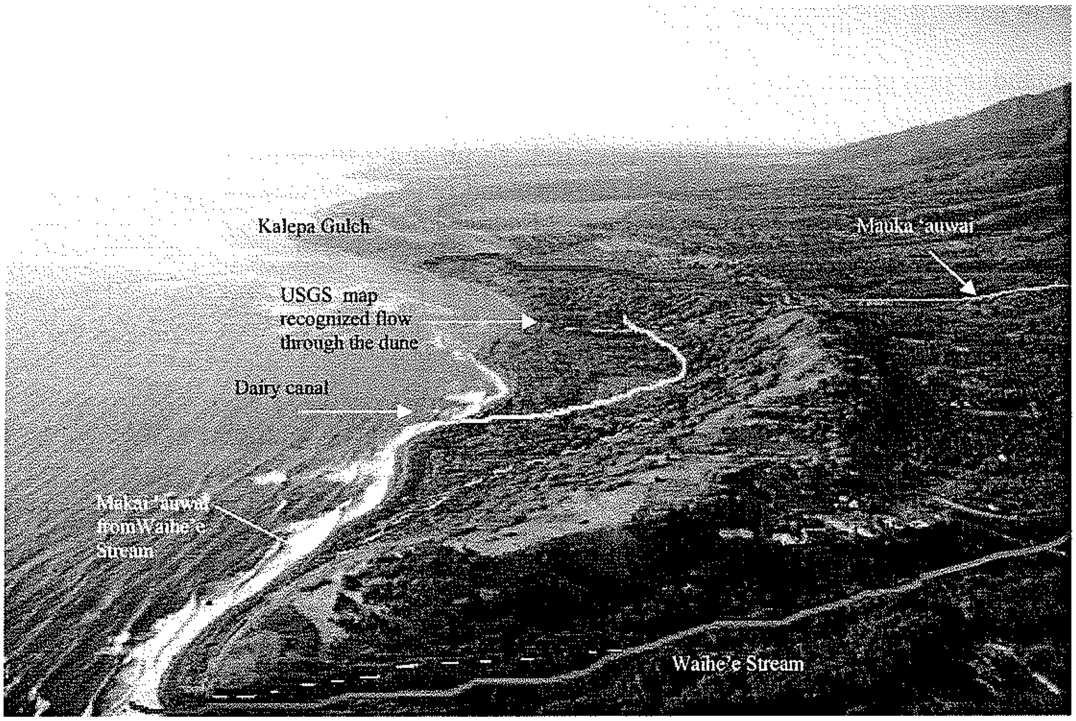
Currently, the upland 'auwai is flowing but falls directly into Kalepa Gulch. The gulch, flows during high rain periods in the uplands. A depression was known to exist near the confluence of the two which once allowed water to pool and slowly drain so that it moved through the dune. Due to the density of vegetation at this time it is unknown whether that topography still exists. Water from both sources now flows through the gulch but appears to circumvent dune hydrology and exits directly to the ocean on the Waikapu side of the parcel (see Fig 3).

Water in the primary wetlands is present year round only in the Dairy Canal. The remainder of the wetland has typically retained shallow standing water only intermittently during the winter rainy season. Volunteers have cleared invasive vegetation in the fishpond and some parts of the wetland over the last few years and this seems to be improving the duration of soil saturation; however, this has not yet been quantified and may also be reflective of a break in the drought cycle this winter (2009). During extreme rain events, water remains onsite for several weeks before disappearing again.

The mouth of the Dairy Canal where it exits the fishpond onto the stone cobble beach is tidally influenced.

The USFWS designates the Refuge as a Supporting Wetland under private ownership for endangered waterbirds (USFWS 2005:69).

Fig 3. Approximate location of water flows at the Waihe'e Coastal Dunes and Wetland Refuge (aerial photograph by Ron Chappel).



4.2. LOSSES AND GAINS

Wetland losses on Lot 8 have been addressed in the original wetland mitigation plan. No loss of wetland function or wildlife habitat will occur within the mitigation site at the Refuge.

The existing stands of invasive species severely curtail inundation in portions of the wetland, edging out native plant communities that support more natural fluxuation and soil saturation. Alien vegetation currently impairs or prevents water movement in 100 percent of the five acres selected for mitigation. Removal of non-native species will improve soil saturation within 100 percent of the mitigation area.

The endangered waterbird populations in the wetland are small (three species; less than ten birds, county-wide bird count August 2009) and no birds currently use the upland or primary wetland area due to dense vegetation and dried out soils. Cattle egrets, a threat to native bird species, roost in these trees in these areas. No roosting, nesting, feeding or loafing habitats will be lost during invasive species removal. Outplanting of native hydrophytic species in 65 percent of the four acres mitigation area (per EPA open water/cover maximum ratios) will improve native waterbird habitat in 100 percent of the five acres.[3]

Overall, a total of 217,800 sqft (5.0 acres) of freshwater palustrine wetland will be rehabilitated against 41,149sqft (.94ac) jurisdictional wetland lost on Lot 8; or, a 1:5 ratio of loss to gain.

Wetland improvement will include the following actions:

- Non-intrusive removal of invasive tree, shrub and grass species in the designated mitigation areas of the pond to enhance and rehabilitate wetland functionality, improve ponding capacity, nesting habitat and foraging sources for native wetland waterbirds and native insect populations. .

- Re-establishment of native obligate (wetland) plant species appropriate to the Waihe'e Refuge site to enhance waterbird habitat and survival.

- Monitoring and management to maintain the improved quality of the mitigation site and prevent regeneration of alien species. A viable, funded mechanism will be implemented to ensure ongoing protection of the improved wetland in coordination with the Maui Coastal Land Trust staff.

4.3. PHYSICAL ATTRIBUTES – SOILS, FLORA, AND FAUNA

Mean sealevel elevations in the four acre mitigation area are estimated at less than 30ft. above sealevel in the primary wetland. Elevation at the upper one acre mitigation site behind the dune is approximately 100ft based on USGS maps.

The primary wetlands at the Waihe'e Coastal Dunes and Wildlife Refuge can be described as a dune impounded wetland behind a boulder beach. As with many of Maui's larger wetlands, Hawaiians shaped the capacity and characteristics of the wetland by building a fishpond within the natural wetland.

Soils

According to the USGS-NRCS Soil Survey Map: Wailuku Quad, there are primarily four soil types in the Waihe'e Refuge:

- Jaucus sand (JaC 0-15%) and Jaucus saline sand (JcC 0-12% slope) found at the makai side of the dunes and dominate the wetland/fishpond complex.
- Puuone sand (PZUE 7-30% slope) representative of the main sand dunes that surround the wetland;

[3] Removing all non-native species will make 100 percent of the mitigation site accessible to waterbirds and will improve soil saturation levels overall. Outplanting 65 percent of the four acres will enhance the entire four acres by providing a variety of habitat niches for native birds and insects.

- Pulehu silt loam (PpA 0-3% slope), a relatively thick, well-drained alluvial soil with a higher organic matter content found near the old dairy footprint; and
- Iao clay (IcB) soils are located on the mauka side of the dunes facing Kahekili Highway. In representative sites, Iao clays are relatively thick (60 inches; surface and subsoil) and dark brown with moderately slow permeability indicative of good taro growing soils. In the one acre mitigation area, large rocks are also found in the surface and upper soil layers, partially due to soil and rock movement from Kalepa Gulch.

A USGS-based NRCS Soils map can be found in Appendix A.

Flora

The Waihe'e Refuge has representative elements of Dry, and Mesic Coastal and Lowland communities as defined by soils, rainfall, elevation, observable native plant remnants, non-native species, and historic data.[4] Historically, little is known regarding the character and species composition of coastal wetlands in Hawai'i. No pollen records have been done for the Refuge that might shed a more accurate light on rehabilitation efforts. The description below will focus primarily on plant species within the wetlands and mitigation areas, but will briefly mention the endangered species found throughout the Refuge. An informal Section 7 concurrence was given by USWFS in 2006 for restoration work during the NRCS program.

Several endangered plants are found on the dunes, including a small, but relatively healthy, endemic Nehe Herbland (*Wallastonia integrifolia*), a rare Nama herbland (*Nama sandwicensis*) and the endangered dwarf naupaka (*Scaevola coriacea*). The endangered popolo, *Solanum nelsonii*, is documented historically in the area. The Waihe'e dunes represent the type site for one endangered species of lovegrass, *Eragrostis mauiensis*, which has been listed as possibly extinct. In early 2009, the endangered sedge, pu'uka'a (*Cyperus trachysanthos*), previously unrecorded for Maui, was found growing in the wetland indicating the historic seed bank is still viable.

Other more common wetland species have also returned with little or no assistance to cleared areas of the fishpond, including 'ae'ae (*Bacopa monnieri*), 'akulikuli (*Sesuvium portulacastrum*), 'ahu'awa (*Mariscus javanicus*), the fibers of which were used to strain the bitter 'awa root drink, kaluha (*Schoeneplectus juncoides*), and *Pycreus polystachyos*.

Along the length of the coastline in the salt spray zone, 'aki'aki (*Sporobolus virginicus*), 'ilima (*Sida fallax*), mau'u 'aki'aki (*Fimbristylis cymosa*), naupaka kahakai (*Scaevola sericea*), pa'uohi'iaka (*Jacquemontia ovalifolia*), 'uhaloa (*Waltheria indica*), pohinahina (*Vitex rotundifolia*) and pohu'ehu'e (*Ipomoea pes_caprae*) are present.

Coastal strand flora at adjacent sites are rich with additional species that were likely found within the Refuge historically, including 'ohelo kai (*Lycium sandwicense*) and ko'oko'olau (*Bidens mauiensis*).

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[4] Based on "Classifications of Hawaiian Plant Communities" in Wagner et al. 1990:45-114. *Manual of Flowering Plants of Hawai'i*. University of Hawaii Press and Bishop Museum Press. Honolulu.

The vegetation at the base of the dune and encroaching into the wetland is currently composed almost exclusively of non-native species. Invasive tree and shrub species include kiawe (*Prosopis pallida*), christmasberry (*Shinus terebinthifolius*), African tulip (*Spathodea campanulata*), guava (*Psidium guajava*), Java plum (*Syzygium cumini*), octopus tree (*Schefflera actinophylla*), and koa haole (*Leuceana leucocephala*) which is prevalent in the one acre mitigation site. A small stand of hau (*Hibiscus tiliaceus*) is located adjacent to the four acre mitigation site. While hau can be invasive in uncontrolled circumstances, it has value as a resource for cordage and other cultural materials, and as a traditional mulch source for taro patches under selective management. Castor bean (*Ricinus communis*) occupies a portion of the mitigation area along the Dairy Canal, as well.

Hilahila (*Mimosa pallida*) is infrequent but present. Honohono grass (*Commelia diffusa*) is limited to a few sites on the mauka edges of the primary wetland, but, it is clear it remains in the seed bank despite heavy outcompetition by cane grass and Guinea grass (*Panicum maximum*) at the one acre mitigation site.

Several *Ipomoea* sp and passion fruit (*Passiflora edulis*) vines are present in the wetlands. Kudzu (*Pueraria montana* var. *lobata*), Chinese violet (*Asystasia gangetica*) and glycine (*Neonotonia wightii*) are found in the understory of the four acre mitigation site. California or para grass (*Brachiaria mutica*) once dominated a majority of the wetland and fishpond but has been pushed back and is currently found mostly around the Dairy Canal, within the four acre site, and towards the Waihe'e Stream side of the wetland and adjacent dry flat.

Fauna

A small population of endangered waterbirds are found at the Waihe'e wetland; a total of four ae'o or Hawaiian stilt (*Himantopus mexicanus knudseni*), three 'alae ke'oke'o or Hawaiian coot (*Fulica alai*) and two ducks of undetermined species (potentially hybrid Mallard- Hawaiian duck cross) were present at the August 2009 bird count (pure koloa or Hawaiian duck, *Anas wyvilliana* x *A. platyrhnchos* have not been observed on Maui). 'Alae ke'oke'o stay within the deeper parts of the Dairy Canal. Ae'o prefer the edges of the canal and slightly mounded areas within the wetland where water remains shallow during the rainy season. The pair of ducks also prefers the edge of the canal. Migratory shorebirds, make use of the mudflat-like shallow water areas formed within the wetland during the winter months. The kolea (Pacific golden plover, *Pluvialis fulva*) is a common visitor.

Nene (*Branta sandvicensis*), an endangered species which uses the Refuge advantageously, are occasionally observed. The protected 'ua'u kani (wedgetailed shearwater, *Puffinus pacificus chlororhynchus*) nests in the dunes above the wetland.

Non-native birds identified by sight or call within the Refuge include the common mynah (*Acridotheres tristis*), northern cardinal (*Cardinalis cardinalis*), spotted dove, zebra dove and rock dove (*Streptopelia chinenisis*, *Geopelia striata*, and *Columba livia*), Java sparrow (*Padda oryzivora*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*) and Japanese white eye or mejiro (*Zosterops japonicus*. Cattle egrets (*Bubulcus ibis*) have a fluctuating population within the wetlands.

One endangered insect, Blackburn's sphinx moth (*Manduca blackburni*) is recorded near the Waihe'e wetland; the moth or its associated native tree species, the aiea (*Nothocestrum* sp.) have not been found within the Refuge. The moth also feeds on other plants in the *Solanacea* family including non-natives such as tree tobacco, tomato and popolo (wild eggplant). A rapid assessment did not find these species within the selected mitigation acreage. Native and non-native dragonfly species have been observed in the wetlands, including pinao (Giant Hawaiian Dragonfly, *Anax strenuus* and Common Green Darner *A. junius*).

Mongoose, rats, mice, cattle egrets, feral cats, and free roaming dogs are present and a threat to stilts and shearwaters. Systematic trapping and removal, in conjunction with regular monitoring for feral animals is conducted by MCLT staff.

4.4 HISTORY

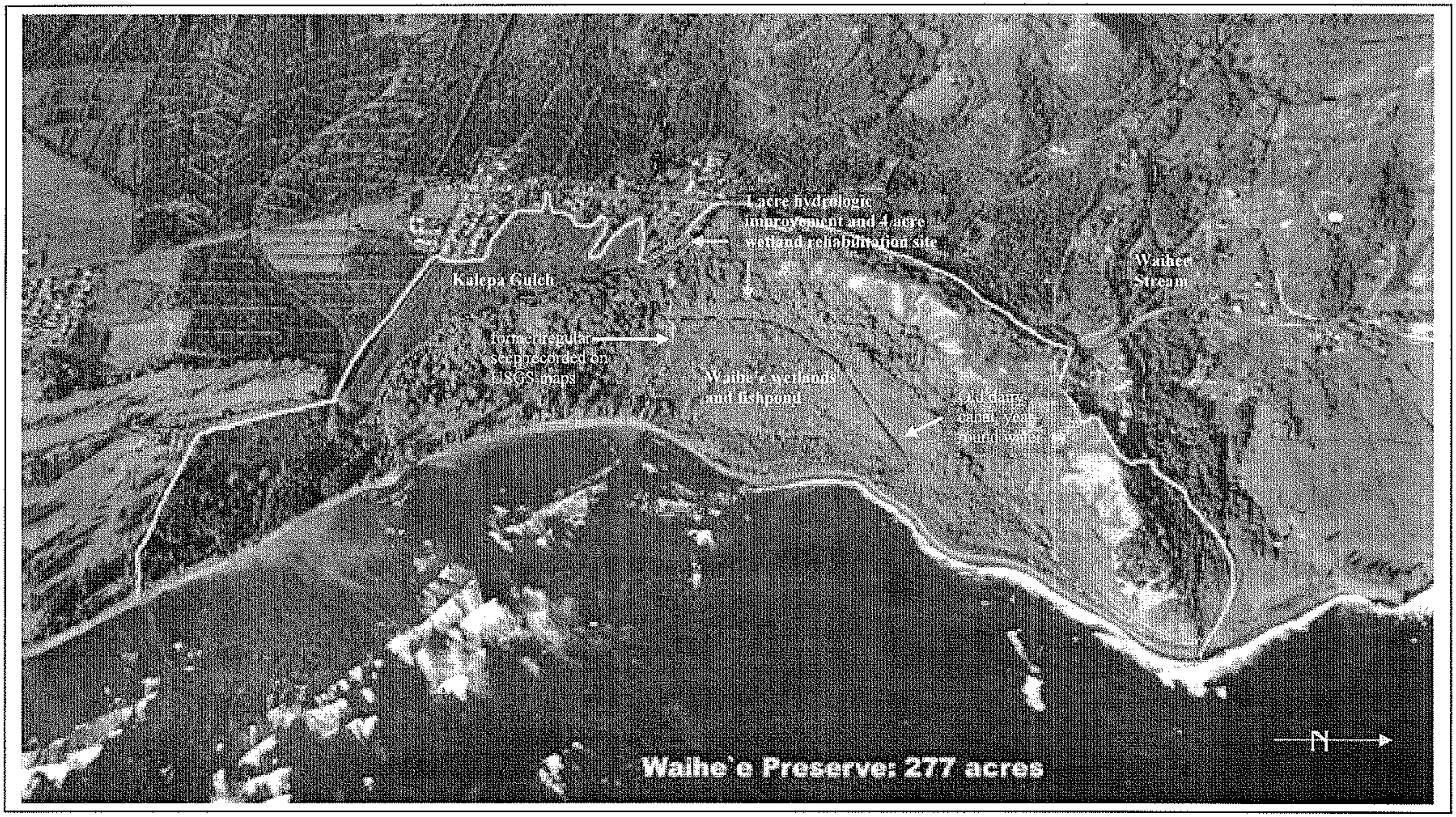
The Refuge was once a thriving Hawaiian community. Numerous archaeological sites are found on the parcel, including the remnants of two heiau (Kapoho and Kealakaihonua), a Hawaiian village complex (Kapoho), an inland fishpond, midden sites and burials within the dunes. A burial plan is on file with the Maui County Burial Council and State Historic Preservation Office. Archaeologists determined there were few sites within the wetland or fishpond. Earlier vegetation clearance within the core of the wetland/fishpond was allowed to be done using small machinery and manually where the edges of the wetland interfaced with upland or stone structures. An archaeologist was on site as needed during those efforts.

Wetland taro cultivation continued through the 1800s and some lo'i may have remained in production until the end of the century on the edge of the primary wetland and through the 1940's in the area mauka of the dunes. Between 1919 and 1967, the site operated as the Waihe'e Dairy. Three wooden buildings remain from this period; at least one was fashioned in the design of renowned Hawai'i architect C.W. Dickey. This structure is in the process of collapse. The remaining buildings are in the process of recovery to house an education center. A caretaker now lives on the property to discourage vandalism and other behavior on the site that could negatively impact the Refuge or the nearby community. Several historic period cemeteries are located on the parcel along Kahekili Highway at the top of the dunes.

In the 1990's, an attempt was made to develop the site as a golf course. The failure of the golf course became the opportunity for the initiation of preservation efforts in 2002.

The Waihe'e Coastal Dunes and Wetlands Refuge is now open to the public. A limited amount of recreational fishing, hiking and some motorcycle activity currently occurs along the periphery of the easement but not within the core of the wetland. Public access is mostly at the east end of the Refuge at a place locally called Round Table. A system of trails in conjunction with hiking tours and outreach education within the local community has reduced human impacts on the dunes and the wetland.

The Waihe'e wetland is isolated from main roads, residences and vehicular traffic and provides a safe sight for local waterbird populations.

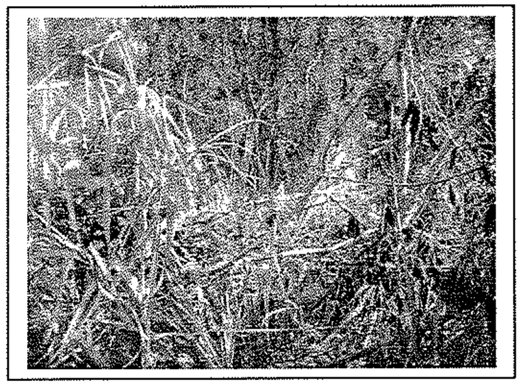


MAP 1. WAIHE'E COASTAL DUNES AND WETLAND REFUGE

☐ Historic extent of the wetland (approximate)
☐ Historic seeps and 'auwai (ditches)
▩ Present day intermittent (Kalepa Gulch during storms) or perennial water (Waihe'e Stream)

4.5 WAIHE'E WETLAND MITIGATION SITE CONDITIONS

Upland one acre mitigation site along the backside of the dune.

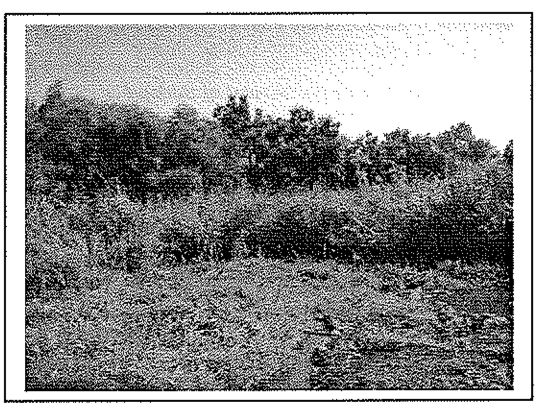


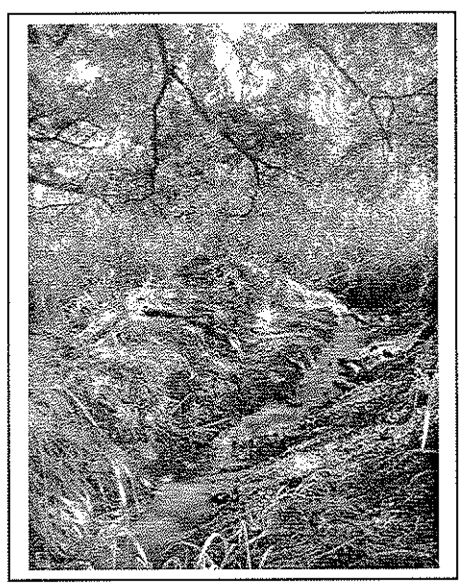
Upper left and right: typical vegetation in the one acre mitigation site.

Middle: Guinea grass-koa haole thicket on the site.

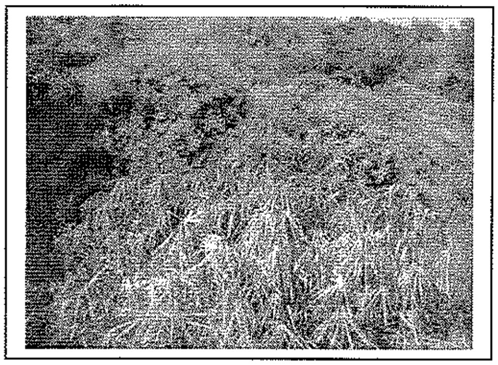
Below left: traditional 'auwai in the foreground adjacent to the cleared test area.

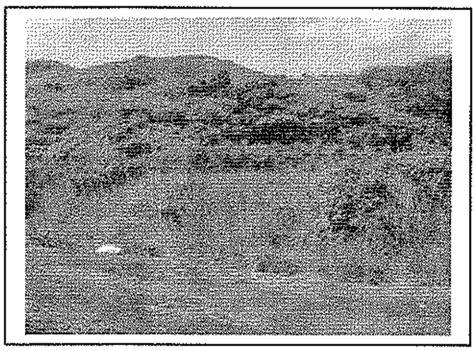
Below right: portion of Kalepa Gulch where it runs through the mitigation site. Good winter rains in the mountains have restored intermittent shallow water to the gulch.

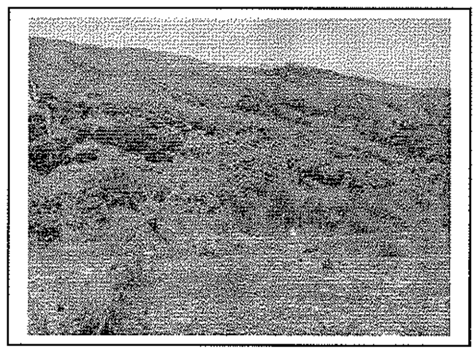




Four acre mitigation site within the primary wetland in front of the dunes.





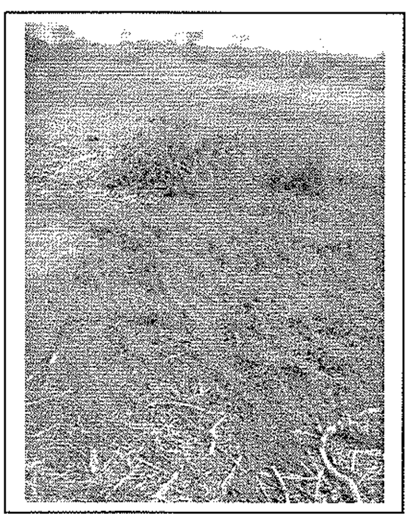


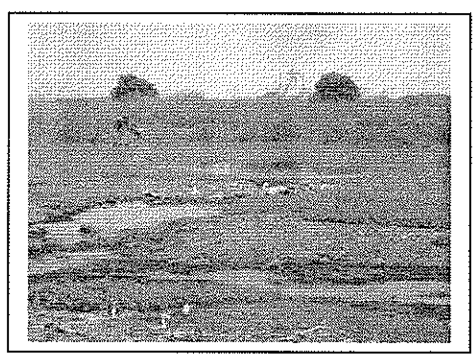
Upper left and right: Invasive species inside the four acre mitigation site.

Middle left and right: view of the four acre mitigation site from inside the cleared portions of the wetland/fishpong.

Lower left: Natural re-establishment of Bacopa and 'ahu'awa in the wetland after clearing.

Lower right: Stilts in the ponded portions of the fishpond after rains (1/12/08).





5. MITIGATION ACTION ANALYSIS

This mitigation plan will enhance and rehabilitate five degraded acres within the Waihe'e Coastal Dunes and Wetland Refuge. The proposed five acres of the mitigation site qualifies as rehabilitation due to the disruptive nature of the invasive vegetation established there. All of the five acres have been dewatered by the presence of aggressive tree, shrub and grass species. Hawai'i. Native waterbirds are currently unable to utilize the area.

Controlling noxious species is a major objective of the Maui Coastal Land Trust for the Refuge; the second being to encourage native species and restore some of the hydrology that once supported the wetland.

The wetland function analysis on the following page (Table 1) is based on US-ACE and USFWS examples and the discussion of function in *Hawai'i Wetland Field Guide: an ecological and identification guide to wetlands and wetland plants of the Hawaiian Islands* (Erickson and Puttock 2006), as well as local agency and individual expertise.

Table 1. Wetland mitigation functional capacity analysis

Function	Lot 8 value	Mitigation site value
Sediment attenuation and reduction	The topography of the site traps and stores sediment. Improved water capture will also increase retention value on the property. Landscaping will trap and prevent soil movement.	Dense vegetation has dried the mitigation site. Removal of alien species will increase water retention capacity by 20 percent. Native aquatic sedges will reduce sediment movement.
Nutrient and chemical attenuation and reduction	The site traps and filters sediment in the ground. Pollution filters installed at the bottom of water capture basins will reduce impacts to soils/groundwater.	NA.
Flood attenuation and storage	Improved water capture capacity in two retention basins will increase this functional value on the property by 57 percent (from an estimated 80,000gallons to 126,000 gallons)	Removal of alien vegetation which currently blocks water movement will increase flood attenuation capacity of the entire 27 acre wetland by 15 percent by allowing water to spread into cleared acres.
Hydrology	NA	Rehabilitation of the mauka acre will potentially improve water seepage through the dune into the wetland, restoring a small portion of the original hydrology to the site.
Plant community abundance and diversity; ecological niche diversity	The construction site is dominated by non-native plant species. Natives persist for only a short period each year after extreme flooding. Landscaping on the construction site will support the use of transitional native species (from coastal strand to coastal lowland) throughout the property and as protective barriers between the parcel and the pond.	The mitigation site is dominated by invasive tree, shrub and grass species that alter the fundamental ecological character of Hawai'i wetlands. Healthy edge and buffer zones are lacking. Alien plant species diversity and abundance will decline by 80 percent or more. Native plant diversity and abundance will increase to 80 percent or more in 5 years. Appropriate wetland niche diversity will increase in kind.
Fish and wildlife habitat	The site is severely degraded and has no fish and poor wildlife habitat value in its current condition. It is detached and isolated from the wetland or any upstream water body. No fish are present on the site even during ponding events. Waterbirds have been noted onsite only temporarily after major storm events.	Removal of invasive species and replacement with native species will turn the structure and function of the site from an unusable portion of habitat to one of high quality for waterbirds. Mitigation will create shallow open water and mudflats (a minium of 35 percent per EPA performance standards) and provide at least 80 percent improvement to available food resources, loafing, hiding, breeding and nesting habitat for endangered and migratory waterbirds.
Groundwater recharge	Improved water capture in the two retention basins will increase this value on the property. Pollution filters within the basins will improve the quality of groundwater recharge.	Ground water recharge is difficult to asses as the hydrology of this wetland site has not been tested to identify water exchange patterns. Improved freshwater seep into the property will improve water quality.
Traditional cultural resources	None present.	Dominant invasive vegetation dramatically alters the traditional Hawaiian landscape. The plant species selected for outplanting including makaloa and 'ahu'awa have important cultural uses. Improvements in the wetland restore the context of Hawaiian landscape found at the Refuge.

6. PROPOSED MITIGATION WORK PLAN

The following mitigation work plan is intended to achieve the goal and objectives outlined in Section 2.

6.1. BOUNDARIES OF PROPOSED MITIGATION

The proposed mitigation site is divided into two portions – a one acre mauka site and a four acre site in the primary wetland. Both sites will be GPS'd and marked with PVC pipes during the first two weeks of access to ensure they meet the acreage requirement and their boundaries can be maintained for future monitoring and management. Map 1 indicates the boundaries of the Refuge and the location of the proposed mitigation.

Removal of invasive species and replacement with native species will occur in the four acre site but not in the upper one acre site due to unknown topography and conditions under the vegetation. Removal of invasive species will increase available water for seepage through the dune that has the potential to improve hydrology to the larger wetland.

6.2 MITIGATION TIMING AND SCHEDULE

Project implementation will occur prior to construction on Lot 8 provided that all permits are received in time to meet this goal and that flooding at either site does not prevent mechanical access. The small size of current populations of native waterbirds and the distance separating them from the selected mitigation areas allows for work to be completed with a monitor on site to inspect areas to be cleared to avoid impact to birds or bats rather than a closed season.

Removal of non-native vegetation represents the highest level of disturbance that will occur during this effort. The estimated amount of time for this work is one week (7 days) during allowable daylight hours for the one acre site and 3 weeks (21 days) for the four acre area.

Outplanting will occur in coordination with the seasonal rains. Primary planting will begin in the first available year as plant availability occurs. Drought conditions will have impacts on plant mortality rates and replacement plantings may occur in subsequent years through year three during the same time frames. Seed collection, propagation and outplanting will be coordinated with a local nursery six months in advance of outplanting.

Invasive species removal and outplanting schedules are contingent on the timing of permit approvals. No work will occur until authorization by permitting agencies is provided.

Table 2 provides an estimated schedule for implementation.

Table 2. Estimated schedule for implementation

Action	Start date	End date
1. Coordination with selected plant provider(s); seed collection and nursery germination	Prior to implementation	November 2010
2. GPS outline and marking of mitigation area.	Implementation year (January 2010)	3 days (January 2010)
3. Mapping to establish a baseline against which to monitor change; flagging of native species within the work area	Implementation year (January 2010)	5 days (January 2010)
4. Invasive species removal	Implementation year (January 2010)	March 2010
7. Outplantings	Implementation year (December 2010)	March 2011
8. Maintenance (weed control, plant replacement)	Year 1 (2010 after implementation)	Plant replacement Year 3; weed control perpetual
9. Monitoring	Year 1 (2010)	Year 5 (2015)

6.3. INVASIVE SPECIES REMOVAL

Invasive species removal in the mitigation area will be conducted using a forestry mulcher, which works from the top of vegetation down rather than by pushing; and with manual removal near rock walls per archaeologist recommendations and gulch edges for safety. No disturbance below soil surfaces is expected. Trees will be cut at the base and mulched on site. This method has been used successfully in the fishpond and some portions of the wetland for three years. The organic matter breaks down quickly and has served to keep down weeds while native species establish during the first year, significantly reducing follow-up invasive species monitoring and management. Because the wetland ponds only in small patches and intermittently in typical years, and rarely throughout, organic matter breaks down rapidly and does not hinder native species recruitment. The microtopography created by the organic matter supports a variety of flora and fauna. Stumps will be cut or ground to surface level and the stump treated to discourage resprout. The proposed activity follows earlier protocols for this site.

Invasive species removal after initial mitigation is described in Section 7.3.

Applicable BMPs:

1. To avoid impacts to endangered bird species and bats a monitor will be onsite during vegetation removal. A qualified monitor will survey the area for nests prior to vegetation clearing work. Vegetation will not be cut or otherwise cleared unless the area is free of birds. If perennial, woody host plants for the Blackburn's sphinx moth are found, they will be flagged and the soil around the plants will protected from disturbance within a 3 meter buffer. An archaeologist will be on site when working near cultural features.

2. Equipment will be cleaned off-site prior to work on-site to reduce potential for new invasive species introductions.

3. Invasive species will be removed mechanically within the wetland and by hand in areas adjacent to archaeological features or gulch edges to minimize impacts and ensure safety.

4. No project related materials or vehicles will be stockpiled or stored within the wetland area.

5. No trash disposal or polluted runoff will be discarded or released to the wetland site.

6. Containment supplies such as absorbent pads and other materials will be kept on site to facilitate immediate cleanup of any accidental spills of petroleum products or other chemicals.

7. Contractors and others involved in invasive plant control will be required to demonstrate to Refuge managers, or their designee(s), their ability to identify native plants likely to be found in the wetland to ensure that no accidental removal of native species occurs.

6.4. GRADING PLAN AND CONSTRUCTION METHODS

No grading will occur within the mitigation site and no construction will occur within the mitigation site.

6.5. PLANNED HYDROLOGY

Existing open water in the Refuge are minimal and confined to the Dairy Canal except during substantial rains when perhaps 20 percent of the wetland is ponded for a brief time during the peak of the winter season. Exceptions occur during extreme rains; the last documented event occurred in 1990 and 2005 when an estimated 50 percent of the wetland was flooded. Water in the pond evaporates rapidly, likely at a similar rate as that of Kanahā, meaning what little water may be captured disappears quickly. Removal of invasive species, particularly kiawe has made more moisture available to maintain wetland soil characteristics.

Removal of invasive species from the one acre mitigation site is intended to improve seepage of freshwater through the dunes to the wetland. Vegetation removal in the wetland will improve and extend water saturation levels in the soil. Piezometers will be established along the mauka edge of the wetland to monitor changes in wetland hydrology. Existing piezometers may provide some past years data for comparison; however, it may be impossible to determine if increased saturation will be in response to increased rains overall or to improved hydrology.[5]

[5] We appear to be coming out of a seven year drought cycle but the uncertainty of rains in the last five years has left Maui with a groundwater deficit that will continue to impact watersheds and acquifers in the future.

Seasonal fluctuations mimic to some degree naturally occurring conditions for coastal wetlands in Maui, where water levels change daily, weekly, seasonally and annually particularly on hot days and in drought years. For this reason, it is not possible to accurately predict or define changes in duration, depth and acreage.

6.6. PLANNED VEGETATION

For a discussion of plant species choices in the context of Maui's coastal dune and fishpond associated wetlands refer to the original mitigation plan.

The following native species (endemic, indigenous or Polynesian-introduced) were selected based on documented presence within coastal fresh and brackish water wetland in Maui and at the site in consultation with the MCLT project manager. These plants serve multiple functions, including:

- Aquatic niches
- Soil retention
- Water filtering
- Food sources for birds and other aquatic fauna
- Hiding, nesting and loafing niches
- Cultural use

Hawaiian Name	Common Name	*Scientific Name*	Species Status	Height (meters)	Wetland Status*
Sedges and rushes (to 1.5m)					
'Ahu'awa	Java sedge	*Cyperus javanicus*	I	0.4 to 1.1	FACW
Makaloa	Smooth flatsedge	*Cyperus laevigatus*	I	0.2 to 1.0	OBL
Kaluhā	Saltmarsh bulrush	*Bolboschoenus maritimus*	I	0.5 to 1.5	OBL

* OBL = Obligate wetland species (99% found in wetlands); FACW = Facultative wetland species (67-99% found in wetlands).

Some flexibility in species choice will be essential in the event that the needed amounts of seedlings are not available. Mitigation team members will work closely with MCLT staff to ensure the best mix of species for the site for all plantings. Changes in species composition will be submitted to the US-ACE for review prior to implementation.

Planting plan

The EPA has determined that "less than 75 percent of [a] restoration site should be dominated by plant cover" and open waters and mudflats should be "actively maintained to prevent invasive plants of low habitat value (e.g. mangrove and pickleweed, *Batis maritime*)" as a performance standard in previous wetland mitigation projects in Hawai'i in support of endangered waterbirds (EPA Docket No. CWA-404-309(s)-06-007; Steinwascher).

Planting will occur in 65 percent of the four acre mitigation area in support of maintaining a balance of open mudflat and potential ponding area as preferred bird habitat. The one acre site will not be planted due to uncertain topography at this time but will be maintained to prevent soil erosion.

Source, size, spacing and numbers for outplanting

Seed stock for kaluhā and 'ahu'awa will come from existing populations within the wetland. Makaloa seed will be sourced from neighboring wetlands in Central Maui or approved nurseries known to have a healthy source of local plant material.

Plant stock will be grown to 4-inch pots. An estimated four to six months are needed for herbaceous species growth in the nursery prior to outplanting to ensure healthy root development.

A minimum 2ft on center (FOC) (or 4ft diameter) is recommended for sedges and rushes. Planting patterns will follow those outlined in the original mitigation plan to mimic more natural habitat cover. A minimum of 24,000 starts will be established.

Hawaiian Name	Species	Height (meters)	Spacing FOC	Sq FOC	Estimated Numbers
'Ahu'awa	*Cyperus javanicus*	0.4 to 1.1	2ft	4ft	3,000
Makaloa	*Cyperus laevigatus*	0.2 to 1.0	2ft	4ft	15,000
Kaluhā	*Bolboschoenus maritimus*	0.5 to 1.5	2ft	4ft	6,000

Plants will be grown out at the MCLT Refuge nursery and a providing outside nursery. Advance coordination with nurseries will be required by the party(s) responsible for mitigation to allow for reasonable growing time; a minimum of four to six months prior to seed collection and outplanting where necessary.

Applicable BMPs:

1. Planting material will not be brought in from other islands or high risk nurseries as a caution against invasive species and soil or plant pathogen introductions, including cocqui frogs (Hawai'i, O'ahu, and Maliko gulch area on Maui), little red fire ant (Hawai'i and Kaua'i), ants, nematodes and root aphids (O'ahu and Hawai'i), powdery mildew and other fungal diseases. In addition, plant material will be inspected upon delivery and rejected if disease, insect or weed infestations, or poor vigor are observed.

2. Outplanting crews will clean their boots, clothing and equipment of weed seeds or soil prior to entering the mitigation site.

3. Planting depths for herbaceous seedlings will be no more than four inches. A thin, light covering of soil will be placed on top and tamped down by hand.

4. Replacement plantings will be done where significant mortality (greater than 20 percent) occurs during the first three years after planting.

6.7 PLANNED SOILS

No planned soils are required for this mitigation effort.

6.8 PLANNED HABITAT FEATURES

Hawai'i's endangered waterbirds prefer shallow ponds (one foot or less), marshy areas or mudflats and feed on fish, crabs, worms, aquatic insects, seeds and leaves. Existing soil surfaces will support nesting, feeding, wading and loafing sites for ae'o once re-planted with appropriate native species.

Deliberately maintained open waters and mudflats support desirable waterbird habitat for birds and their food sources. Variable densities in planted material (sedges) provide more diverse managed habitat for bird activity. No additional features are necessary to be installed.

6.9. PLANNED BUFFERS AND ADDITIONAL FEATURES

There are no planned buffers or additional features for this plan.

7. PERFORMANCE STANDARDS

Performance standards and monitoring techniques are selected appropriate to the status of the wetland as a federal and state wildlife sanctuary. The following practical performance standards will be used to quantify and qualify the status of desired outcomes and verify that objectives have been met.

7.1. MEASURES OF SUCCESS

The following measures (performance standards) will determine the level of project completion:

- *Hydrology* – a 20 percent (1 acre) increase in the overall area of inundation/saturation within the primary wetland mitigation area (4 acres) at the peak of the rainy season after alien vegetation removal is completed. A discussion of the imperfect nature of this measure is found in measures of success in original mitigation plan.

  During implementation:

  - no water turbidity will occur during implementation as no standing water or adjoining water exists inside or adjacent to the mitigation areas at this time. The mitigation site is 100 percent dry as are adjoining areas.

- *Vegetation* - a permanent increase in presence and cover of native obligate and upland species to a maximum of 65 percent of the four acre mitigated area within five years.

Allowing for natural spacing and water inundation between individual plants and recognizing initial sedge seedlings will be small in size, the following annual standards are proposed:

Year 1: A reduction in the area covered by invasive and non-native vegetation within the mitigation area by a minimum 80 percent after one year and will not exceed 20 percent cover in subsequent years.

Year 2: Vegetative cover of native species will reach 20 percent in mitigated areas. Outplanted native species will achieve an 80 percent survival rate.

Year 3: Native plant cover will reach 30 percent in mitigated areas.

Year 4: Native plant cover will reach 45 percent in mitigated areas.

Year 5: Native plant cover will reach a maximum cover of 65 percent.

8. SITE PROTECTION AND MAINTENANCE

There is no need for a legal instrument to convey easement or deed for this mitigation project as the property is already protected in perpetuity by the Maui Coastal Land Trust and the County of Maui. Lot 8 will carry a deed requirement for maintenance of the five acres within the pond in perpetuity.

8.1. LEGAL PROTECTIONS AND PARTY RESPONSIBILITY

A legally binding agreement between Maui Coastal Land Trust and Kanahā Professional Plaza LLC will be created to ensure all mitigation measures and future monitoring and maintenance work is completed and supported either through funding, contract, or provision of necessary resources. A legally binding CC&R document that carries these obligations to MCLT with the property in perpetuity will be attached to the deed of Lot 8

During implementation, Kanahā Professional Plaza LLC, or its designated representative(s), will be responsible for providing independent monitoring and compliance and for obtaining all permits as required.

Invasive plant species removal and disposal, plant propagation and/or purchase, outplanting and weed management inside the mitigation area will be handled by contract to MCLT under Kanahā Professional Plaza LLC. The will responsibility for monitoring and maintenance after initial mitigation is complete and the resources required to support that will be assigned either to MCLT or an outside contract at completion of implementation.

After implementation, Kanahā Professional Plaza LLC, or its designated representative(s), will bear the responsibility of ensuring site protection, management, independent monitoring, compliance and reporting to county, state, and federal agencies on the status of the mitigation site.

MCLT will remain the owners and primary managers of the site.

8.2. MAINTENANCE PLAN AND SCHEDULE

Maintenance is tied closely to monitoring. Two levels of maintenance scheduling will occur;

- Quarterly maintenance of invasive species control coordinated with bi-annual monitoring schedules for five years.
- Day-to-day observation by MCLT staff to guide maintenance scheduling for other than quarterly maintenance for five years.

Measures to control invasive species and conduct replacement plantings will be undertaken by Kanahā Professional Plaza LLC or its contracted site manager(s) and monitor(s).

8.3. INVASIVE SPECIES CONTROL PLAN - MAINTENANCE

The wetland will be monitored for invasive species regermination and new introductions on a quarterly basis during the first five years after native plant establishment. More frequent monitoring and maintenance will be done if incipient (new) populations of alien species occur to rapidly eradicate them or if invasive encroachment persists heavily. Alien invasives will be removed using manual techniques (hand pulling) or herbicide treatment where appropriate, particularly where stump resprout occurs. Aquamaster is approved for use in wetlands on emergent wetland plants and may be used to control persistent germination of invasive species (DOFAW 3/31/09). Monitoring will continue for five years to ensure permanence of control action.

Applicable BMPs:

1. All project-related equipment and tools will be free of pollutants and weed seeds to the best possible degree during mitigation activities.

2. Vigilance during the early stages of native plant establishment will significantly reduce invasive species control work loads long term.

3. In the event that chemical control of invasive species is used, such application shall follow label and MSDS instructions for cleanup and disposal of chemical containers and applicators. A licensed pesticide applicator will be on-site. Cleanup will occur outside of wetland areas.

4. Herbicide use will be done during no or low wind periods using a narrow spray range or nozzle drip (ie. basal bark) and clear weather to minimize peripheral impacts. Where non-native plants are in tight proximity to natives, removal with hand tools will be used.

5. A qualified archaeologist will be onsite as needed to monitor the area in the advent of inadvertent discovery of cultural materials and for protection of existing features.

9. MONITORING PLAN

9.1. PARTIES AND RESPONSIBILITIES

The US-ACE has federal authority over permitting and action on this project, with advisory from EPA, USFWS, DLNR and DOH. State and county SMA rules also apply.

Kanahā Professional Plaza LLC will be the responsible party for implementing and/or managing contracts for implementation, onsite management and monitoring. All implementation and monitoring will be carried out in coordination with MCLT.

9.2. DATA

The data collected and reported will provide sufficient information to evaluate performance standards without being overwhelming to a small project. The following types of data will be collected:

- Water presence/absence - date, area inundated and duration (if practical).
- Plant community composition (species) and cover (area).

9.3. ASSESSMENT METHODS

A general baseline has been established against which to measure change though the use of existing photographs and on-site surveys indicating 100 percent alien cover. A GPS outline will provide clear boundaries for measurement. Photographs and species composition lists will be developed by the project monitors. Minimizing regular disturbance within the wetland is a priority for all assessment methods selected.

Vegetation assessment methods are described in the original mitigation plan and are not changed. Water inundation will be evaluated using the percent cover method described for vegetation.

Additionally, a minimum of 5 piezometers will be installed along the length of the four acre mitigation site to monitor soil saturation and ponding levels on a quarterly basis. During the winter quarter, data collection frequency will increase to twice a month.

9.4. MONITORING AND REPORTING FORMAT AND SCHEDULE

Baseline monitoring will be conducted two weeks prior to vegetation removal. Site inspection will occur immediately prior to vegetation removal to ensure no presence of waterbirds in the mitigation area.

Monitoring frequency is described above as part of methodology. A monitor will be present daily during invasive species removal and weekly during outplanting throughout the implementation period, and at bi-annual and annual intervals thereafter.

Reports will be filed with the US-ACE, EPA, USFWS and DLNR bi-annually during the implementation, once a year for all subsequent years. Reports will describe the status of goals, objectives, performance standards, challenges, and status of outplantings, invasive species control and wetland function.

It is noted that the County of Maui has requested review of wetland mitigation projects every 5 years for some wetland properties. In the past, the County has occasionally requested the an outsider site review and report (rather than from the applicant) for the Maui County Council.

10. ADAPTIVE MANAGEMENT PLAN

Adaptive management is a key strategy in increasing the success of any habitat restoration project. Where a goal or objective is met, then mitigation activities have been effective. Where difficulties arise in achieving set standards, the methods or tools in use may need to be revised. The key tool in effective adaptive management is observation (monitoring).

Climate related events, newly observed behaviors or needs in wildlife using the habitat, natural plant community changes, and disease events are all factors beyond the control of wetland managers and the second reason for adaptive management to be included in mitigation. Flexibility within management and monitoring parameters and performance standards is a necessary part of responding to changes in the environment and recognizing the limits of the resources at hand.

10.1. PARTIES AND RESPONSIBILITIES

The US-ACE has federal authority over substantive changes to management strategies. MCLT is the authority for this site.

In the case of adaptive management response, Kanahā Professional Plaza LLC will be the responsible party in collaboration with MCLT for managing contracts for onsite management and monitoring after implementation. Both parties will work together to respond to any needs for adapting practices based on changing conditions at the site.

10.2. POTENTIAL CHALLENGES

A number of potential challenges exist to meeting performance standards in a timely manner and to the success of the project, including:

- Rapid recolonization by aggressive invasive species from the soil seedbank or from new sources.
- Heavy rain or flood event which could potentially disrupt implementation schedules, inundate outplantings and/or result in plant die-off.

- Malicious habitat damage by people or dogs. This can include fire, waterbird kills or destruction of native plants which can potentially impact waterbird populations or quality of the wetlands and is one of the challenges of conservation sites near urban areas.
- Plant species selected for this project may not be immediately available in the numbers required due to seed/stock shortages. This can be the result of drought conditions or rodent predation at seed gathering sites, selection of species that are habitat specific and not kept in large quantities by nurseries, or pest/disease infestations within nursery plantings.
- Delays or poor coordination between invasive species removal and nursery-to-outplanting schedules. A permit issued too late to coordinate with nurseries and grow out plants, will result in unavoidable delays in completion of outplanting. The species selected for the project can not be held over in a nursery without becoming root-bound which makes them unsuitable for outplanting (high failure rate); an extremely expensive loss for a nursery, the applicant and the mitigation project.
- Botulism or insect pest outbreaks within the bird or plant community.
- Changes in project management, monitoring and oversight parties.
- Failure of mitigation efforts at the site due to uncontrollable circumstances.

10.3. POTENTIAL REMEDIAL MEASURES

Remedial measures to address the potential challenges listed above are:

- Rapid recolonization by invasive species will be handled by rapid response. Control of large infestations will be coordinated with MCLT staff and appropriate actions taken using the above described BMPs.
- The site will be inspected after extreme rain or flood events and damage assessed. The appropriate agencies and MCLT will be consulted prior to remedial action in such cases. Flooded plantings may revive on their own. Replacement plantings of the same or similar hydrophitic native species will be done where needed.
- If some plant species selected are not available when the site is ready for outplanting, partial planting or a shift in species composition will occur.
- If permit issue is delayed, seed collection will continue in the summer of 2010. Grow-out time in the nursery will begin in August 2010 and outplanting will occur in December 2010 through March 2011. Delays in outplanting schedules may occur due to natural and uncontrollable elements. Where outplantings can not be completed within a single season; they will be finished in the following year.
- Maui has seen several large botulism outbreaks within Keālia Pond with resultant loses in waterbirds. Any bird deaths within the wetland will be immediately reported to DOFAW and USFWS. Carcasses of any animal (ie. rats) or large fish dieoffs will be reported immediately to minimize potential for fouling water quality. In the event

of an outbreak, DOFAW and USFWS specialists are the responding and responsible agencies.

- The need for changes in project management are often unforeseen. Any new responsible party will be fully briefed on the history, current status of the project and required actions on the part of the managing entity. An alternative management and monitoring agency or individual will be required to have previous local wetland habitat management experience and familiarity with wetland plants and invasive species control.
- Mitigation efforts may fail for a variety of reasons beyond the control of the project. The property owner(s) will work with the US-ACE and MCLT to seek out appropriate alternatives and/or sites in need of assistance. Fund and/or resources would be rededicated to the new site.

10.4. PLAN MODIFICATION PROCEDURE

The mitigation project may meet its goals but in unanticipated ways, particularly during the first year. Where substantive plan modification may be needed the following procedure will be used:

- The management party will consult with specialists (ie. species or habitat restoration or invasive species control specialists).
- The responsible managing party will document the unanticipated changes and the need for plan modification and provide a report and request for modification to US-ACE, the ruling agency and cc to the USFWS, EPA, and DLNR-DOFAW.
- The US-ACE and the responsible management party will review the information and existing standards and develop appropriate alternative standards to fit the situation.

11. FINANCIAL ASSURANCES

Kanahā Professional Plaza LLC will contract Maui Coastal Land Trust for implementation of the mitigation. This will include invasive species removal, native species propagation, and outplanting. A perpetual CC&R will be attached to Lot 8 in the form of a Mitigation Fund, to assure continued monitoring and maintenance.

The cost of implementing mitigation within Waihe'e Refuge is estimated at $112, 200

BUDGET ITEM	ESTIMATED COST
A. COSTS	
1. Equipment and tools	$5,700
2. Non-native vegetation removal	$20,000
3. Archaeological monitoring	$1,500
4. Native plant species propagation/outplanting	$35,000
5. Contracted field staff	$50,000
	$112,200
B. LONG-TERM MITIGATION FUND	
1. Contracted maintenance staff	$75,000
2. Alien plant control materials	$10,000
3. Wildcard events	$10,000
4. Monitoring and reporting	$12,500
	$107,500

The cost of all monitoring and reporting and a perpetual mitigation fund, including coverage for wild card events that may occur, is assigned to Lot 8 development costs, along with the perpetual CC&R conditions assigned to the development property, irrespective of who owns the land. Maintenance and monitoring are estimated at $107,500 over a five year period. A sum of $10,000 is built into the this fund to cover "wildcard" events such as the establishment of an aggressive invasive species currently not present on the site or plant replacement due flooding.

An account will be established initially with a Hawai'i bank (the "Account") into which the developer will deposit $107,500 (the "Mitigation Fund") for the first five years. Additional funding will be added as need in subsequent years. The "Mitigation Fund" will be restricted to use for the monitoring, maintenance and reporting described herein and as approved by the MCLT. The developer will maintain the Account and be solely responsible for all fees associated with the Account. The restrictions on access to the Mitigation Fund consistent with the terms of this plan shall be given to the designated bank or any successor holder of the Account. The Account and the Mitigation Fund shall be deemed an asset of the project and shall be transferred to any successor landowner to ensure available funds for compliance with this plan. Ongoing obligations relating to the mitigation shall also be set forth in a recorded document which shall encumber the developed property. In this way the developer shall ensure that it and any successor landowner shall be appraised of the ongoing obligations and shall be bound by the same.

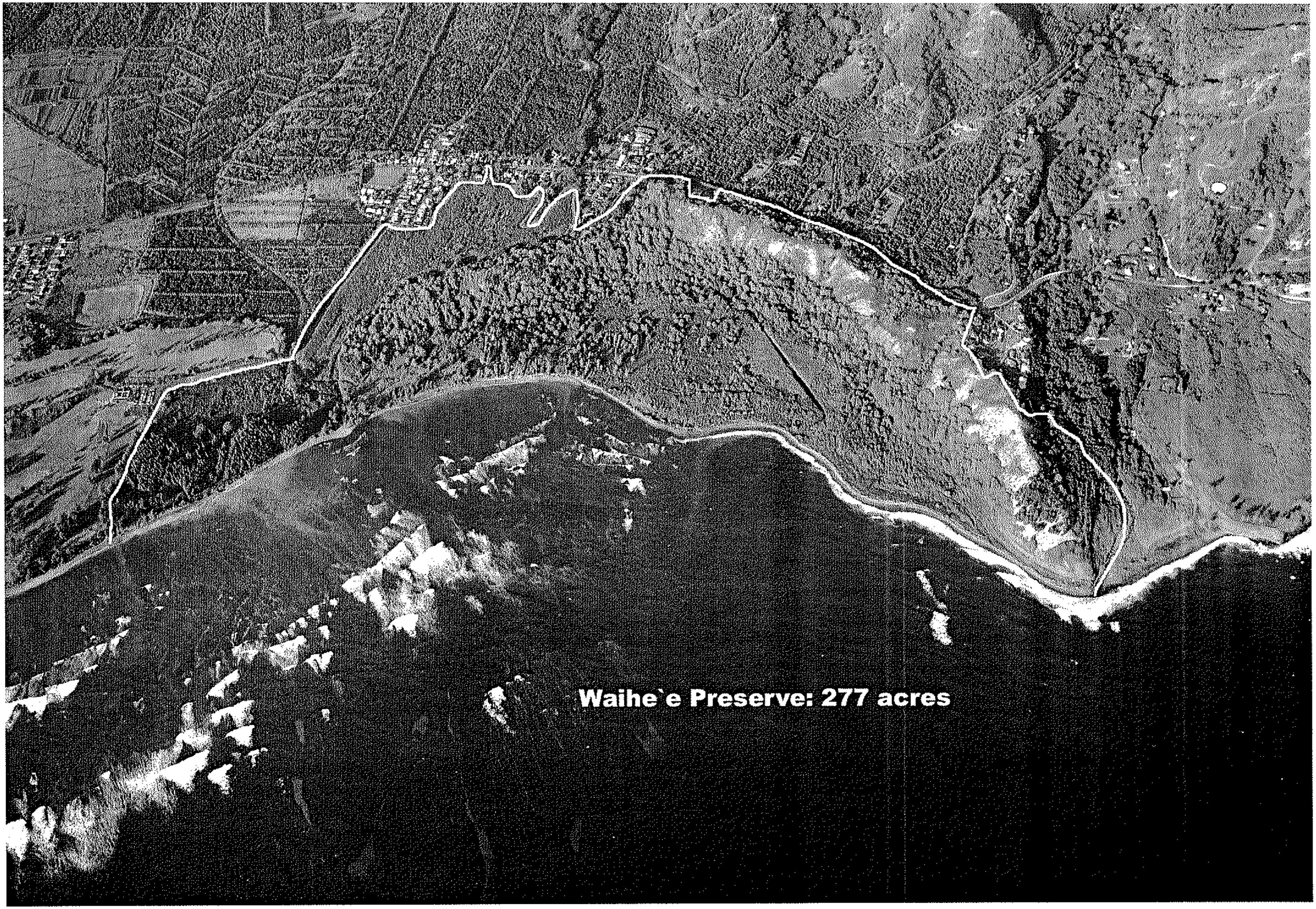
Financial assurances will be reviewed by MCLT and adjusted to reflect current economic conditions such as a rise in the cost of supplies, monitoring and maintenance.

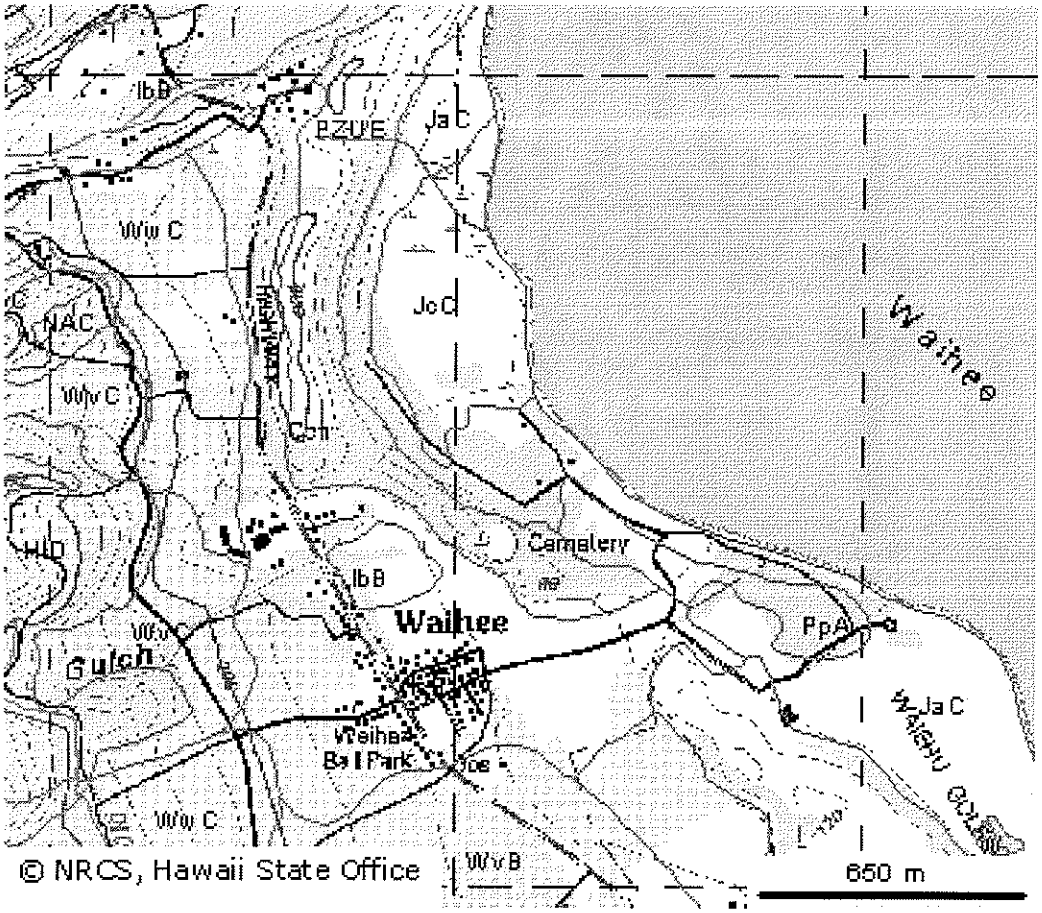
12. REFERENCES

References are found in the original mitigation plan. Photographs were taken by P. Levin except where noted. Aerial photographs underlying maps belong to MCLT.

APPENDIX A: ADDITIONAL MAPS AND IMAGES

Waihe'e Coastal Dunes and Wetlands Refuge boundary map and aerial
USGS/NRCS topographical, soils and T&E species maps
Waihe'e Refuge archaeological sites map, including fishpond location


Waihe`e Preserve: 277 acres


IbB
PZUE
JaC
WvC
JcC
NAC
WvC
Ccn
HID
Cemetery
IbB
Waihee
PpA
Gulch
Waihee Ball Park
JaC
Waihee
WvC
WvB
© NRCS, Hawaii State Office
650 m

Soils Map

Maui Coastal Land Trust

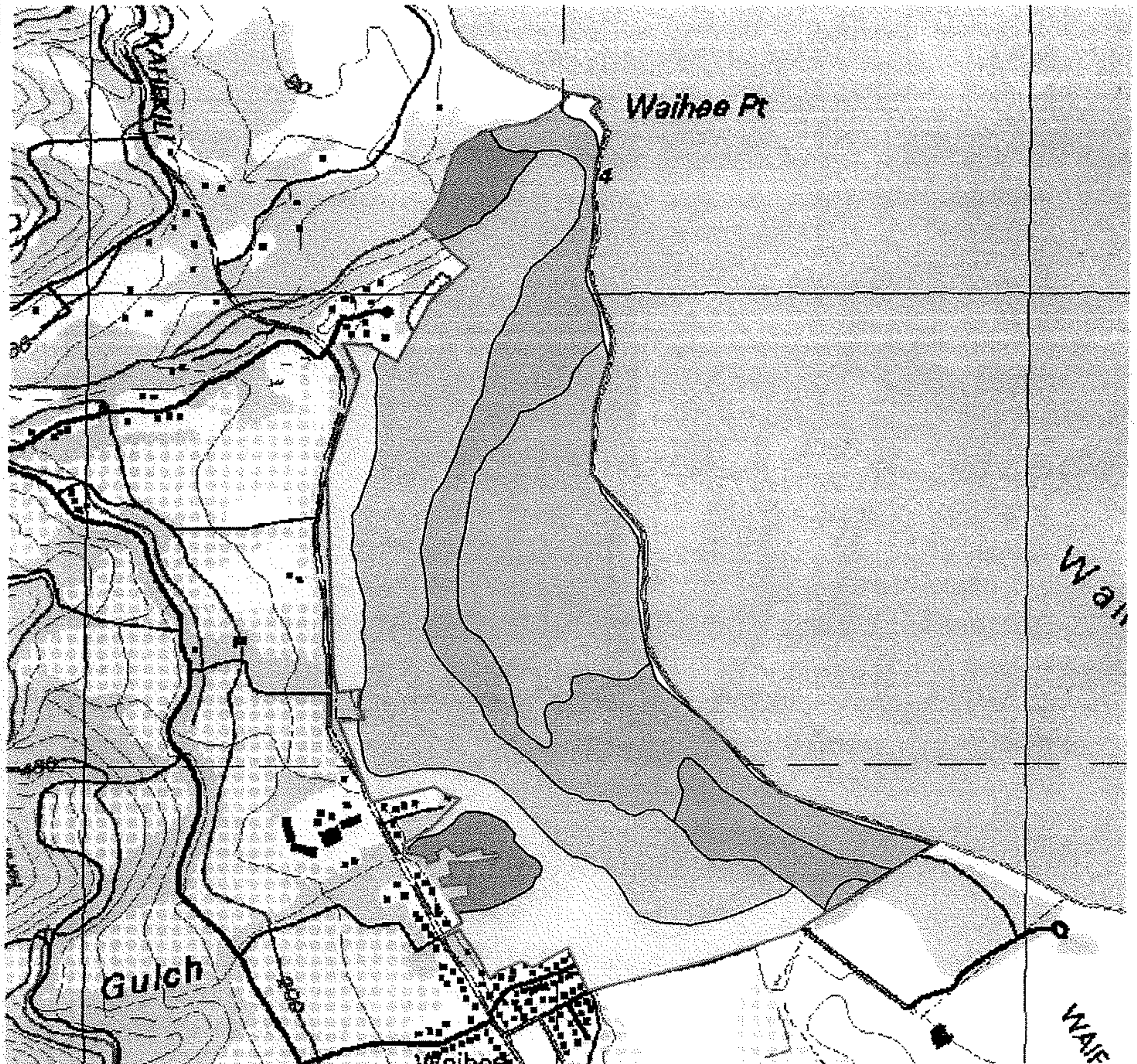
Central Maui

Date: 04/21/2005

Wailuku

USDA-NRCS

RFGC



Legend

Planned Land Units
Soils Map
IbB
IcB
JaC
JcC
PZUE
PpA
Planned Land Units Labels

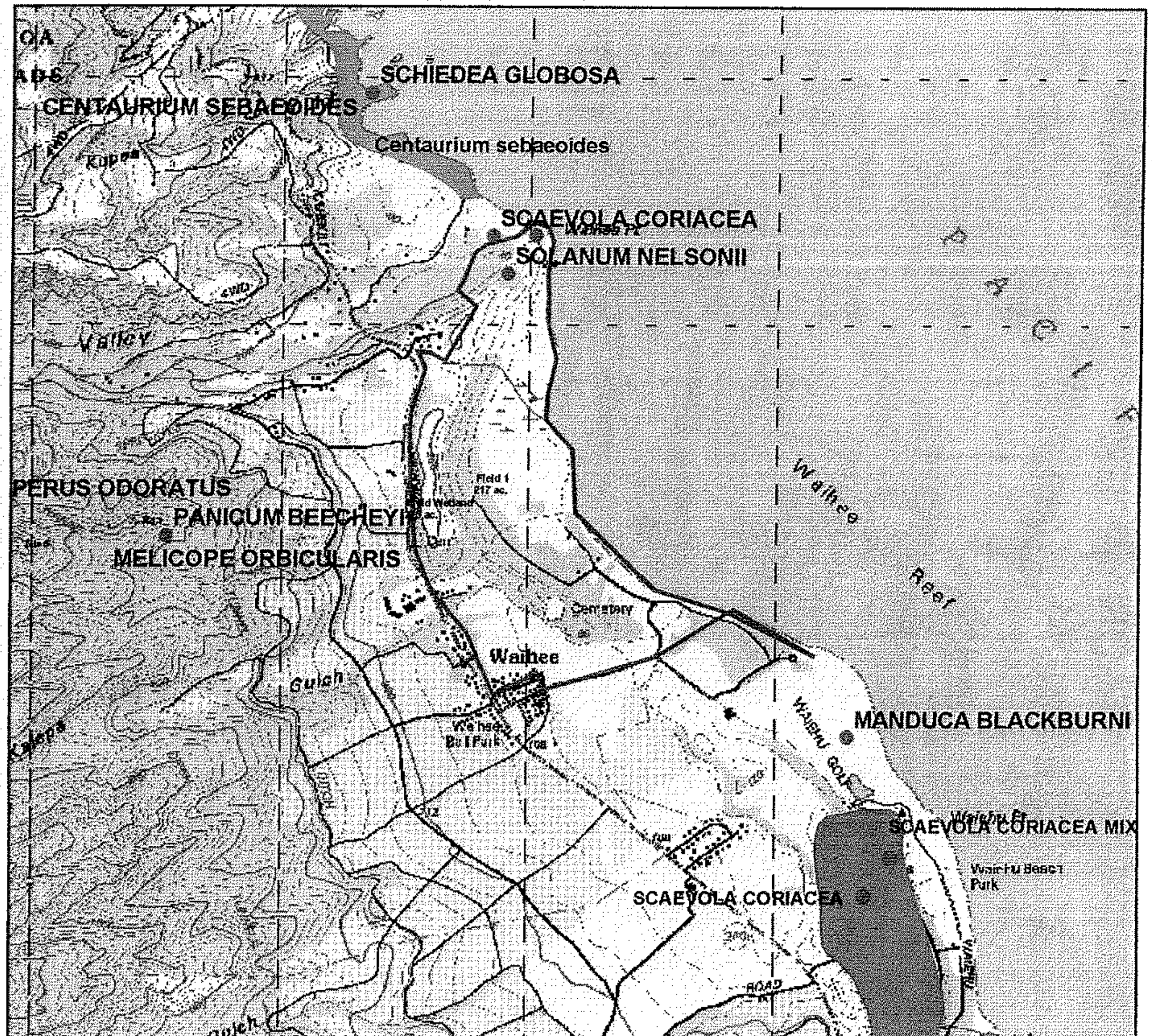
USDA

1000 0 1000 2000 Feet

N

T&E Map

Customer(s): MAUI COASTAL LAND TRUST



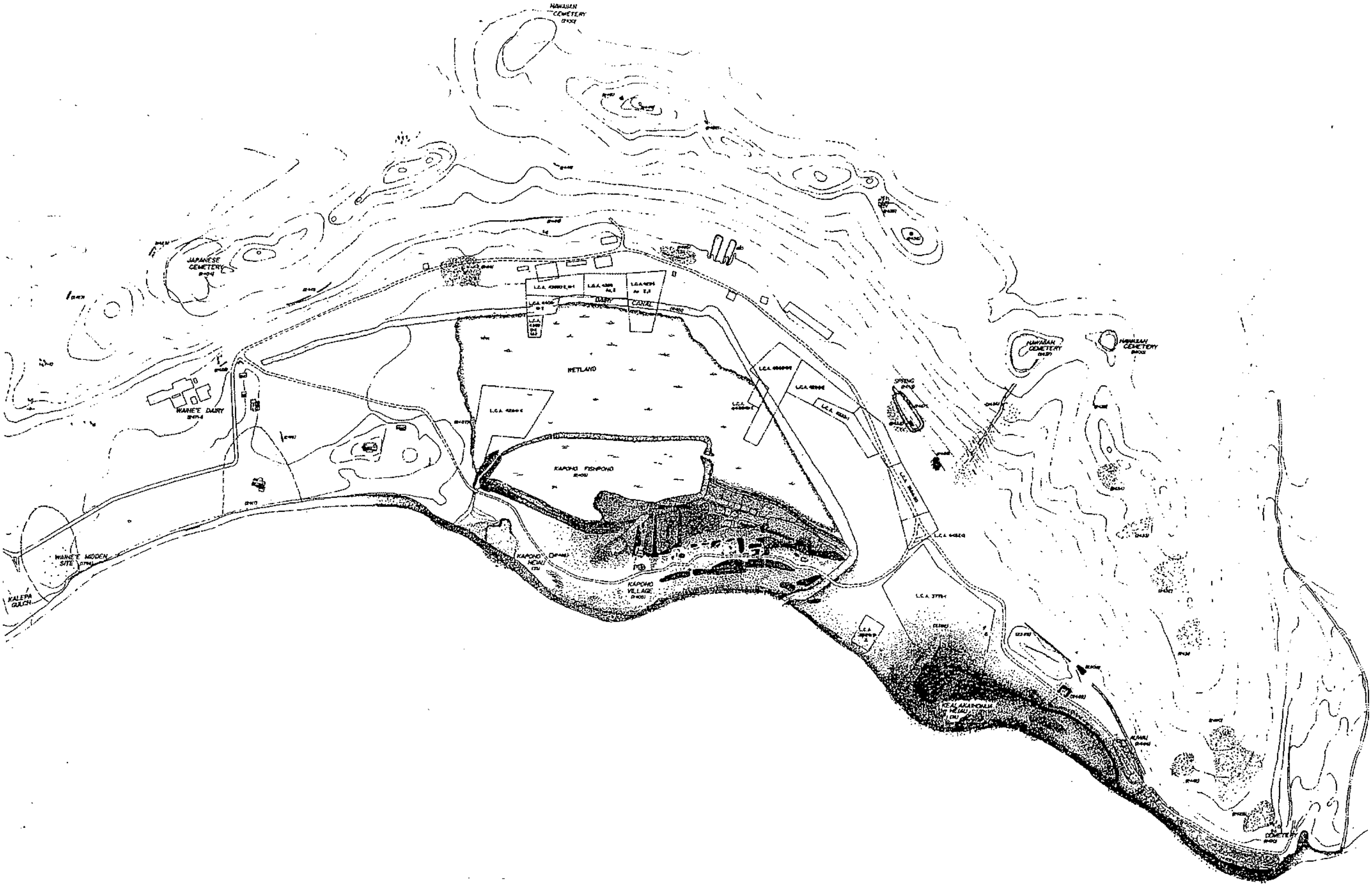
Legend

- Tract Boundaries
- tepointsmau_p_hi009
- mau-indv-final-nad83-06jun2003
- tespeciesmau_a_hi009

Image: o20156h4.tif

1,000 0 1,000 2,000 3,000 4,000 Feet

N



HAWAIIAN CEMETERY
JAPANESE CEMETERY
WAIHE'E DAIRY
DAIRY
CANAL
WETLAND
KAPOHO FISHPOND
KAPONO HEIAU
KAPOHO VILLAGE
SPRING
HAWAIIAN CEMETERY
HAWAIIAN CEMETERY
CEMETERY
WAIHE'E MODERN SITE
KALEPA GULCH

APPENDIX B: SUPPORTING DOCUMENTS

Letter from MCLT dated 11/23/09

MAUI COASTAL LAND TRUST

November 23, 2009

Mr. Bob McDaniel
Maui Medical Plaza
350 Hukilike St. Suite D
Kahului, HI 96732

Dear Mr. McDaniel

On behalf of the Maui Coastal Land Trust, I want to express my appreciation for the offer to provide wetlands restoration funding for the Waihe`e Coastal Dunes and Wetlands Refuge as part of the planning for the new Maui Medical Plaza at Kanaha.

As you know, the Waihe`e Refuge is, like Kanaha Pond, home to a wide variety of shorebirds, including the endangered ae'o (stilt), alae ke`okeo (coot), koloa (duck) and nene (goose).

Although we have been working with a volunteer crew to begin restoring the wetlands and buffers back to native habitat, we do not currently have any specific funding or restoration plan in place to perform the more extensive work we would like to do, and the mitigation funding provided by Maui Medical Plaza will be a tremendous boost to our restoration efforts.

Partnerships such as this, between nonprofits and local business entities, are critical to the protection and enhancement of the Maui that we all treasure. We are pleased to be working with you on this project and look forward to showing you the accelerated progress we will be able to make as a result of this partnership.

Sincerely,

Dale B. Bonar, Ph.D.
Executive Director

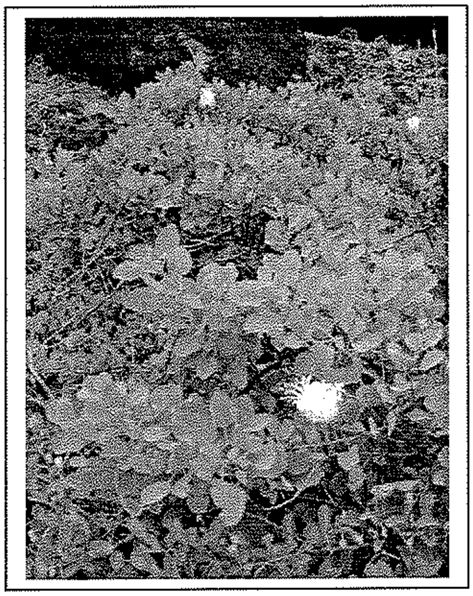
cc. Penny Levin

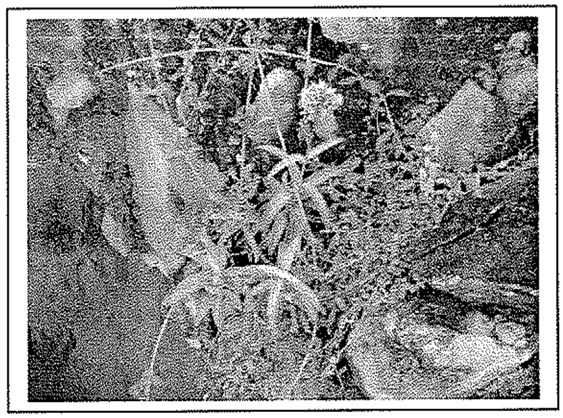
2371 Vineyard St. • PO Box 965, Wailuku, Hawai'i 96793 • ph: 808.244.5263 fx: 808.242.4741 • www.mauicoastallandtrust.org

Recommendations on Landscape Plants Selection:

1. All Kou Haole – replace with the native Kou (*Cordia subcordata*). This is readily available. There is no justifiable reason to plant the non-native version of this species.

2. Olulu/Alulu (*Brighamia insignus*) is endemic and Endangered (listed). It is found in the wild only on the island of Kaua'i. While it is a showy and beautiful native species, it does not belong on the island of Maui. Recommend *Schiedea globosa* (no Hawaiian name) or miapilo (*Capparis sandwichiana*), both of which are known to the coastal and cliff zone from Waihee to Kahakuloa.





Maiapilo (left) Schiedea globosa (right)

3. Maia – definitely use and show off the Hawaiian varieties.

4. Loulu species - *Pritchardia munroi* may be more suited to this habitat. *P. hillbrandii* prefers wet windward areas at slightly higher elevations.

5. Ti should be featured heavily along the highway frontage and near the doorways. It is an important healing plant, one of its uses being to clear the spiritual path to allow for physical healing. The placement of these plants along the path leading in to the building and along its entrances and exits will be supportive of the patients and people who work there.

6. Hau (*Hibiscus tillaceus*) can become invasive. The movement of seeds by birds or rats into the wetland would become a problem for wetland managers. Replace with Hala or native Hawaiian sugarcane (ko) varieties. Kept clean, these are strikingly beautiful elements to any landscape. Ko varieties can reach heights of 15ft.

7. Naupaka kahakai – strongly recommend stock from the hardier, glossier wild populations found along north/northeast facing shores grown by a few local nurseries and not the standard nursery plants that have evolved into large leaved, tall succulent shrubs. This will result in a much more resistant and resilient landscape.

8. Seashore paspalum should be replaced with 'aki'aki (*Sporabolus virginicus*), a hardy native coastal grass that propagates by stolon rather than seed. The location of MMPK adjacent to the wetland presents a problem for movement of nonnative species into the wetland. The use of 'aki'aki will provide a buffer for the wetland and remove the opportunity for the paspalum to move into the wetland.

9. Tahitian gardenia should not be planted if the native and Endangered Hawaiian gardenia (nanu) is also planted (this would be preferred). The native is a smaller flower with milder scent (better for asthma patients). The presence of the two species will result in hybrid seed. The chance that someone would gather the seed to grow out elsewhere (ie. yards or nurseries) has the potential to be outplanted in areas that might jeopardize this Endangered species in the wild.

10. Taro rather than water lilies. The native Hawaiian taros are beautiful. The project wishes to capitalize on the health and wellness image of Hawaiian healing; taro is the heart of this image.

11. African lily (*Agapanthus orientalis*) and white turf lily (*Ophlopogon jaburon*) recommend replacing with 'uki'uki (*Danella sandwicensis*), a native lily known for its striking blue fruits or kokio'ula'ula, the native red hibiscus.

12. Hearts and flowers is not necessary and recommend replacement with any of the other native groundcovers on the list.

For the planters on the building I strongly recommend no bougainvillea. The native *'Awikiwiki* (*Canavalus* sp.) and nehe (*Lipochaeta integrifolia*) are stunning vine species that will drape over the building floors and soften the edges of the structure with silvery green foliage and deep purple and yellow flowers.

MAUI COASTAL LAND TRUST

November 23, 2009

Mr. Bob McDaniel
Maui Medical Plaza
350 Hukilike St. Suite D
Kahului, HI 96732

Dear Mr. McDaniel

On behalf of the Maui Coastal Land Trust, I want to express my appreciation for the offer to provide wetlands restoration funding for the Waihe`e Coastal Dunes and Wetlands Refuge as part of the planning for the new Maui Medical Plaza at Kanaha.

As you know, the Waihe`e Refuge is, like Kanaha Pond, home to a wide variety of shorebirds, including the endangered ae'o (stilt), alae ke`okeo (coot), koloa (duck) and nene (goose).

Although we have been working with a volunteer crew to begin restoring the wetlands and buffers back to native habitat, we do not currently have any specific funding or restoration plan in place to perform the more extensive work we would like to do, and the mitigation funding provided by Maui Medical Plaza will be a tremendous boost to our restoration efforts.

Partnerships such as this, between nonprofits and local business entities, are critical to the protection and enhancement of the Maui that we all treasure. We are pleased to be working with you on this project and look forward to showing you the accelerated progress we will be able to make as a result of this partnership.

Sincerely,

Dale B. Bonar, Ph.D.
Executive Director

cc. Penny Levin

2371 Vineyard St. • PO Box 965, Wailuku, Hawai'i 96793 • ph: 808.244.5263 fx: 808.242.4741 • www.mauicoastallandtrust.org

APPENDIX B-2.

Letter from Department of the Army, USACE Accepting Final Wetland Mitigation Plan

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

January 15, 2010

Regulatory Branch

File No. POH-2006-00531

Mr. Benjamin Brown
8056 Molt Road
Billings, MT 59106

Mr. Robert McDaniel III
Maui Medical Plaza at Kanahā, LLC
350 Hukiliki Street, Suite D
Kahului, HI 96732

Dear Mr. Brown and Mr. McDaniel:

We have reviewed the revised mitigation plan entitled, *Maui Medical Plaza at Kanahā Alternate Wetland Mitigation Plan*, dated November 23, 2009, proposed to compensate for the proposed loss of 0.95 acres of wetland associated with the development of a medical center. We have determined that the proposed mitigation plan will adequately compensate for wetland impacts as required under the Mitigation Rule 33 CFR Parts 325 and 332.

Please note that the Corps will not be able to issue a final permit decision until we receive an amended letter from the Hawaii State Historic Preservation Department for the revised mitigation site. We also must receive Section 401 Water Quality Certification and a Coastal Zone Management Determination from the State of Hawaii. Other federal, state, and local laws may apply.

If you have any questions, please contact Ms. Amy Klein at (808) 438-7023 or via email at Amy.S.Klein@usace.army.mil.

Sincerely,

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

e-Copy Furnished:
Ms. Penny Levin

APPENDIX B-3.

Special Management Area Minor Permit and Environmental Assessment Exemption Determination Letter from Department of Planning for Offsite Wetland Mitigation Project

CHARMAINE TAVARES
Mayor

JEFFREY S. HUNT
Director

KATHLEEN ROSS AOKI
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

March 15, 2010

Ms. Michelle Cockett
P.O. Box 1633
Wailuku, Hawaii 96793

Dear Ms. Cockett:

SUBJECT: APPROVAL OF WETLAND MITIGATION PLAN AT MAUI COASTAL LAND TRUST'S WAIHEE COASTAL DUNES AND WETLANDS REFUGE AT KAHEKILI HIGHWAY AND HALEWAIU ROAD, LOCATED AT WAIHEE, ISLAND OF MAUI, HAWAII; TMK(S): (2) 3-2-040:001 AND (2) 3-2-040:002, AS COMPENSATORY MITIGATION FOR THE PROPOSED MAUI MEDICAL PLAZA AT KANAHA, LOCATED AT KAHULUI, ISLAND OF MAUI, HAWAII; TMK: (2) 3-7-011:028 (SMX 2009/0220) (SM2 2010/0017) (EAE 2010/0011)

In response to your modified plans received on December 2, 2009, the Department of Planning (Department) understands that:

1. The project scope of work is to complete compensatory mitigation at the two (2) subject Tax Map Keys [TMK(S)], as required by the U.S. Army Corps of Engineers (USACE), for the proposed Maui Medical Plaza at Kanaha for filling 0.95 acres of wetlands adjacent to Kanaha Pond, at TMK: (2) 3-7-011:028. This project is to offset loss of wetlands on parcel 28 where the proposed Maui Medical Plaza building is to be constructed in the future;

2. The original proposed project site location for the mitigation has been changed to the Maui Coastal Land Trust's Waihee Coastal Dunes and Wetlands Refuge at TMK: (2) 3-2-040:001 and (2) 3-2-040:002. The USACE has approved this site for the compensatory mitigation;

3. The reason for the change in location is due to the State Department of Transportation's September 10, 2009 letter to the Department that finds the original proposed mitigation location at Kanaha Pond, TMK: (2) 3-7-011:028, may generate adverse impacts to the State highway, Hana Highway, and to the State Airport, Kahului Airport. In addition, on January 15, 2009, U.S Airways flight 1549 made a crash landing in the Hudson River after ingestion of Canadian geese in its two (2) engines. Since that event, there has been a heightened awareness of the seriousness of bird strike hazards to aviation. Thus, habitat improvements near airports have become a National concern; and

4 Mitigation will involve removal of invasive species along a one (1) acre portion of wetland behind an existing sand dune and within a four (4) acre portion of the wetland itself in front of the sand dune. Upon removal of the invasive species, that area will be replanted with *ahuawa (Cyperus javanicus), makaloa (Cyperus laevigatus),* and *kalua (Bolboschoenus maritime).* Work will be done using a forestry mulcher in order to limit impacts to the surface and avoid ground-altering disturbance.

SPECIAL MANAGEMENT AREA MINOR PERMIT APPROVAL

In accordance with the *Special Management Area (SMA) Rules for the Maui Planning Commission*, Sections 12-202-12 and 12-202-14, a determination has been made relative to the above project that:

1. The project is a development;

2. The project has a valuation not in excess of $125,000.00; (Valuation: $112,200.00)

3. In a letter dated January 15, 2010, the USACE, Honolulu District, Regulatory Branch approved the revised mitigation plan entitled, "*Maui Medical Plaza at Kanaha Alternate Wetland Mitigation Plan,*" dated November 23, 2009. The determination is that the proposed mitigation plan will adequately compensate for wetland impacts as required under the Mitigation Rule 33 CFR Parts 325 and 332;

4. The project parcel where the Compensatory Mitigation actions will be completed has a standing accepted Archaeological Monitoring Plan for the project site (SHPD LOG NO: 2007.3717; DOC NO. 0803JP01);

5. The Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) issued a Letter of No Effect to the USACE, (LOG No: 2009.3578 DOC NO: 1001PC22 Archaeological), dated January 22, 2010;

6. The project has no significant adverse environmental or ecological effect, taking into account potential cumulative effects; and

7. The project is consistent with the objectives, policies, and SMA guidelines set forth in the Hawaii Revised Statutes (HRS), Chapter 205-A, and is consistent with the County General Plan and Zoning.

In consideration of the above determination, you are hereby granted a SMA Minor Permit approval, subject to the following conditions:

1. That mitigation actions shall be in accordance with the revised plans submitted on December 2, 2009.

2. That a professional archaeologist must be on-site to monitor for the presence of archaeological resources during all mitigation activities. The archaeologist must have the authority to halt excavation in the event that cultural materials are identified. Consultation with the SHPD will occur in this event, to determine an acceptable course of action. USACE, Honolulu District, Regulatory Branch must also be immediately notified.

3. If human burials or remains, historic or archaeological resources are encountered during mitigation work, all activities in the immediate area shall cease and the permittee must notify the USACE, Honolulu District, Regulatory Branch within one (1) business day of the discovery. The permittee shall perform any work required by the USACE, Honolulu District, Regulatory Branch in accordance with Section 106 of the National Historic Preservation Act and USACE, Honolulu District, Regulatory Branch regulations.

4. That all necessary County and State permits shall be obtained prior to the initiation of compensatory mitigation. Please inquire with the Clean Water Branch, Department of Health at (808) 586-4309, as to any requirements for National Pollutant Discharge Elimination System permit and Community Noise Permits.

5. That compensatory mitigation shall be initiated within one (1) year of the date of this approval letter.

6. That compensatory mitigation activities are permitted on the property periodically over the next five (5) years, or until March 31, 2015.

7. That, at no time, shall construction of the project interfere with public access along the shoreline.

8. That, at all times, the health and safety of the public shall be protected and take precedence over any mitigation activity.

9. That compliance with all applicable government requirements shall be fulfilled.

Furthermore, since no structures will be constructed as part of this project, a County of Maui Special Flood Hazard Permit is NOT required.

ENVIRONMENTAL ASSESSMENT EXEMPTION

This project utilizes state or county lands or funds and therefore, is subject to review under Chapter 343, HRS. This project is *exempt* from an Environmental Assessment as it involves the "Minor alteration in the conditions of land, water, and vegetation," as defined in the *Exemption List for the County of Maui*, Exemption 4.

Thank you for your cooperation. If additional clarification is required, please contact Staff Planner James Buika at james.buika@mauicounty.gov or at (808) 270-6271.

Sincerely,

JEFFREY S. HUNT, AICP
Planning Director

xc: Clayton I. Yoshida, AICP, Planning Program Administrator
Aaron H. Shinmoto, PE, Planning Program Administrator (2)
James A. Buika, Staff Planner
Development Services Administration
Police Department
Department of Environmental Management
Department of Public Works
DLNR-SHPD
USDA-NRCS, Maui
USACE, Honolulu District, Regulatory Branch
DOT-Office of Statewide Planning
EPA, Pacific Islands
U.S. Fish and Wildlife
Department of Health, Clean Water Branch
Maui Medical Plaza at Kanaha
Dale Bonar, Executive Director
CZM (SMX/SM2)
Project File
General File

JSH:JAB:vb
K:\WP_DOCS\PLANNING\SM2\2010\0017_MauiMedicalPlazaRemoveInvasiveSpecies\SM2ApprovalCompMitigationPlan.doc

APPENDIX B-4.

Wetland Mitigation Agreements with Maui Coastal Land Trust

MAUI COASTAL LAND TRUST

November 23, 2009

Mr. Bob McDaniel
Maui Medical Plaza
350 Hukilike St. Suite D
Kahului, HI 96732

Dear Mr. McDaniel

On behalf of the Maui Coastal Land Trust, I want to express my appreciation for the offer to provide wetlands restoration funding for the Waihe`e Coastal Dunes and Wetlands Refuge as part of the planning for the new Maui Medical Plaza at Kanaha.

As you know, the Waihe`e Refuge is, like Kanaha Pond, home to a wide variety of shorebirds, including the endangered ae'o (stilt), alae ke`okeo (coot), koloa (duck) and nene (goose).

Although we have been working with a volunteer crew to begin restoring the wetlands and buffers back to native habitat, we do not currently have any specific funding or restoration plan in place to perform the more extensive work we would like to do, and the mitigation funding provided by Maui Medical Plaza will be a tremendous boost to our restoration efforts.

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Sincerely,

Dale B. Bonar, Ph.D.
Executive Director

cc. Penny Levin

2371 Vineyard St. • PO Box 965, Wailuku, Hawai'i 96793 • ph: 808.244.5263 fx: 808.242.4741 • www.mauicoastallandtrust.org

30

R-439

STATE OF HAWAII
BUREAU OF CONVEYANCES
RECORDED
MAY 28, 2010 08:01 AM

Doc No(s) 2010-074045

/s/ NICKI ANN THOMPSON
REGISTRAR

20 1/1 Z12

TGA: 4144260
(W) KH Total Pgs. 11
CAC Rlg

LAND COURT SYSTEM | REGULAR SYSTEM

Return by Mail [X] Pickup [ ] To:

Merchant Horovitz LLLC
2145 Wells Street, Suite 303
Wailuku, Hawaii 96793
Attention: Peter A. Horovitz

TITLE OF DOCUMENT:

MEMORANDUM OF AGREEMENT REGARDING
IMPLEMENTATION OF MAUI MEDICAL PLAZA AT KANAHA WETLAND
MITIGATION PLAN

PARTIES TO DOCUMENT:

KANAHA PROFESSIONAL PLAZA, LLC
A Hawaii limited liability company
MAUI COASTAL LAND TRUST
A Hawaii not for profit corporation

TAX MAP KEY(S): (2) 3-2-010-001
(2) 3-2-010-002
(2) 3-7-011-028

(This document consists of 11 pages.)

1

MEMORANDUM OF AGREEMENT REGARDING
IMPLEMENTATION OF MAUI MEDICAL PLAZA AT KANAHA WETLAND
MITIGATION PLAN

THIS MEMORANDUM OF AGREEMENT REGARDING IMPLEMENTATION OF MAUI MEDICAL PLAZA AT KANAHA WETLAND MITIGATION PLAN ("Memorandum") is entered into as of this 20th day of May, 2010, by and between the **KANAHA PROFESSIONAL PLAZA, LLC**, a Hawaii limited liability company ("**KPP**") and the **MAUI COASTAL LAND TRUST**, a Hawaii not for profit corporation (the "**Land Trust**"). KPP and the Land Trust are collectively referred to as the "**Parties.**"

RECITALS

A. The Land Trust owns that certain parcel of land located in Waihee, Maui, Hawaii, consisting of commonly known as the Waihe'e Coastal Dunes and Wetland Refuge being approximately 277 acres, more or less, and identified on the tax maps of the State of Hawaii as TMK (2) 3-2-010-001 and 002 (collectively the "**Land Trust Property**"). The Land Trust Property is more particularly described in the attached Exhibit "A";

B. KPP owns that certain parcel of land located at Wailuku, Maui, Hawaii, consisting of approximately 2.5 acres, more or less and identified on the tax maps of the State of Hawaii as TMK No. (2) 3-7-011-028 (the "**KPP Property**"). The KPP Property is more particularly described in the attached Exhibit "B."

C. The Parties have entered into that certain Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland Mitigation Plan (the "**Plan**") dated concurrently herewith that calls for the remediation and maintenance of five (5) acres of land within the Land Trust Property in the general locations identified as the "1 acre hydrologic improvement and 4 acre wetland rehabilitation site" on the attached Exhibit "C" (the "**Mitigation Areas**").

D. The Plan requires that the Mitigation Areas be remediated and managed in accordance with the Plan.

E. The Parties agreed to execute and record this Memorandum for purposes of giving notice of the existence of the Plan.

NOW THEREFORE, for good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the Parties hereby enter into this Memorandum of Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland Mitigation Plan for purposes of giving notice of the existence of the Plan and reservation of the Mitigation Areas in furtherance of the Plan, the terms and conditions of which are all hereby incorporated herein by this reference.

THE PARTIES FURTHER AGREE that should the Mitigation Areas be surveyed, the Parties shall amend this Memorandum to include the metes and bounds description of the Mitigation Areas with KPP bearing the cost of drafting and recording such an amendment and each Party bearing its own costs to review and execute the same.

IN WITNESS WHEREOF, the Parties have executed this Memorandum as of the day and year first above written.

KANAHA PROFESSIONAL PLAZA, LLC
a Hawaii limited liability company

By ______________________
Name: Robert T. McDaniel III
Title: MANAGER

MAUI COASTAL LAND TRUST
a Hawaii not for profit corporation

By ______________________
Name: Dale B. Bonar
Title: Executive Director

By ______________________
Name: Helen Nielsen
Title: Board President

STATE OF Hawaii)
) SS:
COUNTY OF Maui)

On this 20th day of May, 2010, before me personally appeared Robert F. McDaniel III, to me known or proven to be the person described in and who executed the foregoing instrument, and acknowledged that he/she executed the same as his/her free act and deed and in the capacities aforesaid.

X

Name: Christine Makua-Lopez
NOTARY PUBLIC, State of Hawaii Christine Makua-Lopez
My commission expires: My commission expires: 08/11/12

CHRISTINE MAKUA-LOPEZ NOTARY PUBLIC No. 08-332 STATE OF HAWAII

Date: 5/20/10 # Pages: 11
Name: Christine Makua Lopez Second Circuit
Doc. Description: Memorandum of Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland ~~Mitigation Plan~~
Christine Makua-Lopez / 5/20/10
Notary Signature Date
(Stamp or Seal)
CHRISTINE MAKUA-LOPEZ NOTARY PUBLIC No. 08-332 STATE OF HAWAII
NOTARY CERTIFICATION

21

STATE OF HAWAII)
) SS:
COUNTY OF MAUI)

On this 20th day of May, 2010, before me personally appeared DALE B. BONAR to me known or proven to be the person described in and who executed the foregoing instrument, and acknowledged that he/she executed the same as his/her free act and deed and in the capacities aforesaid.

Name: Christine Makua-Lopez
NOTARY PUBLIC, State of Hawaii
My commission expires: Christine Makua-Lopez
My commission expires: 08/11/12

CHRISTINE MAKUA-LOPEZ
NOTARY PUBLIC
No. 08-332
STATE OF HAWAII

Date: 5/20/10 # Pages: 11
Name Christine Makua-Lopez Second Circuit
Doc. Description: Memorandum of Agreement Regarding Implementation of Maui Medical Plaza at Kahului Wetland Mitigation Plan
Christine Makua-Lopez 5/20/10
Notary Signature Date
(Stamp or Seal)
CHRISTINE MAKUA-LOPEZ
NOTARY PUBLIC
No. 08-332
STATE OF HAWAII
NOTARY CERTIFICATION

6

STATE OF HAWAII)
) SS:
COUNTY OF MAUI)

On this 20th day of May, 2010, before me personally appeared HELEN NIELSEN to me known or proven to be the person described in and who executed the foregoing instrument, and acknowledged that he/she executed the same as his/her free act and deed and in the capacities aforesaid.

Name: Christine Makua-Lopez
NOTARY PUBLIC, State of Hawaii Christine Makua-Lopez
My commission expires: My commission expires: 08/11/12

CHRISTINE MAKUA-LOPEZ NOTARY PUBLIC No. 08-332 STATE OF HAWAII

Date: 5/20/10 # Pages: 11
Name Christine Makua-Lopez Second Circuit
Doc. Description: Memorandum of Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland Mitigation Plan (Stamp or Seal)
Christine Makua-Lopez 5/20/10
Notary Signature Date
NOTARY CERTIFICATION

CHRISTINE MAKUA-LOPEZ NOTARY PUBLIC No. 08-332 STATE OF HAWAII

6

EXHIBIT A

PARCEL ONE

ITEM I: All of that certain parcel of land (being the lands described in and covered by a portion of Royal Patent Number 4475, Land Commission Award Number 7713, Apana 24 to V. Kamamalu; portion of Royal Patent Number 5324, Land Commission Award Number 2423 to Kapuahelani; portion of Royal Patent Number 6168, Land Commission Award Number 3962, Apana 2 to Napukeha; Apana 1 of Royal Patent Number 6168, Land Commission Award Number 3962 to Napukeha; portion of Royal Patent Numbers 5149 and 6169, Land Commission Award Number 4274, Apana 2, Mahele 2 to Kuanea; Royal Patent Number 3657, Land Commission Award Number 4284, Apana 4 to Kekumoku; portion of Royal Patent Number 6378, Land Commission Award Number 4284-E, Apana 2 to Kapuipui; Apana 1 of Royal Patent Number 6378, Land Commission Award Number 4284-E to Kapuipui; portion of Royal Patent Number 7337, Land Commission Award Number 4284-F, Apana 1 and 2 to Waiolama; Apana 2 of Royal Patent Number 6195, Land Commission Award Number 4296 to Kawainui; Apana 2 of Royal Patent Number 6406, Land Commission Award Number 4389 to Kahokola; portion of Royal Patent Number 6752, Land Commission Award Number 4389-D, Apana 1 to Palea; portion of Royal Patent Number 6751, Land Commission Award Number 4405-T to Kekehena; Apana 3 of Royal Patent Number 5361, Land Commission Award Number 4432 to Kahikiula; Apana 3 of Royal Patent Number 6225, Land Commission Award Number 4438 to Kekaula; Apana 1 of Royal Patent Number 7718, Land Commission Award Number 5333 to Pea Anakalea; portion of Apana 1 and all of Apana 2 of Royal Patent Number 4103, Land Commission Award Number 5626 to Kaehukalamea; portion of Apana 1 and all of Apana 3 of Royal Patent Number 6148, Land Commission Award Number 8365 to Kalua; and portion of Royal Patent Number 5327, Land Commission Award Number 8366, Apana 1 and 2 to Kapua) situate, lying and being at Malaukanaloa, Kapahukauwila, Kapoho, Paleileiha, Makaaka, Kalopue and Waihee, District of Wailuku, Island and County of Maui, State of Hawaii, being LOT 1-A, bearing Tax Key designation (2) 3-2-010-001 and containing an area of 247.009 acres, more or less.

PARCEL TWO:

All of that certain parcel of land (being all of the land(s) described in and covered by Apana 1 of Royal Patent Number 5360, Land Commission Award Number 3775 to Anakalea) situate, lying and being at Waihee, District of Wailuku, Island and County of Maui, State of Hawaii, bearing Tax Key designation (2) 3-2-010-002, and containing an area of 3.470 acres, more or less.

TOGETHER WITH a perpetual non-exclusive road and utility easement, 12 feet wide, for pedestrian and vehicular ingress and egress and for water, telephone, electrical and utility lines, etc., to and from Parcel 3-2-10-2 under and across Parcel 3-2-10-1, including the right to install, maintain and repair such apparaus within the easement area as may be reasonably necessary to provide Parcel 3-2-10-2 with such utility services under and across the easement area; subject to conditions contained therein, as granted in Grant of Easement dated December 2, 1986, recorded in the Bureau of Conveyances of the State of Hawaii in Liber 20139, Page 366.

Being portions of the lands conveyed from Waihee Oceanfront Hawaii, Inc. to Maui Coastal Land Trust pursuant to that certain Warranty Deed dated June 25, 2004 and recorded in the Bureau of Conveyances of the State of Hawaii on June 30, 2004 as Document No. 2004-133091

SUBJECT, HOWEVER, TO all liens and encumbrances of record as of the date of recordation of the attached document.

EXHIBIT "B"

The land referred to in this Report is situated in the State of Hawaii, and described as follows:

All of that certain parcel of land (being portion(s) of the land(s) described in and covered by Royal Patent Grant Number 3343 to Claus Spreckels) situate, lying and being at Kahului, Wailuku Commons, Island and County of Maui, State of Hawaii, being Lot 8 of the "KANAHA INDUSTRIAL SUBDIVISION II," the same being all of Lot 1 and a portion of Lot 4 of the Kanaha Industrial Subdivision, and being more particularly described as follows:

Beginning at a pipe at the Westerly corner of this Lot, on the Northeasterly side of Hana Highway, said pipe being also the Southwesterly corner of Lot 5 of the Kanaha Industrial Subdivision II, the coordinates of said point of beginning referred to Government Survey Triangulation Station "LUKE" being 3,804.67 feet North and 12,198.69 feet East, and running by azimuths measured clockwise from true South:

1. Along Lot 5 of the Kanaha Industrial Subdivision II on a curve to the left with a radius of 30.00 feet, the chord azimuth and distance being:

	261°	25'		42.43	feet;
2.	216°	25'		96.00	feet along same to a pipe;
3.	306°	25'		84.41	feet along Lots 6 and 7 of the Kanaha Industrial Subdivision II to a pipe;
4.	235°	30'		65.45	feet along Lot 7 of the Kanaha Industrial Subdivision II to a pipe;

5. Thence along same on a curve to the right with a radius of 170.00 feet, the chord azimuth and distance being:

	243°	45'		48.79	feet to a pipe;
6.	252°	00'		144.77	feet along same to a pipe;
7.	343°	29'	30"	186.25	feet along same to a pipe;
8.	5°	40'		211.60	feet along same to a pipe;
9.	273°	44'	30"	73.29	feet along same to a pipe;
10.	16°	27'		100.40	feet along same to a pipe;

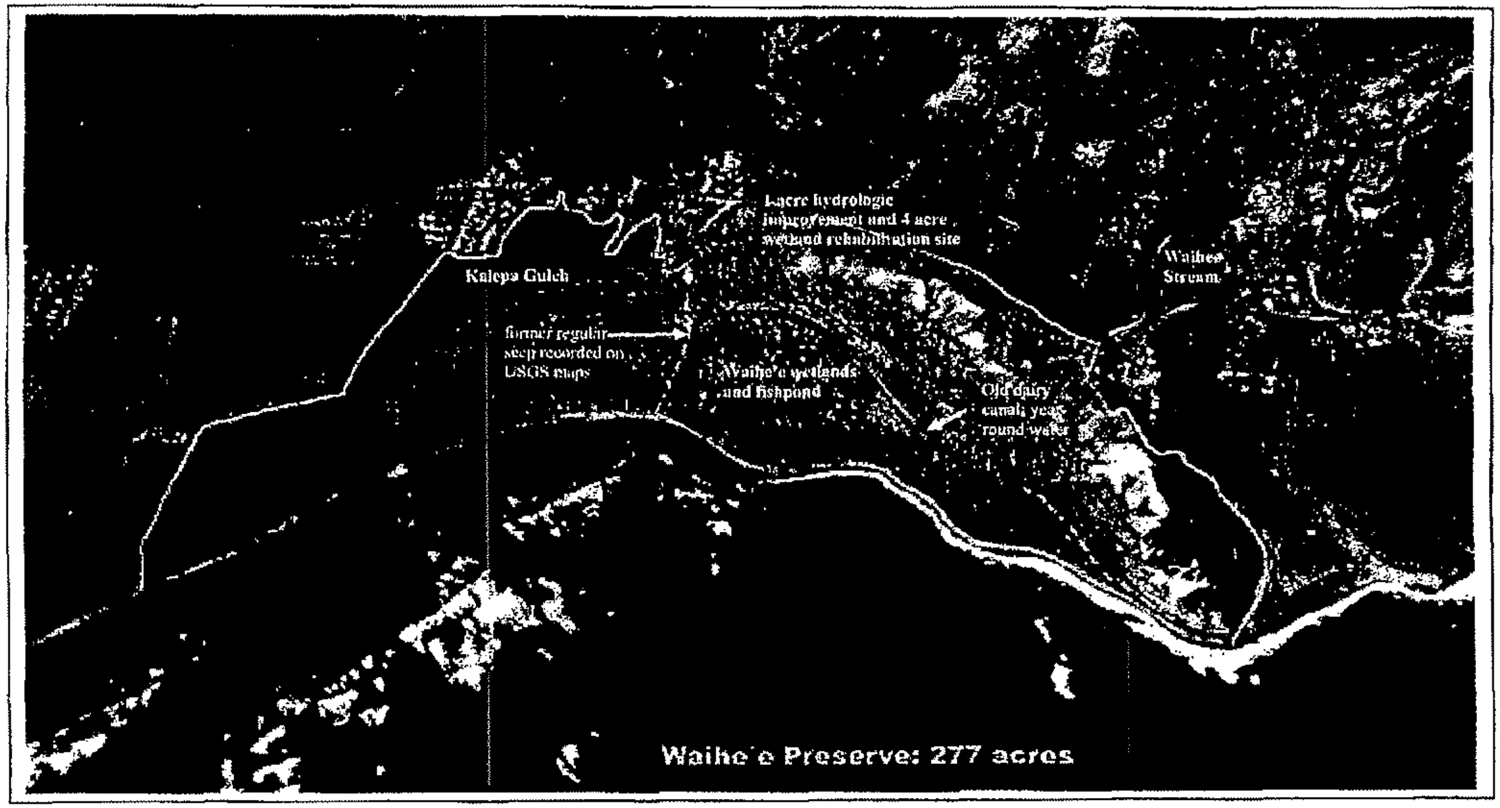
11.	126°	25'	595.21	feet along the Northeasterly side of Hana Highway to the point of beginning and containing an area of 2.499 acres, more or less.

Being all the property described in the following:

DEED

Recorded	:	August 31, 2006 in the Bureau of Conveyances, State of Hawaii, as Document No. 2006-160148
Grantor	:	KANAHA MARKET PLACE LLC, a Hawaii limited liability company
Grantee	:	KANAHA PROFESSIONAL PLAZA LLC, a Hawaii limited liability company

SUBJECT, HOWEVER, to all liens and encumbrances of record as of date of recordation of the attached document.



acre hydrologic improvement and 4 acre wetland rehabilitation site
Kalepa Gulch
former regular seep recorded on USGS maps
Waihe'e wetlands and fishpond
Old dairy canal; year round water
Waihee Stream
Waihe'e Preserve: 277 acres

EXHIBIT "C"

FIRST AMENDMENT TO AGREEMENT REGARDING IMPLEMENTATION OF MAUI MEDICAL PLAZA AT KANAHA WETLAND MITIGATION PLAN

THIS FIRST AMENDMENT TO AGREEMENT REGARDING IMPLEMENTATION OF MAUI MEDICAL PLAZA AT KANAHA WETLAND MITIGATION PLAN (the "**First Amendment**") is entered into effective as of this 26 day of JANUARY, 2011 by and between KANAHA PROFESSIONAL PLAZA, LLC,, a Hawaii limited liability company dba Maui Medical Plaza at Kanaha ("**KPP**") and the MAUI COASTAL LAND TRUST, a Hawaii not for profit corporation ("**Land Trust**") (collectively, the "Parties").

RECITALS:

A. The Land Trust and KPP entered into that certain Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland Mitigation Plan on or about May 20, 2010 (the "**Agreement**").

B. A Memorandum of the Agreement (the "**Memorandum**") was recorded on May 28, 2010 in the Bureau of Conveyances of the State of Hawaii as Document No. 2010-074045 (the "**Memorandum**").

C. The Agreement and Memorandum memorialize and serve to implement that certain Agreement Regarding Implementation of Maui Medical Plaza at Kanaha Wetland Mitigation Plan (the "**Mitigation Plan**").

D. The purpose of this First Amendment is to amend the Agreement and, to the extent required, the Memorandum.

NOW, THEREFORE, in consideration of the mutual covenants contained herein, the Parties agree as follows:

1. Project Funding Provisions. KPP has paid to the Land Trust the Startup Costs as defined in the Agreement. The Mitigation Plan and Agreement also call for 1) expected Monitoring costs through December 31, 2015 ("**Monitoring Costs**"), and 3) Perpetual maintenance from January 1, 2016 forward. (the "**Long Term Costs**"). The Mitigation Plan set the Monitoring Costs at $107,500 ($97,500 of "**Hard Costs**", and $10,000 for contingencies (the "**Contingency Fee**")). From January 31, 2011 through December 31, 2015, The $10,000 Contingency Fee shall be replaced by the requirement that KPP maintain a Letter of Credit in favor of the Land Trust from a federally insured financial institution or a bond in favor of the Land Trust or, subject to the Land Trust's reasonable approval, other dedicated cash reserve held on account at such an institution in either case equal to one hundred twenty percent (120%) of the unpaid Hard Costs existing as of the beginning of any calendar year (collectively the "**LOC**"). The amount of the LOC shall decrease on an annual basis until all of the Hard Costs have been paid but shall not fall below $19,500.00 (20% of the initial hard Costs) through December 31, 2015. From January 1, 2016 forward, KPP shall maintain an LOC in an amount equal to twenty percent (20%) of annual Long Term Costs as established by the Parties.

The Monitoring Costs to be paid in annual installments, and the corresponding LOC requirements are illustrated in the following table:

Payment Date	Payment Amount	Unadjusted LOC Amount	Monitoring Cost Balance
January 31, 2011	$25,000	$117,000	$72,500
January 1, 2012	$25,000	$87,000	$47,500
January 1, 2013	$25,000	$57,000	$22,500
January 1, 2014	$22,500	$27,000	$0.00
January 1, 2015	0 (5 year Monitoring Costs fully funded)	$19,500	$0.00
January 1, 2016	TBD	20% of Payment Amount	

KPP may prepay the Hard Costs at any time and the LOC may be reduced accordingly upon such pre-payment. The LOC by its terms shall 1) guaranty payment of the Hard Costs, and 2) shall be available to the Land Trust to pay for reasonable cost overruns up to not more than $19,500 on a cumulative basis through December 31, 2015 and to an amount equal to the minimum LOC required for subsequent years. KPP shall not be obligated, however, to replenish the LOC or LOC funds once depleted to the extent allowed.

2. Attached hereto as Exhibit "A" is a map and corresponding GPS data points establishing the mitigation area required by the Mitigation Plan (the "**Mitigation Area**"). The Parties understand and agree that currently it is not practical to survey the Mitigation Area but should either party survey the Mitigation Area the Parties agree to amend the Mitigation Plan, Agreement or Memorandum, as appropriate, to include such survey.

3. The Land Trust will permanently set the Mitigation Area aside to satisfy the requirements of the Mitigation Plan, the terms of which will run with and bind the Mitigation Area in perpetuity.

4. Not less than sixty (60) calendar days prior to any action taken to 1) void or modify the Mitigation Plan, Agreement or Memorandum, or 2) transfer title to or establish legal claims over the Mitigation Area, the Parties, or one of them, shall provide written notice to the U.S. Army Corps of Engineers, Honolulu District (the "**Corps**") of such intended action..

5. Within ten (10) calendar days of any material breach of the Mitigation Plan, Agreement or Memorandum, including any amendments thereto, the non-breaching party shall provide written notice to the Corps of such breach.

6. The Land Trust hereby grants a right of reasonable entry to Corps personnel, and any government consultants, to inspect the Mitigation Areas and mitigation work contemplated by the Mitigation Plan (the "**Mitigation Work**") until such time as the Corps has determined the Mitigation Work to be successful in accordance with the performance standards set forth in the Mitigation Plan and any applicable special conditions set forth in the Department of the Army permit authorizing certain work in waters of the United States associated with the construction of the new Maui Medical Plaza at Kanaha facility, Kahului, Maui, Hawai'i. The right of entry may be subject to reasonable notice requirements and/or other reasonable conditions.

7. The rights and obligations of KPP as set forth in the Mitigation Plan, Agreement, Memorandum and any amendments thereto shall run with the land and shall bind any future owners of the KPP property currently designated as Tax Map Key No. (2) 3-7-011-028 and more fully described in the Agreement.

8. Any notice required to be served upon the Corps shall be in writing, shall prominently display the reference number POH-2006-00351 and shall be given by 1) U.S. Mail addressed the U.S. Army Corps of Engineers, Honolulu District, Building 230, Fort Shafter, Hawai'i, 96858-5440, Attn: Chief, Regulatory Branch, 2) by e-mail to CEPOH-EC-R@usace.army.mil, or 3) by facsimile to (808) 438-9258.

9. Except as amended hereto, the Mitigation Plan, Agreement and Memorandum remain in full force and effect.

10. Governing Law. This Agreement shall be interpreted, enforced, and governed under the laws of the State of Hawaii, without giving effect to the conflict of law principles thereof.

11. Warranty of Authority. Each signatory hereto represents and warrants that he or she is authorized to execute and deliver this Agreement on behalf of the party indicated.

12. Binding Effect. This Agreement shall be binding upon and inure to the benefit of the Parties hereto and their respective successors and assigns.

13. Execution in Counterparts/Electronic/Facsimile Signatures. This Agreement may be executed in two (2) or more counterparts, each of which shall be deemed an original, but all of which shall constitute one and the same instrument. The Parties agree that facsimile or electronic copies of this Agreement (including electronic signatures or acknowledgments) may be signed as originals. Facsimile and electronic signatures or acknowledgments shall be deemed valid original signatures. Any party that executes a document by facsimile signature shall deliver to the other parties, the hard copy original signature page(s) of such document within seven (7) days after execution thereof; provided, however that any failure to provide such hard copy shall not invalidate the document that was executed by facsimile.

(The remainder of this page is intentionally left blank; the signature page follows.)

IN WITNESS WHEREOF, the parties hereto execute this Agreement effective as of the date first written above.

KANAHA PROFESSIONAL PLAZA, LLC
a Hawaii limited liability company

By ______________________
Name: Robert T. McDaniel III
Title: MANAGER

MAUI COASTAL LAND TRUST
a Hawaii not for profit corporation

By ______________________
Name: Dale B. Bonar
Title: Executive Director

By ______________________
Name: Helen Nielsen
Title: Board President

IN WITNESS WHEREOF, the parties hereto execute this Agreement effective as of the date first written above.

KANAHA PROFESSIONAL PLAZA, LLC
a Hawaii limited liability company

By ______________________
Name: Robert T. McDaniel III
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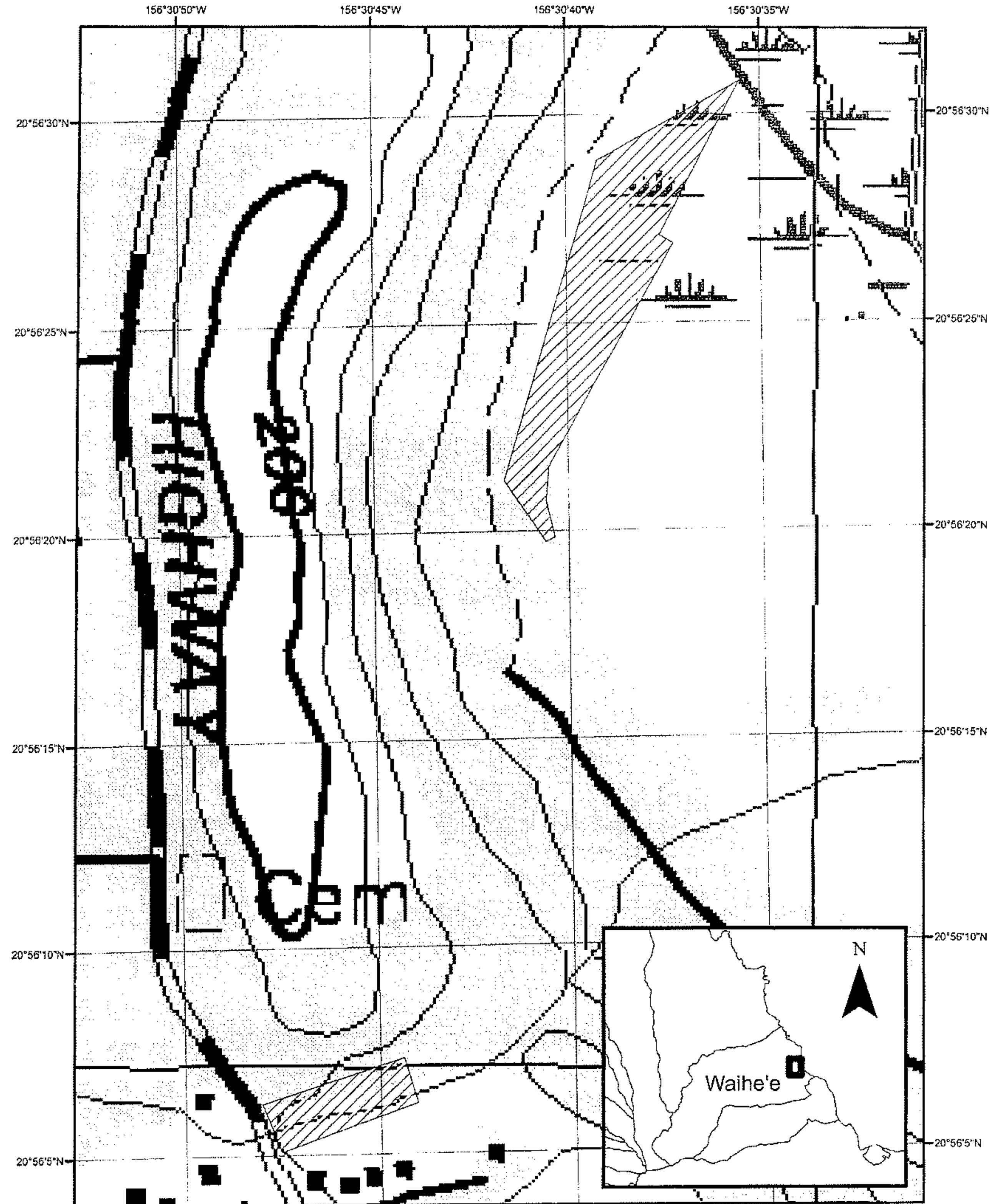
MAUI COASTAL LAND TRUST
a Hawaii not for profit corporation

By ______________________
Name: Dale B. Bonar
Title: Executive Director

By ______________________
Name: Helen Nielsen
Title: Board President

Waihe'e Mitigation Area EXHIBIT "A"



Legend

Mitigation Area

0 50 100 200 Meters

Map Created by James Crowe 2011-01-04

APPENDIX B-5.

Provisional Department of Army Permit and Related Approvals

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

February 1, 2011

Regulatory Branch
Engineering and Construction Division

File Number POH-2006-00531

Mr. Benjamin Brown
Kanahā Professional Plaza, LLC
8056 Molt Road
Billings, MT 59106

Dear Mr. Brown:

We have completed our review of your Department of the Army (DA) permit application to fill 0.94 acres of wetland at 151 Hana Highway, Kahului, Island of Maui, Hawaii.

Enclosed is a "provisional" DA permit. **At this time, you are <u>not</u> authorized to perform the proposed work.** The provisional DA permit is being provided to you for your review. The provisional DA permit lists the permit conditions and describes the work that will be authorized once the remaining permit requirements are satisfied as described below.

By Federal law, the U.S. Army Corps of Engineers (Corps) may not issue a DA permit until the Clean Water Act Section 401 Water Quality Certification (WQC) requirements have been satisfied. For this project, the State of Hawaii Department of Health, Clean Water Branch (CWB) is the agency responsible for issuing the WQC. As of the date of this letter, CWB has not issued a WQC for the proposed work. The Corps will issue a DA permit for the proposed work if CWB issues a WQC. As described in General Condition 5 of the DA permit, you are required to comply with all WQC conditions, if one is issued. Should CWB's actions necessitate changes to the proposed work or the terms and conditions shown in the provisional permit, you will be notified. Such changes could require additional evaluation of your permit application. If CWB denies the WQC, then the Corps must deny without prejudice your request for a DA permit.

Please sign and date both copies of the enclosed provisional permit once (1) CWB has issued a WQC and (2) you agree to all the terms and conditions of the provisional permit. Please return both copies of the signed provisional permits to the Corps with your check in the amount of $100.00 made payable to the "FAO, USAED, Honolulu." Your DA permit is not valid until the permit bears both your signature and the signature of the appropriate Corps official. We will mail you a copy of the finalized permit.

If you object to this permit decision, you may request an administrative appeal under our regulations as described in the enclosed the *Notification of Administrative Appeal Options and Process and Request for Appeal* form.

A copy of this letter without enclosures is being forwarded to Mr. Robert McDaniel III, Kanahā Professional Plaza, LLC, 350 Hukilike Street, Suite D, Kahului, Hawaii, 96732; Mr. John Nakagawa, Hawaii CZM Program, Office of Planning, P.O. Box 2359, Honolulu, Hawaii 96804; and Mr. Alec Wong, Chief, Clean Water Branch, Hawaii State Department of Health, P.O. Box 3378, Honolulu, Hawaii 96801.

If you have questions concerning the WQC process, please contact Mr. Edward Chen at (808) 586-4309. If you have questions concerning your DA permit application, please contact Ms. Amy Klein, Regulatory Specialist, at (808) 438-7023 or via email Amy.S.Klein@.usace.army.mil.

BY AUTHORITY OF THE DEPARTMENT OF THE ARMY:

Douglas B. Guttormsen, P.E.
Lieutenant Colonel, U. S. Army
District Engineer

Enclosures

DEPARTMENT OF THE ARMY PERMIT

Permittee: Kanahā Professional Plaza, LLC

350 Hukilike Street, Suite D
Kahului, Hawai'i, 96732

Permit No: POH-2006-00531

Issuing Office: Honolulu District

NOTE: The term "you" and its derivatives, as used in this permit, means the permittee or any future transferee. The term "this office" refers to the appropriate district or division office of the U.S. Army Corps of Engineers (Corps) having jurisdiction over the permitted activity or the appropriate official of that office acting under the authority of the commanding officer.

You are authorized to perform work in accordance with the terms and conditions specified below.

Project Description: Fill 0.94 acres of palustrine emergent wetland to construct a six-story medical offices facility. The project will require a single six-story building, a five-story parking structure, two access roads, and three stormwater detention basins.

The project will occur in accordance with the plans and drawings dated December 16, 2008 attached hereto which are incorporated in and made a part of this permit. The purpose of the project is to provide medical services to the island of Maui by constructing a medical facility.

Project Location: In wetlands at 151 Hana Highway, Kahului, County of Maui, Hawai'I;
Tax Map Key (TMK) (2) 3-7-11: 28

Permit Conditions:

General Conditions:

1. The time limit for completing the work authorized ends on ________________. If you find that you need more time to complete the authorized activity, submit your request for a time extension to this office for consideration at least 1 month before the above date is reached.

2. You must maintain the activity authorized by this permit in good condition and in accordance with the terms and conditions of this permit. You are not relieved of this requirement if you abandon the permitted activity, although you may make a good faith transfer to a third party in compliance with General Condition 4 below. Should you wish to cease to maintain the authorized activity or should you desire to abandon it without a good faith transfer, you must obtain a modification to this permit from this office, which may require restoration of the area.

3. If you discover any previously unknown historic or archeological remains while accomplishing the activity authorized by this permit, you must immediately notify this office of what you have found. We will initiate the Federal and State coordination required to determine if the remains warrant a recovery effort or if the site is eligible for listing in the National Register of Historic Places.

4. If you sell the property associated with this permit, you must obtain the signature of the new owner in the space provided and forward a copy of the permit to this office to validate the transfer of this authorization.

5. If a conditioned water quality certification has been issued for your project, you must comply with the conditions specified in the certification as special conditions to this permit. For your convenience, a copy of the certification is attached if it contains such conditions.

6. You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being or has been accomplished in accordance with the terms and conditions of your permit.

7. After a detailed and careful review of all the conditions contained in this permit, the permittee acknowledges that, although said conditions were required by the Corps, nonetheless the permittee agreed to those conditions voluntarily to facilitate issuance of the permit; the permittee will comply fully with all the terms of all the permit conditions.

Special Conditions:

a) The wetland areas enhanced as compensatory mitigation for work authorized by this permit (the "Mitigation Area") may not be made the subject of any future individual or general Department of the Army permit application for fill or other development except for the purposes of enhancing or restoring the mitigation associated with this project. The Mitigation Area may not be included in any future mitigation bank or in lieu fee program proposal. In addition, a description of the Mitigation Area identified in the document entitled, *Maui Medical Plaza at Kanahā Alternate Wetland Mitigation Plan*, dated November 23, 2009, and the addendum to that document (modified location) dated October 18, 2010 (collectively, the "Mitigation Plan") as approved must be recorded at the State of Hawai'i Bureau of Conveyances. Proof of this recorded documentation must be provided to this office no later than 13 months from the date of permit issuance.

b) Mitigation construction must be completed in its entirety within six months of commencing fill and grading activities at the project site. The permittee must submit as-built drawings of the completed Mitigation Area. Mitigation construction will not be considered complete until this office has reviewed and approved the as-built drawings.

c) The Permittee must implement and abide by the Mitigation Plan and the following protocol:

1. Prior to initiating construction in waters of the U.S., the Permittee must post financial assurance in a form approved by this office ("financial assurance") for the estimated cost of implementing the approved Mitigation Plan (including a 20% contingency to be added to the total costs). The purpose of this financial assurance is to guarantee the successful implementation, maintenance, and monitoring of the wetland and non-wetland waters creation, restoration, and enhancement work. This office will accept as financial assurance a performance bond or an irrevocable standby letter of credit. The financial assurance must be in the amount of 120% of the anticipated cost of the mitigation and monitoring associated with the project, as indicated above; however, subject to approval from this office, this amount may be reduced as certain mitigation milestones are successfully met.

   i. If the Permittee chooses to obtain a performance bond,
      a. The bonding company must appear on the Department of Treasury Circular 570, Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and Acceptable Reinsuring Companies. For a current list of Treasury-authorized companies, write or call the U.S. Department of the Treasury, Financial Management Services, Surety Bond Branch, 3700 East West Highway, Room 6F01, Hyattsville, MD 20782; (202) 874-6850 or at the following website: http://www.fms.treas.gov/c570/c570.html; and

b. The performance bond will be released only upon a determination by this office that the Mitigation Work, as defined in the Mitigation Plan, has been successfully completed and is in compliance with these Special Conditions.

ii. If the Permittee chooses to obtain an irrevocable standby letter of credit, the terms of the letter of credit are subject to approval by this office.

2. Monitoring must occur annually for five years.

3. Year 1 monitoring begins 12 months after approval by this office of the as-built drawings.

4. Each annual monitoring report must be submitted no later than 45 calendar days after the annual monitoring event.

5. Each annual monitoring report must be submitted in hardcopy to this office and must prominently display the reference number: POH-2006-00531.

6. If the mitigation site has not met approved performance standards at the end of 5 years, monitoring and the submission of mitigation monitoring reports must continue annually thereafter until (1) mitigation success is demonstrated as defined in Section 7 of the Mitigation Plan and (2) the Permittee has received written verification of mitigation success from this office.

d) The Permittee must obtain a right of reasonable entry for Corps personnel, and any government consultants, to inspect the Mitigation Area and Mitigation Work until such time as this office has determined the Mitigation Work to be successful in accordance with the performance standards set forth in the Mitigation Plan and these Special Conditions. The right of entry may be subject to reasonable notice requirements and/or other reasonable conditions.

e) In the event of a transfer of any interest in TMK (2) 3-7-11: 28, the Permittee must either retain the responsibility to pay for and ensure the successful implementation of the Mitigation Work and long-term monitoring and maintenance of the Mitigation Area required by the Mitigation Plan and these Special Conditions or must explicitly transfer such responsibility to its grantee.

For Compliance with Section 7 of the Endangered Species Act:

f) Construction equipment, signs, poles, and other structures associated with the project could pose a flight obstacle to the night-flying Hawaiian petrel and Newell's shearwater (collectively referred to as seabirds) during the breeding season. Any outdoor lighting, particularly during each year's peak fallout period (September 15 through December 15), could result in seabird disorientation, fallout, and injury or mortality. To avoid impacts to seabirds all outdoor lights associated with construction and the completed development will be shielded so the bulb can be seen only from below.

g) Blackburn's sphinx moth may occur in the development and wetland mitigation sites. The adult moth feeds on nectar from native plants including beach morning glory (*Ipomoea pes-caprae*), iliee (*Plumbago zeylanica*), and maiapilo (*Capparis sandwichiana*), and the larvae feed upon non-native tree tobacco (*Nicotiana glauca*) and the native (*Nothocestrum latifolium*) (collectively referred to as host plants). Although no host plants were found during the Biological Resources Survey, completed in September, 2006, these plants may become established within the project area. To avoid impacts to Blackburn's sphinx moth a biologist or other individual capable of identifying host plants must survey the Mitigation Area for the presence of host plants within one month of ground-breaking. If a host plant is found, it must be marked with flagging. No host plants may be removed or trimmed, and the soil within

10 meters of the host plant must be protected from disturbance throughout implementation of the Mitigation Work. Soil disturbance includes any removal of invasive plant species or installation of native plant species if such removal or installation would disturb the root system of a host plant.

h) To avoid impacts to the endangered Hawaiian hoary bat, woody plants suitable for bat roosting must be identified and flagged by a biologist or other individual capable of identifying suitable woody plants. The plants may not be removed or trimmed during the bat birthing and pup rearing season (April to August).

i) In areas where endangered Hawaiian waterbirds have been observed, nest searches by a biologist familiar with nesting behavior of Hawaiian waterbirds must be conducted prior to any work being conducted and after any subsequent delay in work of three or more days (during which birds may attempt nesting). If a nest is discovered, work must cease in the vicinity for a minimum of 60 days; if a nest with chicks is discovered, work must cease for a minimum of 30 days. These standard guidelines are intended to protect chicks, and may be shortened if monitoring is conducted often enough to note when chicks have fledged (usually five to six weeks after hatching). If a previously undiscovered nest is found after work begins, all work must cease within a minimum radius of 100 feet of the nest and the U.S Fish and Wildlife Service must be contacted at (808) 792-9469 within 24 hours. The permittee must also notify this office within one business day. Notification may be provided via phone call at (808) 438-9258 or e-mail at CEPOH-EC-R@usace.army.mil. The permittee must perform any work required by this office in accordance with Section 7 of the Endangered Species Act and Corps regulations.

For Compliance with Section 106 of the National Historic Preservation Act:

j) A professional archaeologist must be on-site to monitor for the presence of archaeological resources during all mitigation activities within the Mitigation Area at Waihe'e Coastal Dunes and Wetlands Refuge. As per the approved monitoring plan, the archaeologist must have the authority to halt excavation in the event that suspected cultural materials are discovered.

k) If human burials or remains, or historic, cultural, or archaeological resources are encountered during project site work or Mitigation Work, all activities in the immediate area must cease and the Permittee must notify this office within one business day of the discovery. Notification may be provided via phone call at (808) 438-9258 or e-mail at CEPOH-EC-R@usace.army.mil. The Permittee must perform any work required by this office in accordance with Section 106 of the National Historic Preservation Act and Corps regulations.

l) Ground disturbance at the Mitigation Area must be limited to the surface removal of invasive vegetation.

Further Information:

1. Congressional Authorities. You have been authorized to undertake the activity described above pursuant to:

   ☐ Section 10 of the Rivers and Harbor Act of 1899 (33 U.S.C. 403).

   ☒ Section 404 of the Clean Water Act (33 U.S.C. 1344).

   ☐ Section 103 of the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C 1413).

2. Limits of this authorization.

a. This permit does not obviate the need to obtain other Federal, State, or local authorization required by law.

b. This permit does not grant any property rights or exclusive privileges.

c. This permit does not authorize any injury to the property or rights of others.

d. This permit does not authorize interference with any existing or proposed Federal project.

3. Limits of Federal Liability. In issuing this permit, the Federal Government does not assume any liability for the following:

a. Damages to the permitted project or uses thereof as a result of other permitted activities or from natural causes.

b. Damages to the permitted project or uses thereof as a result of current or future activities undertaken by or on behalf of the United States in the public interest.

c. Damages to persons, property, or to other permitted or unpermitted activities or structures caused by the activity authorized by this permit.

d. Design or construction deficiencies associated with the permitted work.

e. Damage claims associated with any future modification, suspension, or revocation of this permit.

4. Reliance on Applicant's Data. The determination of this office that issuance of this permit is not contrary to the public interest was made in reliance on the information you provided.

5. Reevaluation of Permit Decision. This office may reevaluate its decision on this permit at any time the circumstances warrant. Circumstances that could require include, but are not limited to, the following:

a. You fail to comply with the terms and conditions of the permit.

b. The information provided by you in support of your application proves to have been false, incomplete, or inaccurate (See 4 above).

c. Significant new information surfaces which this office did not consider in reaching the original public interest decision.

Such a reevaluation may result in a determination that it is appropriate to use the suspension, modification, and revocation procedures contained in 33 CFR 325.7 or enforcement procedures such as those contained in 33 CFR 326.4 and 326.5. The referenced enforcement procedures provide for the issuance of an administrative order requiring you to comply with the terms and conditions of your permit and for the initiation of legal action where appropriate. You will be required to pay for any corrective measures ordered by this office, and if you fail to comply with such directive, this office may in certain situations (such as those specified in 33 CFR 209.170) accomplish the corrective measures by contract or otherwise and bill you for the cost.

6. Extensions. General condition 1 establishes a time limit for the completion of the activity authorized by this permit. Unless there are circumstances requiring either a prompt completion of the authorized activity or a reevaluation of the public interest decision, the Corps will normally give favorable consideration to a request for an extension of this time limit.

Your signature below, as Permittee, indicates that you accept and agree to comply with the terms and conditions of this permit.

________________________________ ____________________________

Kanahā Professional Plaza, LLC (DATE)

This permit becomes effective when the Federal official, designated to act for the Secretary of the Army, has signed below.

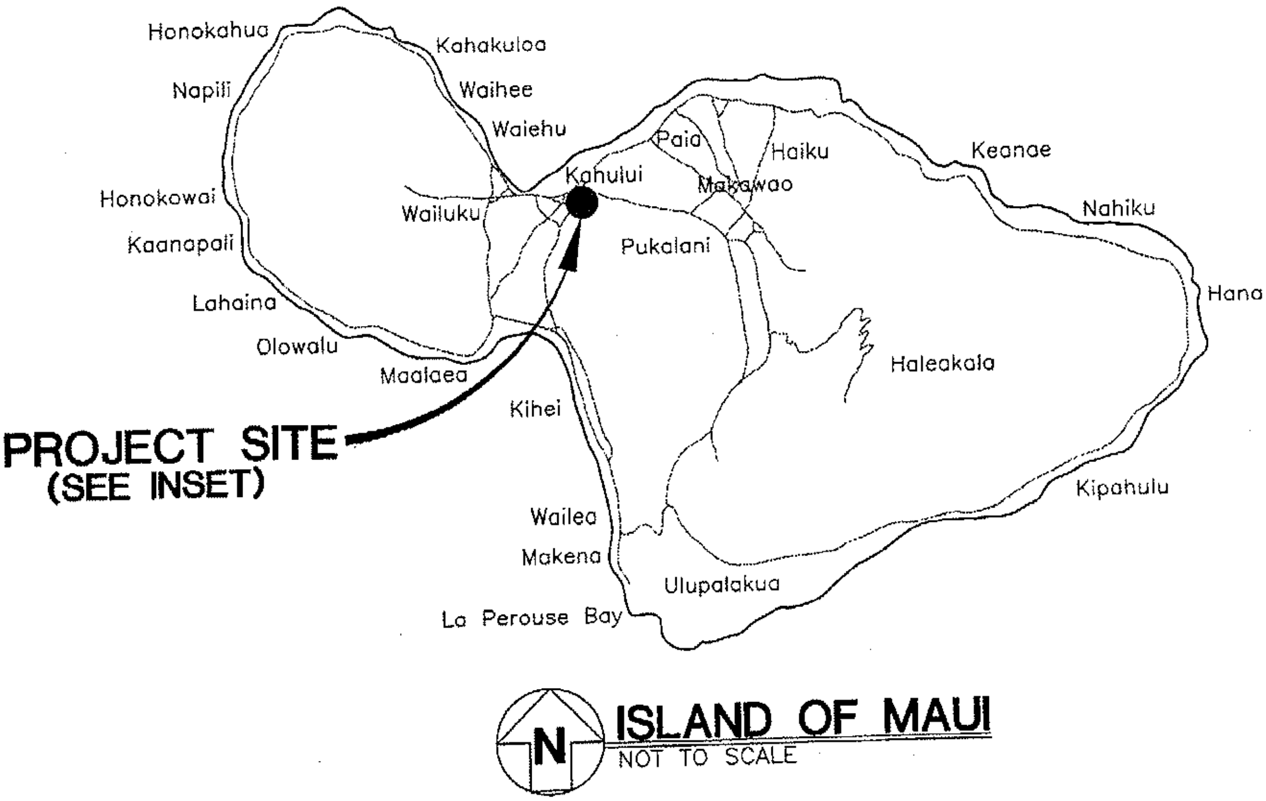
________________________________ ____________________________

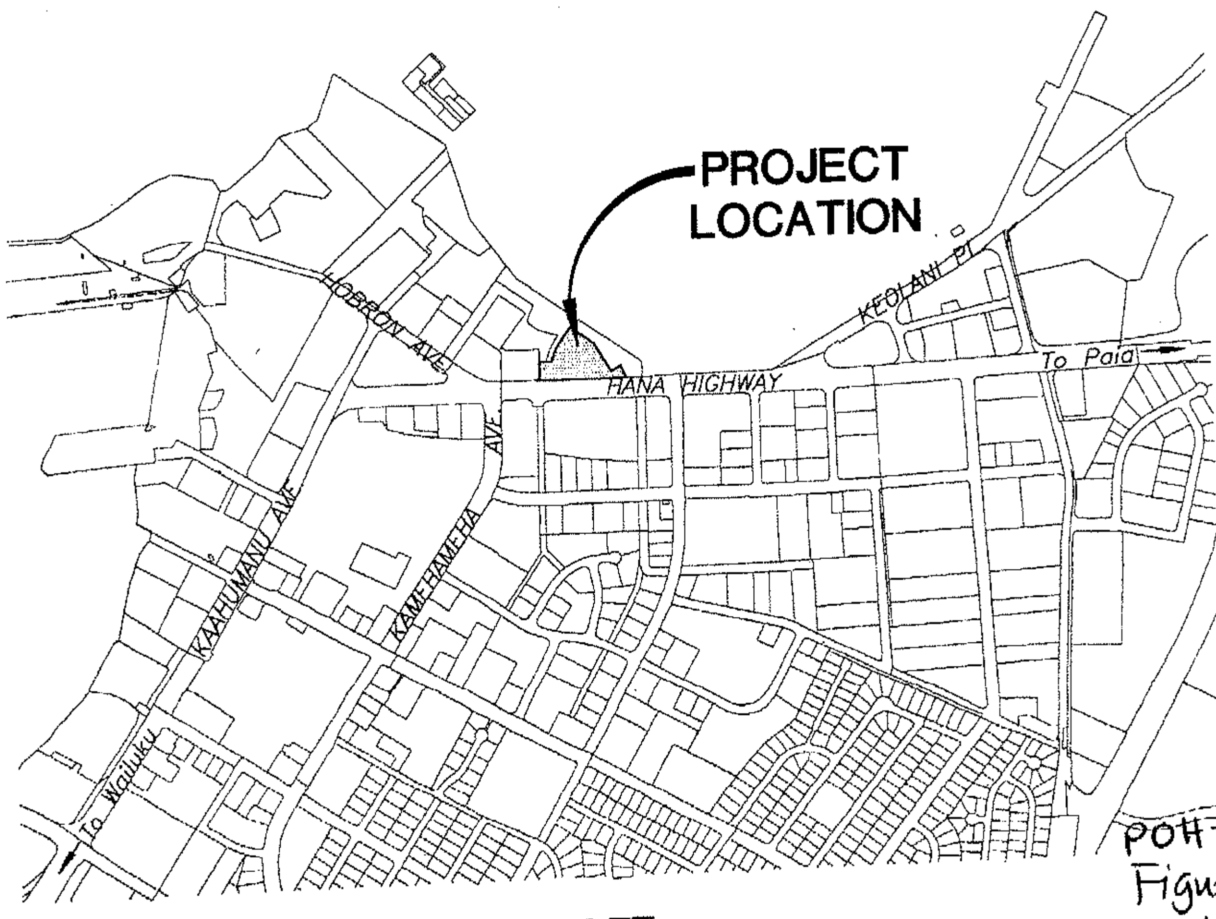
Douglas B. Guttormsen, P.E. (DATE)
Lieutenant Colonel, U. S. Army
District Engineer

When the structures or work authorized by this permit are still in existence at the time the property is transferred, the terms and conditions of this permit will continue to be binding on the new owner(s) of the property. To validate the transfer of this permit and the associated liabilities associated with compliance with its terms and conditions, have the transferee sign and date below.

________________________________ ____________________________

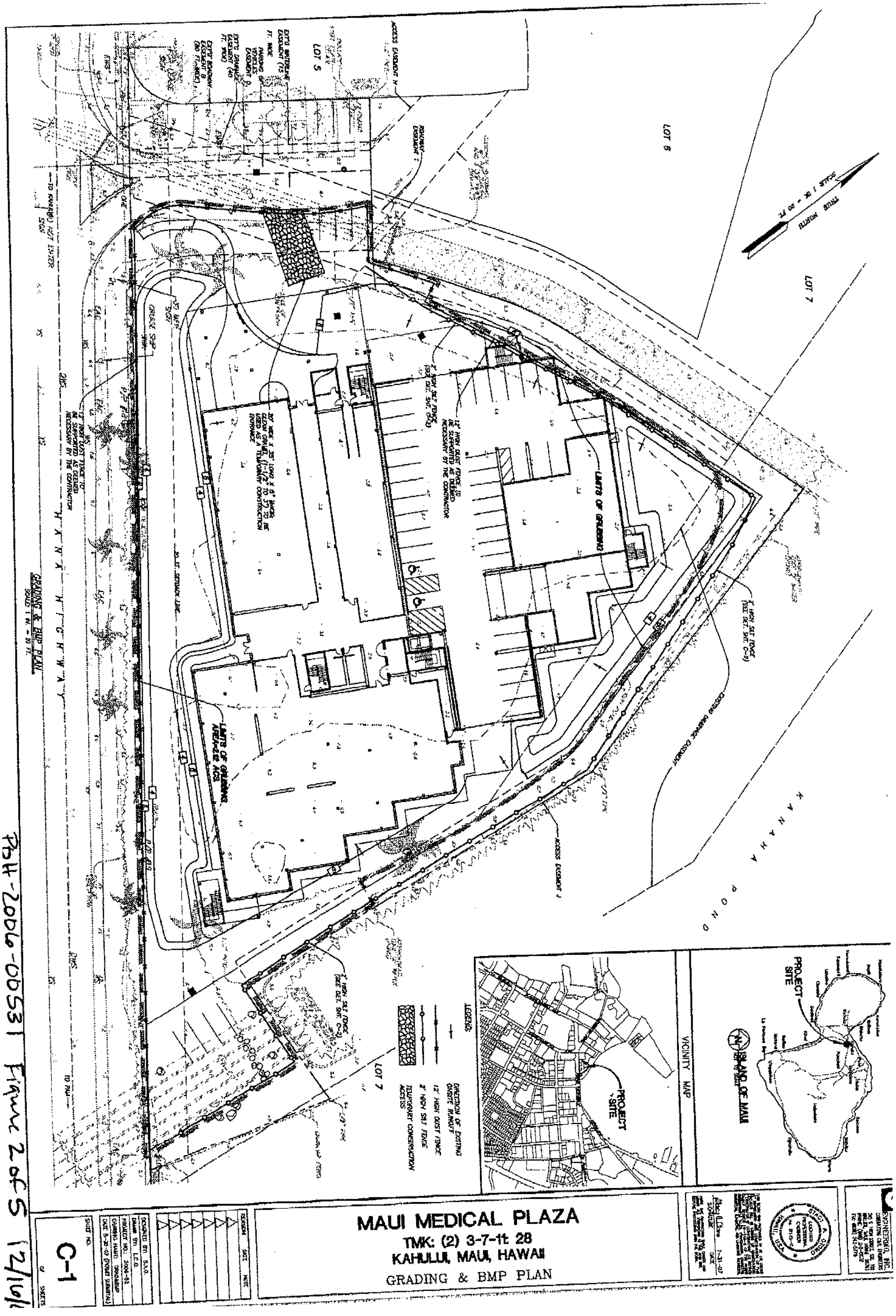
(TRANSFEREE) (DATE)



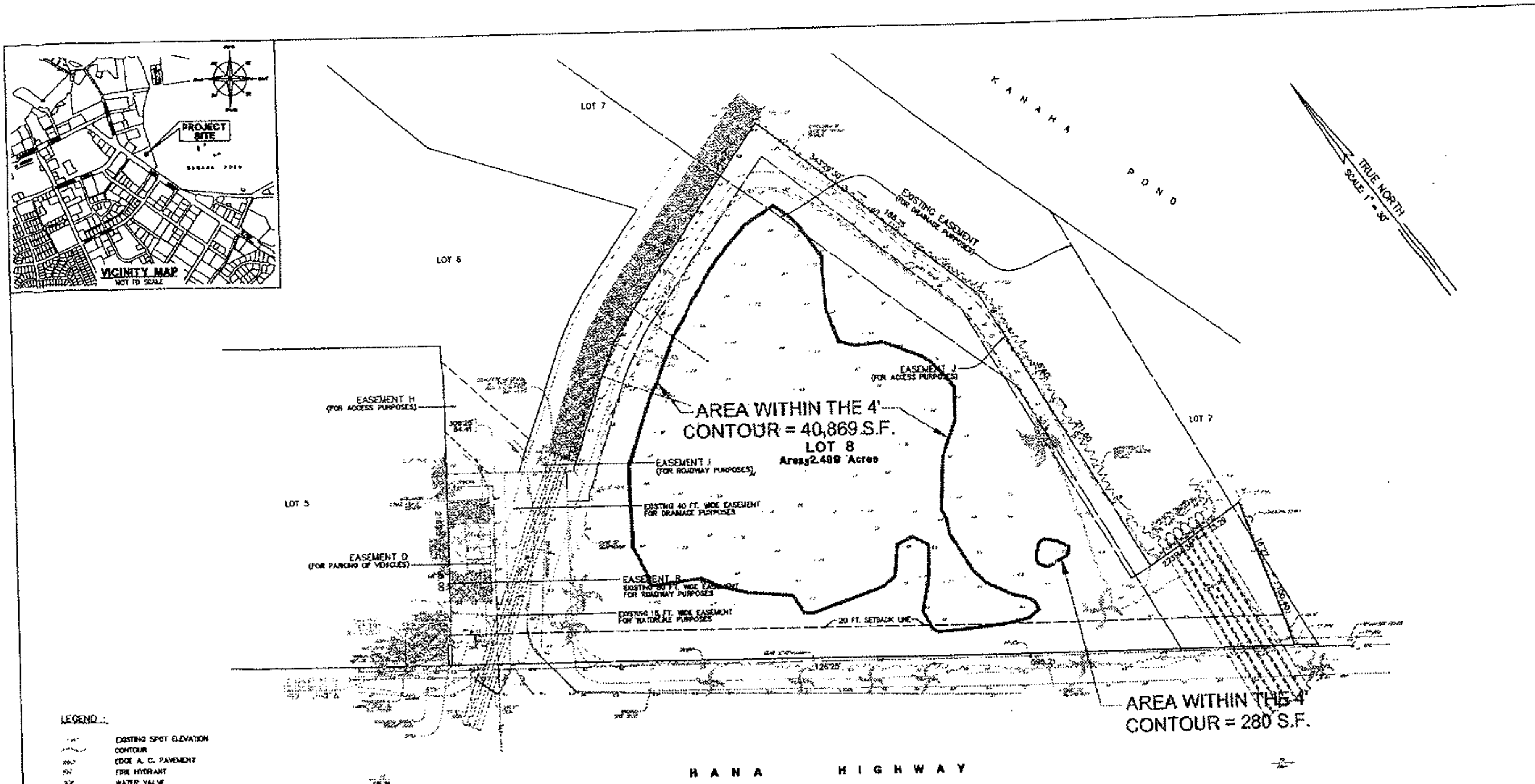


INSET

POH-2006-00531
Figure 1 of 5
12/16/08



PDH-2006-00531 Figure 2 of 5 12/10/



LEGEND :

EXISTING SPOT ELEVATION
CONTOUR
EDGE A. C. PAVEMENT
FIRE HYDRANT
WATER VALVE
WATER MANHOLE
POWER POLE
IRRIGATION CONTROL VALVE
OVERHEAD ELECTRICAL LINE
TOP BANK
BOTTOM BANK
EXISTING WATERLINE AND SIZE
EXISTING DRAINLINE AND SIZE

NOTES FOR TOPOGRAPHIC FEATURES:

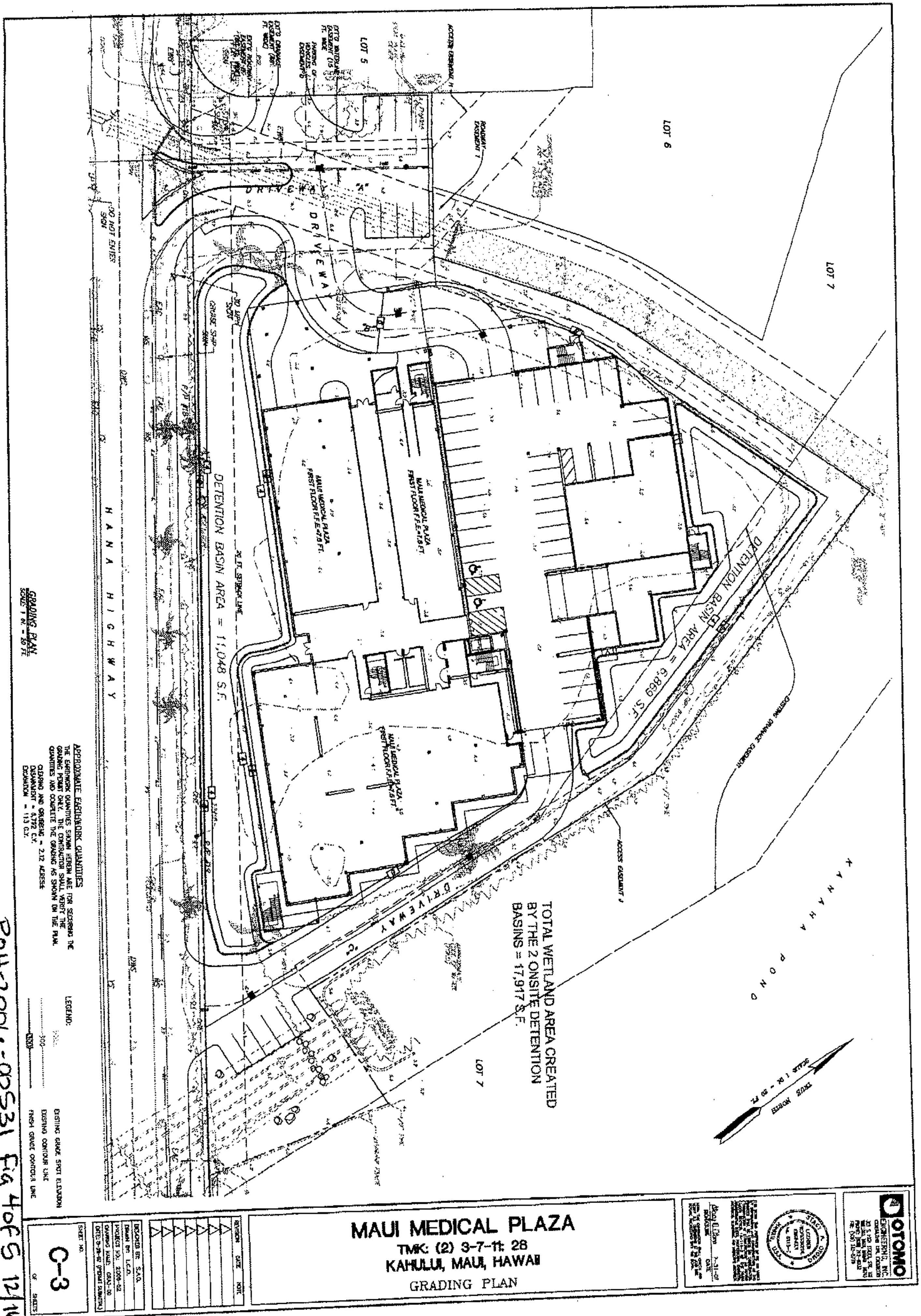
1. ELEVATION DATUM – MEAN SEA LEVEL.
2. ALL VISIBLE UTILITY STRUCTURES HAVE BEEN LOCATED IN THE FIELD. HOWEVER, CONNECTION OF UNDERGROUND UTILITY LINES AS SHOWN ARE UNVERIFIED AND COMPILED FROM EXISTING DATA. UNDERGROUND UTILITIES SHOWN HEREON ARE FOR INFORMATION ONLY, HAVING BEEN OBTAINED FROM THE BEST AVAILABLE SOURCES, BUT FROM OTHERS NOT CONNECTED WITH THIS COMPANY. THEREFORE, NO GUARANTEE IS MADE ON THE ACCURACY OR COMPLETENESS OF SAID INFORMATION.

TOPOGRAPHIC SURVEY MAP
OF
LOT 8, KANAHA INDUSTRIAL SUBDIVISION II
BEING A PORTION OF GRANT 3343 TO CLAUS SPRECKELS
AT KAHULUI, WAILUKU COMMONS, MAUI, HAWAII

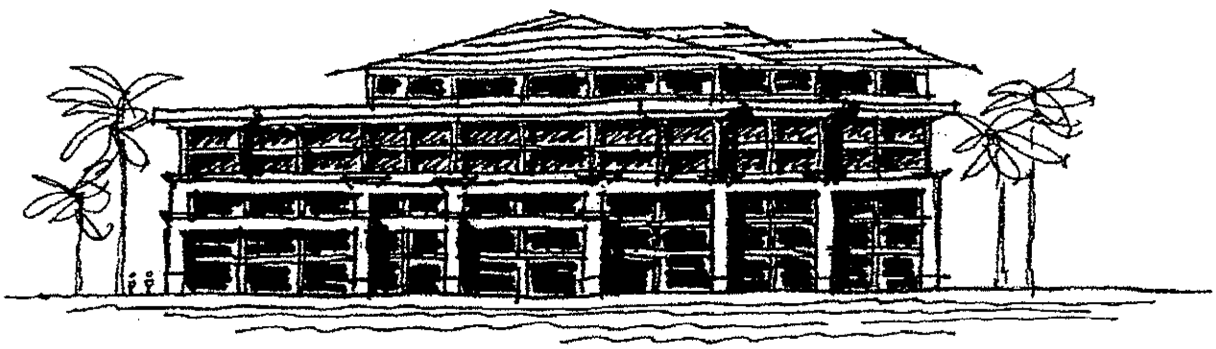
30 15 0 30 60
GRAPHIC SCALE IN FEET

POH-2006-00531 Fig. 3 of 5
12/16/08

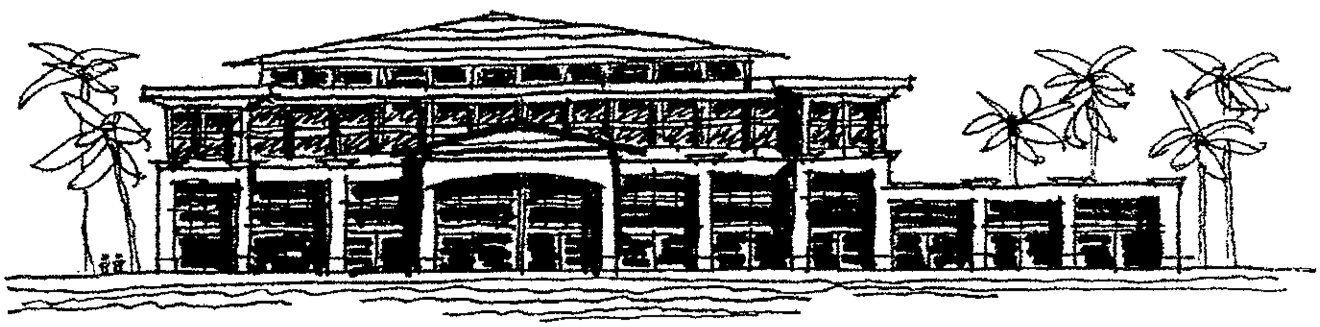
Tax Map Key (2) 3-7-11: 28



PoH-2004-00531 Fig 4 of 5 12/14



KANAHA POND/HALEAKALA SIDE



HANA HIGHWAY SIDE

SCHEME 'A' - CONCEPT PHASE

KANAHA PROJECT, LOT 8

R. HARTMAN ARCHITECT LLC

07-12-06

PAGE 1 OF 1

POH-2006-00531 Fig. 5 of 5 12/16/08

LINDA LINGLE
GOVERNOR
THEODORE E. LIU
DIRECTOR
PEARL IMADA IBOSHI
DEPUTY DIRECTOR
ABBEY SETH MAYER
DIRECTOR
OFFICE OF PLANNING

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

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

Telephone: (808) 587-2846
Fax: (808) 587-2824

Ref. No. P-13044

June 23, 2010

Mr. Robert McDaniel
350 Hukilike Street, Suite D
Kahului, Hawaii 96732

Dear Mr. McDaniel:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency Review for the Proposed Maui Medical Plaza at Kanaha Facility, Kahului, Maui, TMK (2) 3-7-11: 28 (Lot 8); Department of the Army Permit File No. POH-2006-531

The proposal to develop a medical offices facility, which involves filling 0.94-acre of on-site wetland and providing approximately 5 acres of off-site compensatory mitigation at the Waihee Coastal Dunes and Wetland Refuge (TMK (2) 3-2-10: 1, 2) in conjunction with the Maui Coastal Land Trust (MCLT), has been reviewed for consistency with the Hawaii CZM Program. We concur with your certification that the activity is consistent with the enforceable policies of the Hawaii CZM Program based on the following conditions:

1. The project shall be in compliance with State of Hawaii water quality standards and requirements, including obtaining a Section 401 Water Quality Certification as specified in Hawaii Administrative Rules, Chapter 11-54, and Hawaii Revised Statutes (HRS), Chapter 342D, which are federally-approved enforceable policies of the Hawaii CZM Program.

2. The "Maui Medical Plaza at Kanaha Alternate Wetland Mitigation Plan" (November 23, 2009) and the applicable elements of the original plan, the "Maui Medical Plaza at Kanaha Wetland Mitigation Plan" (July 31, 2009), shall be fully implemented. Strict adherence to the alternate mitigation plan is required, including the following components: proposed mitigation work plan and all best management practices (Sec. 6); performance standards (Sec. 7); site protection and maintenance (Sec. 8); monitoring plan (Sec. 9); adaptive management plan (Sec. 10); and financial assurances (Sec. 11).

3. As represented in the alternate mitigation plan (p. 7), the enhancement and rehabilitation of existing wetland ecosystem function and structure in five degraded

acres of the Waihee Coastal Dunes and Wetland Refuge shall occur prior to construction on Lot 8.

4. As represented in the alternate mitigation plan (p. 6), long term monitoring and management will be supported with dedicated resources via a perpetual obligation in agreement with MCLT for the five acres that will be attached to Lot 8. Financial assurances for the first five years will be provided through a "Mitigation Fund" to be established by the applicant (alternate mitigation plan, pp. 31-32).

5. On-site engineering and design for Lot 8 (alternate mitigation plan, p. 5, and original mitigation plan, Appendix C) shall address drainage and infiltration functions lost by filling of the 0.94-acre wetland area and shall be fully implemented.

6. Special management area use permits shall be obtained from the County of Maui, Department of Planning, for the development of Lot 8 and the off-site mitigation work at the Waihee Coastal Dunes and Wetland Refuge. The special management area requirements are specified in HRS, Chapter 205A, which is a federally-approved enforceable policy of the Hawaii CZM Program.

7. Any changes to the development proposal or the wetland mitigation plan are subject to additional CZM review.

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your cooperation in complying with the Hawaii CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at (808) 587-2878.

Sincerely,

Abbey Seth Mayer
Director

c: ✓Ms. Michelle Cockett
Ms. Amy Klein, U.S. Army Corps of Engineers, Regulatory Branch
U.S. Fish and Wildlife Service, Pacific Islands Ecoregion
Dr. Wendy Wiltse, U.S. Environmental Protection Agency
Department of Health, Clean Water Branch
Department of Planning, County of Maui

APPENDIX C.

Phase I Environmental Site Assessment Report

Vuich Environmental Consultants, Inc.

Environmental Site Assessment:
Phase I Investigation

Subject Site:

KANAHA INDUSTRIAL SUBDIVISION II (LOT 8)
30 Hobron Avenue
Kahului, Hawaii 96732
T.M.K. (2) 3-7-11:28

Prepared for:

MR. BEN BROWN AND MR. BOB MCDANIEL
5618 Lower Kula Road
Kula, Hawaii 96790

Conducted and Compiled by:

Vuich Environmental Consultants, Inc.
VEC Project Number #0605-1157
June 16, 2006

P.O. Box 337 Makawao, Hawaii 96768 • 808.249.2777 Phone • 808.249.2778 Fax

Vuich Environmental Consultants, Inc.

Environmental Site Assessment:

Phase I Investigation

Property: KANAHA INDUSTRIAL SUBDIVISION II (LOT 8)
30 Hobron Avenue
Kahului, Hawaii 96732
T.M.K. (2) 3-7-11:28

Prepared for: MR. BEN BROWN AND BOB MCDANIEL
5618 Lower Kula Road
Kula, Hawaii 96790

We declare that, to the best of our professional knowledge and belief, we meet the definition of *Environmental professional* as defined in 312.10 of 40 CFR 312 and we have the specific qualifications based on education, training, and experience to assess a *property* of the nature, history, and setting of the *subject property*. We have developed and performed the all appropriate inquiries in conformance with the standards and practices set forth in 40 CFR part 312.

Jeffrey E. Kermode, Site Investigator — Date: 6/16/06

- B.A. (Geography), B.Tech. (Environmental Engineering)
- Lead-Based Paint Inspector (EPA Accredited Course)
  EPA Certification No. HI-03-0920045008
- Asbestos Building Inspector (AHERA Accredited Course)
  State of Hawaii Certification No. HIASB-0351

John S. Vuich, M.S., Project Supervisor — Date: 06/16/06

- Registered Environmental Assessor
  Registration No. 1433 (State of California)

Table of Contents

Vuich Environmental **End of Section**

Disclosure

This document contains the results of services performed on this Project by **Vuich Environmental Consultants, Inc. (VEC)** pursuant to Agreement. The results represent the application of a variety of scientific and analytical disciplines that have been rendered using the standard of care, skill, and diligence normally provided by professionals in the performance of similar services under similar circumstances.

VEC assessments are intended to reduce, but not eliminate, uncertainty regarding recognized environmental conditions in connection with the Subject Site, as conducted within reasonable limits of time and cost. A general consensus of EPA's guidance on landowner liability is that *no environmental site assessment can wholly eliminate uncertainty regarding the potential for recognized environmental conditions in connection with a property.*

The use of this document and the results reported are limited to the services performed and areas examined as described in this document and no inferences are intended with respect to anything not described herein.

VEC is not responsible for conditions or consequences arising from relevant data, facts, and information that were concealed, missing, withheld, not fully disclosed, or not reasonably available at the time these services were performed. **VEC** is not responsible for any indirect, incidental, or consequential damages of any nature arising from any cause.

VEC has no beneficial economic interest in the Project other than as an independent professional organization performing the agreed services. **VEC's** warranties are as described above and there are no other warranties of any kind, expressed or implied, regarding the services.

Executive Summary

Introduction

This Phase I Environmental Site Assessment (ESA) has been prepared for Mr. Ben Brown and by Mr. Robert McDaniel and was conducted pursuant to Vuich Environmental Consultants, Inc.'s (VEC's) written proposal and contract accepted by Mr. Robert McDaniel on May 23, 2006. This investigation and report format follows the guidelines of the American Society of Testing and Materials (ASTM) Publication E1527-05.

Site Description

The subject site is located at 30 Hobron Avenue and is part of the the Kanaha Industrial Subdivision II, near the intersection of Hobron Avenue and Hana Highway in the town of Kahului, Maui, Hawaii. The property consists of one (1) parcel of land, irregular in shape, measuring approximately 2.49 acres in total area. The site is further described on the Tax Maps of the State of Hawaii as Division 2, Zone 3, Section 7, Plat 11, Parcel 28. It is also referred to as Lot 8 of the Kanaha Industrial Subdivision II. Property access is from Hana Highway.

Lot 8 consists of undeveloped, heavily vegetated land. No building structures were located on-site except for temporary structures from homeless activities.

Surrounding land use consists of commercial and industrial activities and a wildlife sanctuary.

Kahului is Maui's central hub of commercial activity and is a seaside town situated near the north coast of the isthmus of Maui, between the West Maui Mountains and East Maui.

Records Review

The purpose of a records review is to obtain and review records that will help identify ***recognized environmental conditions*** in connection with the subject property. The services of Environmental Data Resources, Inc. were utilized to compile the database listings.

Our records review did not discover any current investigation of the subject site under any programs conducted by a federal, state, or local environmental agency. Several risk sites were identified in the vicinity of the subject property.

Site Reconnaissance

A site investigation focuses on obtaining information indicating the likelihood of identifying physical ***recognized environmental conditions*** in connection with the property and assessing the subject property in relation to surrounding land uses and natural surface features. It includes a physical inspection of the real property and any on-site facilities.

On June 8, 2006, VEC personnel, Mr. Jeffrey Kermode, conducted an overall site inspection of the subject site. Accessible areas of the property were visually and physically inspected.

The following are significant observations of field conditions: (See Site Plan, Figure 2)

- The property is predominantly undeveloped and heavily vegetated;
- Several homeless encampments were noted. Human feces were visible;
- Vehicle batteries were noted in the vicinity of the homeless encampments;
- One (1) derelict forklift;
- A limited number of vehicle tires;
- Storm water canals and wetlands are located adjacent to the subject site;
- Wetland characteristics are noted on the subject site;
- Dredged sediment piles from the adjoining canals are located on-site.

Conclusions

Recognized environmental conditions, as defined by ASTM Standard E1527-05, are the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property, or into the ground, ground water, or surface water of the property. ***Recognized environmental conditions*** are described with regard to (1) the nature and extent of the environmental condition, (2) potential or actual environmental threat, (3) potential for transport (migration) of any environmental conditions, and (4) consideration for further investigation. The term is not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

VEC has performed this Phase I Environmental Site Assessment in conformance with the scope and limitations of the ASTM Practice E 1527-05 for the subject property located at 30 Hobron Avenue, also listed as Lot 8 of the Kanaha Industrial Subdivision II, in the town of Kahului, Maui, defined as the subject property. Any exceptions to or deletions from this practice are described in Section 1.4, Limitations and Exceptions, of this report. **This assessment has revealed no evidence of *recognized environmental conditions* in connection with the property.**

- ***Database Listings***

  The subject site is <u>not</u> listed.

  There are several nearby listed sites, as indicated by the EDR Report, within the appropriate search distances from the subject property. The listed nearby sites within close proximity to the subject site were reviewed for environmental concerns relative to the subject site. Based on the current status with the State, these sites unlikely pose a significant concern to the subject site.

  The location of the subject site is in an area zoned "Heavy Industrial" and there may have been sites in the surrounding area that have, over time, contributed to the overall degradation of the quality of the region's surface soils, surface waters and groundwater.

*The concerns listed below may not be considered **recognized environmental conditions** by ASTM definition, however, they may be considered regulated under other environmental laws and ordinances and may present a potential liability to the property owner.*

- ***Solid Waste Management***

  A moderate amount of dumping activity is evident on the subject property and is mainly related to homeless activities. Some of the materials identified were regulated items that require proper management and disposal procedures. Any waste disposal should be in a permitted solid waste landfill or recycled in a manner that complies with all local, state, and federal regulations as applicable to the specific waste type.

- ***Transported Fill / Dredged Sediment***

  Sediment dredged from the adjacent storm water canals by the County has historically been deposited (transported fill) onto the subject property boundary. This transported fill could contain elevated levels of contaminants.

  VEC recommends that these sediment fill piles be tested to ensure the underlying soils of the subject property are not being impacted.

- ***Surface Waters and Area Aquifer Protection***

  Currently, the subject property is undeveloped, however, if the future land use includes commercial or industrial activities or development, the future developer and property owner should be aware of the potential for contaminants to run off-site and into nearby watercourses, including adjacent wetlands. Products of concern relating to any future development project would be earthen material (silt), paints, oils, antifreezes and other fluids from automobile or on-site machinery, or leaks from on-site stocked items.

  Any future grading or grubbing activity on-site may require a County of Maui grading/grubbing and a State Department of Health NPDES permit.

- ***Wetland Determination***

  Areas on the subject property appear to have wetland characteristics and have been determined to have such areas (though limited in extent) in wetland studies previously conducted on-site. VEC recommends that the subject of wetlands relating to this property be finalized with the Army Corps of Engineers prior to any development activities. This will likely be a requirement in the SMA permit process with the County of Maui.

- ***Special Management Area***

  According to the Maui County Planning Department, the subject site is located within the Special Management Area (SMA). These areas are subject to additional regulations, special permitting and county scrutiny during development. This Phase I Investigation will contain some of the elements of a SMA permit.

The conclusions stated above should not be construed to mean that any regulatory agency would have the same opinion as this author, nor is any implication proposed therefrom.

The results of this environmental assessment are intended for general reference purposes only and are not intended as legal advice. The advice of legal counsel should be sought in regard to individual facts, circumstances and interpretation of environmental liability.

Environmental Site Assessment

Phase 1 Investigation

1.0 INTRODUCTION

A Phase I Environmental Site Assessment (ESA) is conducted to determine if a site may be contaminated with hazardous or toxic substances or wastes resulting from current or past site activities, unauthorized dumping or disposal, or migration of contaminants from adjacent or nearby properties. Its goal is to identify ***recognized environmental conditions*** on a property that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products. These release conditions apply to structures on the property as well as the soil, groundwater, or surface water of the property. The American Society of Testing and Materials (ASTM) Standard 1527-05, Standard Practice for Environmental Site Assessments: Phase 1 Environmental Site Assessment Process, is used to "...define good commercial and customary practices for conducting an environmental site assessment of a parcel of commercial real estate".

1.1 Purpose

The study objectives are to characterize the environmental setting of the subject property, to identify any obvious activity of environmental concern that may have occurred at or near the site, and to evaluate potential migration pathways for any identified contaminants. It may also address any activities that affect future considerations for potential environmental impairment to the property.

Another function of this Phase I ESA is to conduct an *all appropriate environmental inquiry* in response to the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, its amendments, and similar state and local regulations. An ESA "all appropriate inquiry" may provide the buyer, receiver, or lender making a loan secured by the subject real property with a basis to qualify for the *innocent landowner defense* should any legal action be initiated for environmental impairment to the property.

1.2 Detailed Scope of Services

This Phase I Environmental Site Assessment (ESA) has been prepared for Mr. Ben Brown and Mr. Robert McDaniel and was conducted pursuant to Vuich Environmental Consultants, Inc.'s (VEC's) written proposal and contract accepted by Mr. Robert McDaniel on May 23, 2006. Both of the above-mentioned parties can rely on the information contained within this Phase I ESA.

There were no other additional services requested of VEC by the Client.

1.3 Significant Assumptions

The assessment of ***recognized environmental conditions*** relies on: 1) sources of actual knowledge, 2) thorough appropriate inquiry, 3) reviewing reasonably ascertainable documents and records, and 4) conducting a visual and olfactory reconnaissance. In conducting this ESA, VEC has relied on the truthfulness of its inquiry sources and the validity of reviewed records. If obvious indications or VEC actual knowledge contradicted the reported/reviewed information sources, it has been so stated in the appropriate sections of this report.

1.4 Limitations and Exceptions

The investigation performed for this report includes the components of an *all appropriate inquiry* regarding the potential for contamination to exist or have occurred at this site. This investigation is also the basis of an *all appropriate inquiry* into the presence or likely presence, release or threatened release, of hazardous substances and petroleum products at this real property. This Phase I Environmental Site Assessment was prepared according to guidelines presented in the American Society of Testing and Materials Document entitled *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* (ASTM E-1527-05).

Since no ESA can eliminate uncertainty regarding the potential for ***recognized environmental conditions*** in connection with a property, the limiting intent of this investigation is to reduce the uncertainty to an appropriate level. Minimal requirements for the Phase I ESA include a review of historical records, a review of files and databases compiled by regulatory agencies, interviews with current owners and/or occupants of the property, and a field reconnaissance of the subject site and adjacent areas.

This ESA also takes into consideration the evaluation of other substances and products that are or may be interpreted as excluded under CERCLA. Commonly, these substances are of concern in commercial real estate transactions under current custom and usage and may include, but are not limited to, Radon, Lead-in-Drinking Water, and Special Environmental Resources. Where appropriate, VEC has considered environmental concerns of other federal, state, and local regulations.

Some database resources developed for Maui County are in their infancy or are not cross-referenced in a manner as to be readily discernible. The Maui County Fire Department maintains an electronic database that dates back to January 2000. Information and records prior to 2000 exist on file, as hardcopies, at the Department of Fire and Public Safety Office.

Databases and records utilized for this investigation were limited to those that are reasonably ascertainable; that is, they had to be publicly available, obtainable from its source within reasonable time and cost constraints, and practically reviewable with regard to volume, sorting, and organization. Additionally, the services of *Environmental Data Resources, Inc.* (EDR) were utilized to compile the environmental database listings. See Appendix B.

VEC did not inspect any occupied homeless encampments located on-site for safety reasons.

1.5 Data Gaps

VEC did not encounter any significant *data gaps* during the course of this Phase I ESA Investigation that would affect the ability of the *Environmental Professional* to identify *recognized environmental conditions* pertaining to the subject property.

1.6 Special Terms and Conditions

As a standard practice, a confidential client privilege was initiated by VEC for the work performed and contents of this report. VEC shall ensure that its officers, employees, agents, and independent contractors do not disclose this report or any information contained therein to any person without the proper knowledge and written consent from the Client (or as otherwise required by law). VEC shall ensure that each of its officers, employees, agents, and independent contractors understand and obey these requirements.

The information and opinions provided herein are intended as background data and planning guidance to interested parties. This should not be construed to mean that any regulatory agency would have the same opinion as VEC, nor is any implication proposed.

VEC has performed this study in a competent and professional manner. Since there may be hidden or unknown conditions that may be missed during this inspection, VEC cannot warrant the actual site conditions described in this report.

Vuich Environmental End of Section

2.0 SITE AND REGIONAL DESCRIPTION

Refer to Figure 1, Regional Setting Map, in Appendix A, for a depiction of the general setting of the subject site in relation to topographic features. Also depicted are the projected groundwater flows, regional surface water flows, and locations of other significant physical features or structures.

2.1 Location and Legal Description

The subject site is located at 30 Hobron Avenue and is part of the Kanaha Industrial Subdivision II, near the intersection of Hobron Avenue and Hana Highway in the town of Kahului, Maui, Hawaii. The property consists of one (1) parcel of land, irregular in shape, measuring approximately 2.49 acres in total area. The site is further described on the Tax Maps of the State of Hawaii as Division 2, Zone 3, Section 7, Plat 11, Parcel 28. It is also referred to as Lot 8 of the Kanaha Industrial Subdivision II. Property access is from Hana Highway.

Surrounding land use consists of commercial and industrial activities and a wildlife sanctuary.

2.2 Site and Vicinity General Characteristics

The subject property consists of one (1) parcel of predominantly undeveloped, heavily vegetated land.

The subject property is bordered by undeveloped land to the north that is currently being used as a storage yard; Kanaha Wildlife Refuge to the east and commercial properties to the south and west. The northern and eastern property boundaries are bordered by storm water drainage canals. See Figure 2, Appendix A.

Kahului is Maui's central hub of commercial activity and is a seaside town situated near the north coast of the isthmus of Maui, between the West Maui Mountains and East Maui. See Figure 1, Appendix A. The Pacific Ocean is located approximately 2,000 feet north of the subject property and Kanaha Pond is located adjacent to the subject property to the east.

2.3 Description of Structures, Roads, Other Improvements

As noted above, the subject property is predominantly undeveloped and heavily vegetated. Historically, the land has had fill material placed over its surface from drainage canal improvements and drainage canal maintenance (dredging). This has raised the land level of the subject property, which, historically, was likely part of the Kanaha pond (wetland). No building structures were located on-site except for temporary structures from homeless activities.

An unpaved access road extends along the northern and eastern boundaries providing access to the adjacent drainage canal. The western corner of the property provides access to Lot 8 and to the adjoining properties. This area is paved. A limited amount of chain link fencing is located in this area. See Figure 2, Appendix A.

2.4 Current Use of the Property

As noted above, the subject property is predominantly undeveloped, heavily vegetated land. A significant amount of homeless activity was noted on-site. The western corner of the property provides access for the western and northern adjoining lots.

2.5 Current Uses of the Adjoining Properties

The current uses of the adjoining properties as observed by the investigator during the site reconnaissance are as follows (see also Figure 2, Site Plan, in Appendix A):

▪ *Northern Adjoining Property:*	Open storm water canal beyond which is an undeveloped lot used for storage (storage containers and limited derelict vehicles/machinery).
▪ *Eastern Adjoining Property:*	Open storm water canal beyond which is Kanaha Wildlife Sanctuary.
▪ *Southern Adjoining Property:*	Hana Highway beyond which are commercial warehouses/businesses.
▪ *Western Adjoining Property:*	Commercial businesses.

Vuich Environmental End of Section

3.0 USER PROVIDED INFORMATION

As a standard of practice, the following information was requested from the Client during the preliminary phases of this investigation:

- Title records and knowledge of environmental liens or activity and land use limitations (AULs);
- Personal, specialized knowledge or experience in regard to ***recognized environmental conditions*** concerning the property; and
- If applicable, actual knowledge of a significant, low purchase price for the property, and explanation for the lower price.

The purpose of this information is to help identify the possibility of ***recognized environmental conditions*** in connection with the property. These tasks do not require the technical expertise of an environmental professional and are generally not performed by environmental professionals performing the Phase I ESA. VEC submits a Preliminary Environmental Investigation questionnaire to the Client for this information. The completed questionnaire is attached in Appendix B.

According to information provided by the Client in the Preliminary Environmental Investigation, the Client is not aware of any environmental liens, proceedings, or investigations against the subject property as of the date of this ESA.

Vuich Environmental End of Section

4.0 RECORDS REVIEW

The purpose of a record review is to obtain and review records that will help identify ***recognized environmental conditions*** in connection with the subject property. The service of Environmental Data Resources, Inc. (EDR) was utilized to compile the database listings.

4.1 Standard Environmental Record Sources

The subject property and properties within the minimum search distances were reviewed from the following record sources (see below). Risk sites, if any, that may be located on or adjacent to the subject property, or are within close proximity to the subject site are described. Refer to Appendix B, EDR Field Check Report, for a complete listing and description of all sites located within the designated search distances, details, and government agency database release dates.

The EDR Report bases the location of the listed risk sites on longitude/latitude information provided by the respective government agency. VEC confirms the locations of risk sites within close proximity to the subject site during the site visit. When the VEC site visit contradicts the EDR Report, it has been so stated.

THE SUBJECT SITE IS NOT LISTED ON ANY OF THE FOLLOWING FEDERAL OR STATE DATABASE LISTINGS OF THE EDR REPORT.

Federal Database Listings

▼ **National Priorities List (NPL or Superfund) and Proposed NPL, EPA.** The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program.

- *The EDR database report indicates no listings within the one-mile search radius of the subject site.*

▼ **Comprehensive Environmental Response, Compensation and Liability Information System List (CERCLIS), EPA.** The CERCLIS list contains data on potentially hazardous waste sites that have been reported to EPA by states, municipalities, private companies and private persons, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLIS contains sites that are either proposed to or on the NPL and sites, which are in the screening and assessment phase for possible inclusion on the NPL.

- *The subject site is not listed.*
- *The EDR Report indicates two (2) listings within the 1/2-mile search radius of the subject site.*

It is our opinion that these sites do not have a reasonable potential to adversely impact the environmental condition of the subject property due to the distance and downgradient location relative to the subject site.

▼ **CERCLIS – No Further Remedial Action Planned (NFRAP), EPA.** NFRAP sites may be sites where, following an initial investigation, no contamination was found, contamination was removed quickly without the need for the site to be placed on the NPL, or the contamination was not serious enough to require Federal Superfund action or NPL consideration.

- *The subject site is not listed.*
- *The EDR Report indicates one (1) listing within the 1/2-mile search radius of the subject site.*

▼ **Corrective Action Report (CORRACTS), EPA.** The CORRACTS report lists hazardous waste handlers with RCRA corrective action activity.

- *The EDR Report indicates no listings within the one-mile search radius of the subject site.*

▼ **Resource Conservation and Recovery Information System (RCRIS), EPA/NTIS.** RCRIS includes selective information on sites that generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA).

- *The EDR Report indicates no listings within the ½-mile search radius of the subject site, which treat, store, and/or dispose of hazardous waste (TSD).*
- *The EDR Report indicates no listings within the ¼-mile search radius of the subject site, which generate at least 1,000 kg/month of non-acutely hazardous waste or 1.0 kg/month of acutely hazardous waste (Lg. Quan. Gen. - LQG).*
- *The EDR Report indicates seven (7) listings within the ¼-mile search radius of the subject site, which generates less than 1,000 kg/month of non-acutely hazardous waste (Sm. Quan. Gen. - SQG).*

Based on the limited quantities of waste generated at these sites and the distance and direction from the subject site, and/or on the current status of the sites, it is our opinion that these sites do not have a reasonable potential to adversely impact the environmental condition of the subject property.

▼ **Emergency Response Notification System (ERNS), EPA/NTIS.** Records and stores information on reported releases of oil and hazardous substances.

- *The subject site is not listed.*

State of Hawaii Database Listings

▼ **Sites List (SHWS), DOH.** A list of facilities, sites, or areas in which the Office of Hazard Evaluation and Emergency Response (HEER) has an interest, has investigated or may investigate under HRS 128D (includes CERCLIS sites).

- *The subject site is not listed.*
- *The EDR Report indicates seventeen (17) listings within the 1-mile search radius of the subject site.*

  It is our opinion, based on the current environmental status, distance and/or direction from the subject property, that the listed sites have no reasonable potential to adversely impact the environmental condition of the subject property.

  VEC is also aware that the Department of Health (Solid and Hazardous Waste Branch) was investigating the adjacent property (Lot 6). According to the State project officer, this site has received a "no further action" notice for the petroleum spillage and inappropriate management of petroleum products previously located on-site.

▼ **Permitted Landfills in the State of Hawaii (SWF/LF), DOH.** An inventory of solid waste disposal facilities or landfills in the State of Hawaii. These may be active or inactive facilities or open dumps that failed to meet RCRA Subtitle D Section 4004 criteria for solid waste landfills or disposal sites.

- *The EDR Report indicates no listings within the ½-mile search radius of the subject site.*

▼ **Leaking Underground Storage Tank (LUST) database, DOH.** An inventory of reported leaking underground storage tank incidents.

- *The subject site is not listed.*
- *The EDR Report indicates nineteen (19) listings within a 1/2-mile radius of the subject site.*

All listings within 1/2-mile of the subject property, except for the listed sites below, are listed by EDR with the status of "site cleanup completed", indicating cleanup and remediation activities have been completed to the satisfaction of DOH.

✓ Snow White Linen, 312-H Alamaha Street, is listed as "transferred to HEER" (1995). It is our opinion, based on the distance and/or direction from the subject property that this LUST site has or had no reasonable potential to adversely impact the environmental condition of the subject property. See EDR Report, Appendix B for additional information and location.

- ✓ J's Shell Station, 147 S. Puunene Ave., is listed as "clean up initiated: petroleum". DOH informed VEC that monitoring wells have been put in place and that remediation of soil from 3 to 7 feet has been recommended. Monitoring will continue until remediation is complete.
- ✓ Dorvin Leis Co., 202 Lalo Street, is listed as "clean up initiated: petroleum". VEC was informed by DOH that contamination levels have been reported below Tier I Action Levels and one (1) more year at that level will result in a "clean-up complete" being issued.

See EDR Report located in Appendix B for additional information and locations for the above-noted sites.

It is our opinion, based on their current environmental status, distance and/or direction from the subject property, that none of the listed sites have a reasonable potential to adversely impact the environmental condition of the subject property.

▼ **Underground Storage Tank (UST) database, DOH.** USTs are regulated under Subtitle I of the Resource Conservation and Recovery Act (RCRA) and must be registered with DOH.

- *The subject site is not listed.*
- *The EDR Report indicates twelve (12) listings within ¼-mile of the subject property.*
- It is our opinion, based on the distance and/or direction from the subject property, and on the status of the tanks, that none of the listed UST sites have or had a reasonable potential to adversely impact the environmental condition of the subject property.

4.2 Additional Environmental Record Sources

The subject property and properties within the minimum search distances were reviewed from the following record sources. Refer to Appendix B, EDR Field Check Report, for a complete listing and description of all sites located within the designated search distances, details, and database release dates.

Federal Database Listings

▼ **Superfund (CERCLA) Consent Decrees (CONSENT), EPA Regional Offices.** Major legal settlements that establish responsibility and standards for cleanup at NPL (Superfund) sites.

- *The subject site is not listed.*
- *The EDR Report indicates no listings within the one-mile search radius of the subject site.*

▼ **Records of Decisions (ROD), EPA.** ROD documents mandate a permanent remedy at an NPL (Superfund) site containing technical and health information to aid in the cleanup.

- *The subject site is not listed.*
- *The EDR Report indicates no listings within the one-mile search radius of the subject site.*

▼ **National Priority List Deletions (De-listed NPL), EPA.** A list of sites that have been deleted from the NPL where no further response is appropriate.

- *The subject site is not listed.*
- *The EDR Report indicates no listings within the one-mile search radius of the subject site.*

▼ **Facility Index System/Facility Identification Initiative Program Summary Report (FINDS), EPA.** Contains both facility information and 'pointers' to other sources that contain more detail.

- *The subject site is not listed.*

▼ **Hazardous Materials Information Reporting System (HMIRS) DOT.** A list of hazardous material spill incidents reported to DOT.

- *The subject site is not listed.*

▼ **Material Licensing Tracking System (MLTS), Nuclear Regulatory Commission (NRC).** A list of approximately 8,100 sites which possess or use radioactive materials and which are subject to NRC licensing requirements.

- *The subject site is not listed.*

▼ **Mines Master Index File (MINES), Department of Labor, Mine Safety and Health Administration.** Contains both facility information and 'pointers' to other sources that contain more detail.

- *The subject site is not listed.*
- *The EDR Report indicates no listings within the ¼-mile search radius of the subject site.*

▼ **Federal Superfund Liens (NPL Liens), EPA.** A list of properties whereby the EPA has filed liens against real property in order to recover remedial action expenditures or when the property owner receives notification of potential liability.

- *The subject site is not listed.*

▼ **PCB Activity Database System (PADS).** Identifies generators, transporters, commercial storers and/or brokers and disposers of PCBs who are required to notify EPA of such activities.

- *The subject site is not listed.*

▼ **RCRA Administrative Action Tracking System (RAATS), EPA.** A historical archived database containing records on enforcement actions issued under RCRA pertaining to major violators and includes administrative and civil actions brought by EPA. The database was discontinued on September 30, 1995.

- *The subject site is not listed.*

▼ **Toxic Chemical Release Inventory System (TRIS), EPA.** A list of facilities which release toxic chemicals to the air, water, and land in reportable quantities under SARA Title III, Section 313.

- *The subject site is not listed.*

▼ **Toxic Substances Control Act (TSCA), EPA.** Identifies manufacturers and importers of chemical substances included on the TSCA Chemical Substance Inventory list.

- *The subject site is not listed.*

▼ **Federal Insecticide, Fungicide, & Rodenticide Act (FIFRA)/TSCA Tracking System (FTTS INSP and FTTS), EPA – Office of Prevention, Pesticides and Toxic Substances.** FTTS tracks administrative cases, pesticide enforcement actions, and compliance activities related to FIFRA, TSCA, and Emergency Planning and Community Right-to-Know Act (EPCRA).

- *The subject site is not listed.*

State of Hawaii Database Listings

▼ **Release Notifications (SPILLS), DOH.** Releases of hazardous substances to the environment reported to the HEER Office. The following databases are included in the HEER Spill List:

Release Notification Report: a compilation of releases reported to HEER.

Hawaii Emergency Planning and Community Right-to-Know Act (HEPCRA): a list of facilities that have submitted Tier II and Form Rs as a reporting requirement.

- *The subject site is <u>not</u> listed.*

▼ **Registered Wells and Dry Wells, DLNR.** (See Section 5.5.6) There are no registered wells for this subject property. *(DLNR data).* Nearby wells (upgradient of subject site) are listed as unused at this time.

▼ **Air Quality Permit, DOH.** Current activities conducted on-site do not require an air quality permit.

▼ **Storm Water Discharge (NPDES) Permit, DOH.** Current activities conducted on-site do not require a NPDES permit.

County and Other Database Listings

Other local records of environmental interest that were reviewed or considered for review by VEC included:

▼ **Fire Department, County of Maui.** The Maui County Fire Department (MCFD) maintains file material that is not on a database. MCFD was contacted for an inquiry on the subject property. No incidents were reported on the subject site.

▼ **Former Manufactured Gas (Coal Gas) Sites.** EDR provides exclusive information regarding the existence and location of Coal Gas sites.

- *The EDR Report indicates <u>no</u> listings within the one-mile search radius.*

▼ **Grading/Grubbing Permit, County of Maui.** The current activities being conducted on-site do not require a grading/grubbing permit.

▼ **Hazardous Waste Disposal Documents.** VEC did not review any hazardous waste disposal documents.

▼ **Maui Electric Company.** Maintains records on county power transformers regarding PCB-containing equipment and equipment maintenance. No pad or pole-mounted electrical transformers were observed on the subject property.

▼ **Other Environmental Reports.** Environmental site assessment reports that were previously completed by VEC for the subject site or in close proximity to the subject site were reviewed. Wetland documentation for the subject site was also reviewed. See Section 8.2.

▼ **Planning & Zoning, County of Maui.** According to the Maui County Department of Planning, the subject site's zoning is "Heavy Industrial" and **is** within the boundaries of the Special Management Area (SMA).

▼ **Property Tax Office, County of Maui.** The Maui County Property Tax Office maintains records of past ownership, maps, sketches and other information as it pertains to the subject property. (See also Section 7.1). The property owner is currently listed as Kanaha Market Place, LLC.

▼ **Wastewater Discharge Permit, County of Maui.** VEC did not identify any wastewater discharge permits registered to the subject property.

4.3 Physical Setting Source(s)

The following sources were reviewed for physical setting information (refer to Section 8.0 for a complete listing):

- Atlas of Hawaii;
- Civil Defense Tsunami Evacuation Map;
- Geologic and Topographic Map (Hawaii Atlas & Gazetteer);
- Groundwater Map and Water Quality Plan for State of Hawaii;
- U.S. Department of Agriculture, Soil Conservation Service, Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, HI;

- U.S. Geological Survey, 7.5 Minute Topographic Map, Wailuku, Hawaii, 1997.

These data sources were used to provide information regarding physical characteristics of the subject site and surrounding area. This information is typically used in analysis of potential geological trends, which might impact environmental conditions of the subject site. Note that this investigation is not intended to identify geologic hazards associated with the subject property.

4.4 Historical Use Information Regarding the Property and Adjoining Properties

The following historical data sources were reviewed for this report (refer to Section 8.0 for a complete listing):

- Aerial Photographs;
- Department of Planning and Zoning, County of Maui;
- State Department of Health Offices;
- Maui County Fire Department (Fire Prevention Bureau / Hazardous Materials Division);
- Maui County Real Property Tax Records;
- Sanborn Fire Insurance Maps (no coverage);
- Personal Interviews;

Historical Aerial Photographs

A series of aerial photographs, which covered the subject property and surrounding area, were examined. See Figure 2, Site Plan, for clarification of specific locations.

Table 1.0. Historical Aerial Photograph Analysis.

Date	Aerial Photo Analysis	
12/19/50	SS:	Undeveloped land (cleared) with possible wetland influences. Possibly used for grazing purposes. Unpaved access road located along the eastern boundary.
	N:	Undeveloped vegetated land (cleared). Possibly used for grazing.
	E:	Undeveloped land (cleared). Possibly used for grazing. Kanaha Pond further to the east.
	S:	Hana Highway, beyond which is undeveloped land.
	W:	Undeveloped vegetated land (cleared). Possibly used for grazing.
	RG:	Residential and commercial development noted to the north, south and west.
6/2/64	SS:	No significant changes noted.
	N,E,W:	No significant changes noted.
	S:	Commercial building structures located across Hana Highway.
	RG:	Increased commercial/industrial activity noted to the north, including bulk petroleum tank storage facilities.
12/22/70	SS:	Almost the entire property appears to be inundated (flooded).
	N,E,W,S:	No significant changes noted.
	RG:	No significant changes noted.
1/30/77	SS:	No significant changes noted.
	N:	No significant changes noted.
	E:	The present-day storm water canal is established, otherwise no significant changes noted.
	S:	No significant changes noted.
	W:	The one (1) present-day commercial structure present.
	RG:	Rapid commercial/industrial development in all directions from the subject site except eastward (Kanaha Pond).
2/20/88	SS:	The majority of the lot appears to be heavily vegetated. No grazing activity likely.
	N:	More dense vegetation noted. Present day pond noted.
	E,S, W:	No significant changes noted.
	RG:	Commercial/industrial development continues.

5/30/97	SS: N: E,S,W: RG:	Present day conditions exist. The present-day storm water canal is established. Small structures or vehicles noted. No significant changes noted. No significant changes noted.
Notes: SS Subject Site N Northern Adjoining Property E Eastern Adjoining Property		S Southern Adjoining Property W Western Adjoining Property RG Regional Area

VEC did not observe any features on aerial photographs examined that would suggest the presence of significant vegetation stress, soil staining, or bulk storage of chemicals such as drums or tanks on the subject property.

Vuich Environmental End of Section

5.0 SITE RECONNAISSANCE

Information regarding the storm water flow, property layout, physical characteristics, and adjoining property conditions are presented in Figure 2, Site Plan, and site photographs located in Appendix A.

5.1 Methodology and Limiting Conditions

A site investigation focuses on obtaining information indicating the likelihood of identifying ***recognized environmental conditions*** in connection with the property and assessing the subject property in relation to surrounding land uses and natural surface features. It includes a physical inspection of the real property and any on-site building structures.

On June 8, 2006, VEC personnel, Mr. Jeffrey Kermode, conducted an overall site inspection of the subject site. The method used to observe the subject property included: (1) walking the entire perimeter of the subject property, and (2) inspecting the interior area of the property, where accessible (dense vegetation). The property boundaries were not clearly defined, and the VEC investigator made estimates based on the State of Hawaii Tax Map Key.

Certain physical obstructions limited the investigators from total property observations of native surface soils. The subject site's total surface soils were not observable due to the presence of an undetermined amount of fill material and dense vegetation overlying the native soils. Additionally, VEC did not inspect homeless camps that were currently occupied.

Any environmental conditions reported here are not intended to include minimal conditions that 1) generally do not present a material risk of harm to public health or the environment and 2) generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

5.2 General Site Setting

5.2.1 Current and Past Use(s) of the Property

Current Uses

According to the Maui County Tax Office, the current owner is listed as Kanaha Market Place, LLC. The majority of the land is undeveloped and heavily vegetated. Homeless activity was noted by VEC. The western corner of the property is used (easement) by the adjoining properties for access.

Information presented here represents those items visually or physically observed or identified in the interviews or records review.

Past Uses

County Tax records indicate that historically the subject property was owned by A&B Properties, Inc. and was leased to the Kahului Railroad Co. Since then the property had been owned by Thomas DeCoite and Central Pacific Bank. No significant commercial or industrial activities were noted in aerial photographs dated from the 1950's up to the present. Historically, the land was undeveloped with possible grazing use up until the 1980's. Aerial photographs since that time indicate similar conditions to today (undeveloped and heavily vegetated.

The subject property was historically part of a larger parcel, TMK (2) 3-7-011:001.

The knowledge of past uses of the property was primarily obtained from aerial photographs and interviews. Topographic maps and the Hawaii Atlas provided limited regional information.

5.2.2 Current and Past Uses(s) of the Adjoining Properties and Surrounding Area

VEC has researched current uses of adjoining properties and at its discretion, past uses of the adjoining properties and the surrounding areas. Information presented here represents those items visually or physically observed or identified in the interviews or records review. The information is described herein as items that may indicate ***recognized environmental conditions*** with adjoining properties and those conditions that may indicate a high probability of migration of hazardous substances or petroleum products to the subject property.

Adjoining Property	Period	Land/Property Use	Concerns	Comments
North of Subject Site	Past	Undeveloped land and baseyard.	This site was under investigation in 2004 by the Department of Health for oil spillage onto the ground and inappropriate petroleum waste management.	According to the Department of Health, this site has been cleaned up to their satisfaction and should not pose a concern to the subject site.
	Present	Undeveloped lot used for storage.	None.	None.
East of subject site	Past	Wetland	None	None
	Present	Drainage canal and wetland area (Kanaha Wildlife Sanctuary).	Dredged sediment from the canal is being placed on the subject site by the County.	These sediments should be tested for hazardous characteristics. See Photo #11.
South of subject site	Past	Hana Highway, undeveloped land and commercial use.	Former LUST / UST site. (Leaking underground storage tank).	The site has been remediated and the USTs are no longer in use.
	Present	Hana Highway and commercial use.	None.	None.
West of subject site	Past	Undeveloped land.	None.	None.
	Present	Commercial use.	None.	None.

The development of past uses of the adjoining properties was primarily made from interviews, VEC site reconnaissance, and aerial photographs. Topographic maps and the Hawaii Atlas provided limited regional information.

5.2.3 Topography

The regional area lies on the northwestern edge of the slopes of Haleakala Volcano (East Maui). Its physiographic type feature is described as the Kahului Isthmus.

Locally, the average elevation is approximately 4 - 6 feet above mean sea level. The topographic relief of the property is negligible.

The nearest prominent natural feature is Kanaha Pond Waterfowl Refuge, located adjacent to the eastern boundary.

5.2.4 Geology and Soils

The Haleakala Volcanics have been divided into three series. The oldest are the Honomanu Volcanic Series, which is the primitive shield composed of Pahoehoe and aa flows of tholeiite, tholeiitic olivine basalt, and oceanite. Above sea level, later lavas have almost entirely buried this volcanic series. The Kula Volcanic Series overlies the Honomanu Volcanics and is composed predominantly of hawaiite with lesser amounts of alkalic olivine basalt and ankaramite. Near the summit of Haleakala Volcano, the Kula Series is at least 750 meters thick and near the shore only 15 to 60 meters thick. After a long period of erosion, renewal activity included the flows and cones of the Hana Volcanic Series, which are composed of the same rock type as of the Kula Series, but alkalic olivine basalts and basaltic hawaiites are predominant over the more siliceous types.

According to the U.S. Department of Agriculture, the following soil series underlies the subject site:

- Jaucas sand, saline, 0 to 12% slopes, (JcC). The Jaucas soil series developed in wind and water-deposited sand from coral and seashells. It is somewhat poorly drained in depressions but excessively drained on knolls. These soils are used for pasture, wildlife habitat, and urban development.
- Fill land (Fd) – This land type consists mostly of areas filled with bagasse and slurry from sugar mills. A few areas are filled with material from dredging and from soil excavations. Generally, these materials are dumped and spread over marshes, low-lying areas along the coastal flats, coral sand or areas shallow to bedrock. The likely source of fill material for the subject site was dredged soil/sediment acquired during the construction of the adjacent drainage canals. Dredged sediment is still dumped onto the subject property by the Country of Maui during the on-going dredging (maintenance) of the canals.

Other common, surface geologic phenomena investigated in an environmental site assessment are faults, landslides, rock falls, earthquake zones and volcanic eruptions. In 1992, the USGS reevaluated the seismic hazards for the State of Hawaii, and Maui County was classified as Zone 2B. This indicates that in any given year within a 50-year period (average building life span) there is a 10% chance that 1/5 the force of gravity (ground acceleration) during an earthquake will be exceeded.

After examination of the relevant data, it has been determined by VEC that these geologic phenomena are not a factor to the subject site. However, it should be noted that this is not an investigation for geological hazards.

5.2.5 Hydrology

The subject site area has an annual average rainfall of approximately 22 inches. The average temperature range from the annual high to the annual low is 84 degrees and 65 degrees Fahrenheit, respectively. The pre-development vegetation zone within this temperature and rainfall range is characterized as Kiawe and lowland shrubs. Characteristic plants consist of Kiawe, koa haole, finger grass, and pili grass.

The subject property's relief is minimal and on-site drainage likely stays on-site. Two connected stormwater canals are located immediately adjacent to the subject site. See Figure 2, Appendix A.

The pertinent Federal Insurance Rate Map (FEMA FIRM MAP #15003 0190 D dated map on March 16, 1995) depicts the area as minimal flooding (Zone C). The property, however, has prominent wetland characteristics.

The Civil Defense Tsunami Evacuation Map indicates that the subject property **is** within the Tsunami reach-zone. The Pacific Ocean is located approximately 2000 feet north of the subject site. Kanaha Pond is located adjacent to the eastern property boundary.

5.2.6 Hydrogeology

As with all islands of the United States, Maui is regulated by the Coastal Zone Management Act of the Clean Water Act. These two designations require protective comprehensive plans for groundwater management and limit the extent of certain types of development and land use. One important management criterion is the disposal of wastewater. The Water Resources Research Center has designated the groundwater management area as the *Kahului Aquifer System* within the *Central Aquifer Sector.* The groundwater underlying the subject site is defined as follows:

Table 2.0. Aquifer Classification of the subject site.						
Aquifer	Aquifer Type: Hydrology & Geology	Status of Groundwater				
		Development Stage	Utility	Salinity (mg/l Cl⁻)	Uniqueness	Vulnerability to Contamination
Upper	Unconfined, basal aquifer occurring in nonvolcanic lithology (Sedimentary).	Currently Used	Ecologically Important	Low	Irreplaceabl e	High
Lower	Confined basal aquifer occurring in horizontally extensive lavas (Flank)	Currently Used	Ecologically Important	Low	Irreplaceabl e	Moderate

The following are descriptions of the aquifer classification codes, according to Water Quality Plan: *basal* – freshwater in contact with seawater; *high level* – freshwater not in contact with seawater; *unconfined* – water table is the upper surface of the saturated aquifer; *confined* – aquifer is bounded by impermeable or poorly permeable formations; and *confined or unconfined* – the actual condition is uncertain.

Aquifer Type Geology: flank, dike, flank/dike, perched, dike/perched, and sedimentary.

Development Stage – currently used, potential use, no potential use: Aquifers are differentiated according to those already being used (currently used), those with potential utility (potential use), and those having no potential developability.

Utility – drinking, ecologically important, neither: Identifies aquifers by use.

Salinity – fresh, low, moderate, high, and seawater: The gradation of groundwater from fresh to seawater is a feature of all basal aquifers in Hawaii. The upper limit of the standard for drinking water is 250 mg/l Chlorine (Cl^-) (fresh) and true seawater has a chloride content of 18,980 mg/l.

Uniqueness – irreplaceable and replaceable: The classes irreplaceable and replaceable are direct EPA derivatives. Virtually all potable water in the state of Hawaii should be considered irreplaceable over the long term.

Vulnerability to Contamination – high, moderate, low, none: Because of the geographical limits of resources, interconnection among groundwater sources and the relatively rapid time of groundwater travel, aquifers can be described as being either vulnerable or not vulnerable to contamination.

The estimated depth to the basal groundwater is between approximately 1 to 3 feet below the ground surface. The groundwater flow direction is expected to be in a northerly direction. A hand excavated borehole was noted on-site. The water depth was at 14 inches at the time of VEC's site inspection. See Photo 12, Appendix A.

The subject site is located makai (seaward) of the Underground Injection Control (UIC) line. The UIC line is the designated boundary that divides protected inland areas situated over drinking water sources from seaward areas located over non-potable water sources. Sites makai of the UIC line are not considered drinking water sources and permit limitations are imposed by Maui County, Clean Water Branch (CWB).

5.2.7 Potable Water Supply and Sewage Disposal System

The subject property is undeveloped. This section does not apply.

5.3 Interior and Exterior Observations

5.3.1 Hazardous/Regulated Substances and Petroleum Products in Connection with Identified Uses.

VEC did not identify any hazardous/regulated substances and/or petroleum products that are in connection with identified current uses as visually and physically observed on the property at the time of the site visit.

5.3.2 Hazardous/Regulated Substances and Petroleum Products/Containers (not in connection with identified current uses).

VEC did not identify any hazardous/regulated substances and/or petroleum products that are not in connection with identified current uses as visually and physically observed on the property at the time of the site visit.

5.3.3 Unidentified Substance Containers

VEC did not observe any unidentified substances suspected of being possible hazardous/regulated substances or petroleum products as visually and physically observed on the property at the time of the site reconnaissance.

5.3.4 Storage Tanks

No indications regarding the historic or current presence of USTs on the subject site were obtained through our review of regulatory databases, interviews, or through VEC's site reconnaissance.

5.3.5 Odors

VEC identified no suspect odors on the subject property.

5.3.6 Pools of Liquid

The investigators did not observe any pools or sumps of liquids likely to be hazardous substances or petroleum products to the extent visually and/or physically observed on the subject property at the time of the site visit or from interviews or records review.

5.3.7 Indications of PCBs

Pole or pad-mounted transformers numbered 7777 or above are considered non-PCB containing by the Maui Electric Company. No pole or pad-mounted electrical transformers were observed on the subject property.

Background Information:

Polychlorinated biphenyls (PCBs) are groups of manufactured organic chemicals that contain 209 individual chlorinated chemicals (known as congeners) and were introduced in 1929. PCBs have been used widely as coolants and lubricants in transformers, capacitors, and other electrical equipment. Products containing PCBs are old fluorescent lighting fixtures, electrical appliances containing PCB capacitors, old microscope.oil, and hydraulic fluids.

The manufacture of PCBs stopped in the United States in 1977 because of evidence that they build up in the environment and cause harmful effects. The distribution in commerce of PCB containing items was banned in 1979 (40 CFR 761.20). The EPA aggressively enforces regulations concerning PCB manufacturing, use, distribution, release and disposal under the Toxic Substance Control Act (TSCA). This federal agency extensively regulates the use, servicing, and disposal of PCBs in electrical equipment by enforcing marking, notification, inspection, and record keeping requirements.

5.4 Interior Observations

The subject property is undeveloped with no permanent building structures. This section does not apply.

5.5 Exterior Observations

5.5.1 Pits, Ponds, and Lagoons

There were no areas identified as any man-made or natural depressions that are, or would have been, likely to hold waste liquids or sludge from industrial operations or other activities.

5.5.2 Stained Soil or Pavement

No significant areas of soil staining that indicated gross soil contamination were observed at the time of VEC's site inspection.

5.5.3 Stressed Vegetation

There were no areas of stressed vegetation identified on the subject property at the time of the site visit that are, or would have been, likely caused from something other than insufficient water (or flooding).

5.5.4 Solid Waste

The solid waste items (including regulated items) that were identified by VEC on the subject site at the time of the site reconnaissance consisted of the following:

- The subject property had several former homeless encampments and a limited number of occupied encampments. These areas contained miscellaneous waste items. See Photo 8, Appendix A. Human bio-waste products from this activity were noted, which may increase on-site vermin and vector populations;
- Vehicle batteries (15 count) were identified and limited vehicle tires (see Photo 9, Appendix A);
- One (1) derelict forklift (see Photo 10, Appendix A);
- Dredged sediment stockpiles from dredging activities from the drainage canal (see Photo 11, Appendix A);

Historical on-site disposal practices are unknown. A substantial portion of the subject property consists of fill land. The composition of this fill material is unknown to VEC.

Some wastes may be considered "Special Wastes" according to the Hawaii Administrative Rules (HAR) on Solid Waste, Title 11, Chapter 58.1. Special wastes are those wastes that do not fit in the mixed municipal solid waste (MMSW) category, either by general nature or because of special handling requirements. Special waste categories include: asbestos, sludge, medical waste, used oil, batteries, agricultural wastes, tires, derelict vehicles and white goods (i.e., appliances). Locally, the County of Maui, Department of Public Works, Solid Waste Division administers the disposal of these materials. These wastes need to be disposed of in a permitted solid waste landfill such as the Maui County Central Landfill. Special wastes' management needs to be performed in a manner that complies with all local, state, and federal regulations as applicable to the specific waste type.

5.5.5 Wastewater or Storm Water – Discharge Drains, Dry Wells, Drainage Ways, and Retention Basins

VEC did not note any wastewater, discharge drains, dry wells, or retention basins located on-site. VEC identified two (2) drainage canals located along the northern and eastern property boundaries of the subject property. See Photo 4 & 5, Appendix A. The property owner should ensure that no contaminated run off enters these systems.

Future developers should be aware of the potential for contaminants to enter these adjacent canals and nearby storm water discharge drains. Products of concern relating to any future development project would be earthen material (silt), oils, antifreezes and other fluids from automobile or on-site machinery, or leaks from on-site stocked items.

5.5.6 Wells

From VEC's observations and database search, there are no production, domestic, abandoned, irrigation or monitor wells located on the subject site. Wells located near and upgradient of the subject property are listed as unused at this time

5.5.7 Septic and Cesspool Systems

The subject property is undeveloped. This section does not apply. VEC did not obtain evidence of any former septic or cesspool system located on the subject site.

5.6 Non-Scope Considerations

The concerns listed below are not normally considered relevant under CERCLA, however, they may be considered regulated under other environmental laws and ordinances and may present a potential liability to the property owner.

5.6.1 Asbestos-Containing Materials (ACM)

The subject property did not have any permanent on-site building structures that would consist of asbestos-containing materials. No suspect asbestos-containing debris was noted.

5.6.2 Lead-Based Paint

The subject property did not have any permanent on-site building structures that would consist of lead-based paint. No suspect lead-based paint debris was noted.

5.6.3 Arsenic-Containing Substances

VEC did not observe any suspect arsenic-containing building materials or waste materials at the time of the site visit.

5.6.4 Radon

VEC did not identify any man-made products on the subject property that are known or suspected to emit radioactive decay elements.

Background Information:

Radon is a colorless and odorless radioactive gas that can produce health effects such as cellular injury. Radon gas can occur in the natural environment as concentrations from certain rocks and geologic conditions have a high radon-emanation potential.

These surface rock types are not known to occur in Hawaii. It is possible that increased concentrations of Radon could occur in regions where geologic fault and volcanic rift zones may release gases from deeper earth sources. However, the State of Hawaii, Department of Health (DOH) has not addressed concerns for any significant levels of gas to occur anywhere in Hawaii. This was based on the 1992 and 1996 DOH investigations conducted in elementary schools throughout the State.

5.6.5 Lead in Drinking Water

The subject property is undeveloped. This section does not apply.

5.6.6 Ecological Resources, Endangered Species, Cultural and Historic Resources, and Wetlands

There are no known critical habitats or threatened and/or endangered species on the project site. The subject site is located within the County of Maui's Special Management Area (SMA).

The subject property does appear to contain certain wetland characteristics. The scope of this ESA does not extend to defining if the area is actually a wetland. A proper wetland survey would be required to determine if the area is a wetland. This would likely be a requirement in the SMA permit process with the County of Maui. VEC was supplied with historic wetland report information for the subject property, however, no definitive response from the Army Corp was noted.

As of April 17, 2001, the EPA and Army Corp of Engineers promulgated a final regulation to strengthen wetlands protection. The new rule clarifies those types of activities that are likely to result in a discharge of dredged material subject to the Clean Water Act, Section 404. The EPA and Army Corp of Engineers regard the use of mechanized earthmoving equipment to conduct land clearing, ditching, channelization, in-stream mining, or other earth-moving activity in waters of the United States (includes wetlands) as resulting in a discharge of dredged material, unless project-specific evidence shows that the activity results in only "incidental fallback." Surface water currently generated on the subject site will likely discharge into the northern-situated possible wetland area due to the topography of the area. If applicable, future development activities scheduled for the subject site will be regulated by the Army Corp. of Engineers and require a Section 404 permit (CWA).

The subject property is located adjacent to the Kanaha Wildlife Refuge and is separated by only the drainage canal located along the eastern property boundary. See Figure 2, Appendix A. The U.S. Fish and Wildlife Service may have concerns regarding development in this area and should be consulted prior to any development plans.

5.6.7 Indoor Air Quality

The subject property is undeveloped. This section does not apply.

5.6.8 High Voltage Transmission Lines

VEC did not identify any high voltage transmission lines on the subject site.

Vuich Environmental End of Section

6.0 INTERVIEWS

VEC conducts interviews with persons that may have specific knowledge on the subject property and any land use activities that may have operated on-site in the past or continue to currently operate on the subject property. Interviews are also an effective tool to better understand the overall historical regional and local setting of the subject site. Whenever possible, VEC attempts to interview the present and past owner(s), site manager, occupants, local government officials and other relevant contacts.

6.1 Interview with Property Owner

VEC has talked with the property owner representative, Mr. Vernon Lindsey, several times about the subject site. Mr. Lindsey has not used or developed this property since its purchase in 2004. Mr. Lindsey had no specialized knowledge of the site relating to *Recognized Environmental Conditions* on the subject site.

Mr. Lindsey did inform VEC that he was told by the Army Corps of Engineers that he could proceed with development of the property and that the lot was not considered a wetland under the Corps' jurisdiction.

6.2 Other Persons Interviewed

A list of additional persons interviewed during the course of this investigation is located in Section 8.3. None of these persons interviewed had any specialized knowledge of the site relating to *Recognized Environmental Conditions* on the subject site.

Vuich Environmental **End of Section**

7.0 FINDINGS, OPINIONS, AND CONCLUSIONS

7.1 Recognized Environmental Conditions

Recognized environmental conditions, as defined by ASTM Standard E1527-05, are the presence or likely presence of any hazardous substance or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, ground water, or surface water of the property. ***Recognized environmental conditions*** are described with regard to (1) the nature and extent of the environmental condition, (2) potential or actual environmental threat, (3) potential for transport (migration) of any environmental conditions, and (4) consideration for further investigation. The term is not intended to include *de minimis* conditions that generally do not present a material risk of harm to public health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate governmental agencies.

VEC has performed this Phase I Environmental Site Assessment in conformance with the scope and limitations of the ASTM Practice E 1527-05 for the subject property located at 30 Hobron Avenue, also listed as Lot 8 of the Kanaha Industrial Subdivision II, in the town of Kahului, Maui, defined as the subject property.

Any exceptions to or deletions from this practice are described in Section 1.4, Limitations and Exceptions, of this report.

This assessment has revealed no evidence of *recognized environmental conditions* in connection with the property.

7.1.1 Database Listings (See Section 4.0 & EDR Report, Appendix B)

Findings/Concerns:

The subject site is not listed. The listed nearby sites were reviewed for environmental concerns relative to the subject site.

Opinions and Conclusions:

It is not likely the nearby listed sites have had a significant environmental impact on the subject property, nor is there any expected impact therefrom. However, the location of the subject site is in an area zoned "Industrial" and there may have been sites in the surrounding area that have, over time, contributed to the overall degradation of the quality of the region's surface soils, surface waters and groundwater. Groundwater quality on the subject site may have been degraded over time due to the migration of pollutants from nearby sites. Any potentially degraded groundwater or subsurface soil conditions in the vicinity of the subject property are not likely related to activities that were historically or are currently being conducted on the subject property.

7.2 Other Environmental Concerns

The concerns listed below may not be considered ***recognized environmental conditions*** by ASTM definition. However, they may be considered regulated under other environmental laws and ordinances and may present a potential liability to the property owner.

7.2.1 Solid Waste Management (See Section 5.5.4)

Findings/Concerns:

A moderate amount of solid waste dumping was located on the subject site that is related to homeless activities. A limited amount of these waste items will require special management.

Opinions and Conclusions:

Any waste disposal should be in a permitted solid waste landfill or recycled in a manner that complies with all local, state, and federal regulations as applicable to the specific waste type with special attention given to regulated items (derelict forklift, vehicle batteries and tires).

Due to some heavily vegetated areas on the subject property, the entire subject site was not visibly inspected. Therefore, it is important to note that if additional clearing of the property commences and large amounts of construction debris or unidentifiable substances (containers) are discovered, proper waste identification, testing and applicable waste handling/disposal procedures are followed.

It is important to note that if additional clearing of the property commences and debris or unidentifiable substances (containers) are further discovered, proper waste identification, testing and applicable waste handling/disposal procedures are followed.

7.2.2 Transported Fill / Dredged Sediment (See Section 5.5.4)

Findings/Concerns:

Sediment dredged from the adjacent storm water canals by the County has historically been deposited (transported fill) onto the subject property boundary. The source of this sediment and storm water is from the commercial and industrial district of Kahului and may contain elevated levels of contaminants.

Opinions and Conclusions:

VEC recommends that these dredged sediment fill piles be tested to ensure the underlying soils of the subject property are not being negatively impacted.

7.2.3 Surface Waters and Area Aquifer Protection (See Section 5.5.5)

Findings/Concerns:

If future land use includes developing the land for commercial use, the developer and property owner should be aware of the potential for contaminants to run off-site and into nearby water courses (including adjacent storm drains and canals). Products of concern relating to any future development project or land-clearing activity would be earthen material (silt), paints, oils, antifreezes and other fluids from automobile or on-site machinery, or leaks from on-site stocked items.

Opinions and Conclusions:

Construction managers and developers of any future on-site development activities should consider implementing aggressive, proactive environmental policies during the development-planning phase.

Any future grading or grubbing activity on-site may require a County of Maui grading/grubbing permit and a State Department of Health NPDES permit.

7.2.4 Wetland Determination (See Section 5.6.6)

Findings/Concerns:

The subject property appears to have certain wetland characteristic. VEC was supplied with limited historic wetland reporting documentation, however, no definitive response from the Army Corps of Engineers was noted.

Opinions and Conclusions:

VEC recommends that the property owner or purchaser obtain the necessary wetland determination and approvals from the Army Corps of Engineers prior to the commencement of any future development activities.

Additionally, the subject property is located adjacent to the Kanaha Wildlife Refuge and is separated by only the drainage canal located along the eastern property boundary. The U.S. Fish and Wildlife Service may have concerns regarding development in this area and should be consulted prior to any development plans.

7.2.5 Special Management Area

Findings/Concerns:

According to the Maui County Planning Department, the subject site is located within the Special Management Area (SMA). These areas are subject to additional regulations, special permitting and county scrutiny during development. This Phase I Investigation will contain some of the elements of a SMA permit.

Opinions and Conclusions:

All elements of any required SMA permitting process should be thoroughly addressed prior to the commencement of any development activities.

The conclusions stated above should not be construed to mean that any regulatory agency would have the same opinion as this author, nor is any implication proposed therefrom.

The results of this environmental assessment are intended for general reference purposes only and are not intended as legal advice. The advice of legal counsel should be sought in regard to individual facts, circumstances and interpretation of environmental liability.

8.0 REFERENCES

8.1 Published References

1. American Standard of Testing and Materials, Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process, E1527-00, 2000.
2. "Atlas of Hawaii", 2nd Edition, Department of Geography, University of Hawaii at Hilo, 1983, University of Hawaii Press.
3. "Atlas of Hawaii", 3rd Edition, Department of Geography, University of Hawaii at Hilo, 1998, University of Hawaii Press.
4. County of Maui, Real Property Tax Division, Historical Records for TMK Number (2) 3-7-011:028.
5. Hawaii Administrative Rules, Title 11, Department of Health, Chapter 58.1, Solid Waste Management Control.
6. State of Hawaii, Department of Health, Solid and Hazardous Waste Branch, Underground Storage Tank Section, List of Leaking Underground Storage Tank Release Sites, February 2006.
7. State of Hawaii, Department of Health, Solid and Hazardous Waste Branch, Underground Storage Tank Section, List of Underground Storage Tank Facilities, February 2006.
8. State of Hawaii, Department of Health, Voluntary Response Program (VRP), List of Voluntary Response Program Sites, August 2005.
9. State of Hawaii, Department of Health, Office of Hazard Evaluation and Emergency Response, List of HEPCRA Facilities, October 2001.
10. State of Hawaii, Department of Health, Office of Hazard Evaluation and Emergency Response, List of Release Notifications, August 2005.
11. State of Hawaii, Department of Health, Office of Hazard Evaluation and Emergency Response, List of Sites List, July 2001.
12. State of Hawaii, Department of Land and Natural Resources, Registered Wells and Dry Wells, 2003.
13. State of Hawaii, Department of Land and Natural Resources, "State of Hawaii Water Quality Plan and Groundwater Map", June 1990, Revised December 1991.
14. U.S. Department of Agriculture, Soil Conservation Service, "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii", 1972.
15. U.S. Environmental Protection Agency, Office of Air and Radiation et al., Indoor Air Facts No. 4 (revised) Sick Building Syndrome, April 1991.
16. U.S. Environmental Protection Agency, Building Air Quality: A Guide for Building Owners and Facility Managers, 1991.

8.2 Map and Other References

1. Environmental Data Resources, Inc., "The EDR Field Check Report", June 15, 2006.
2. Federal Emergency Management Agency, "Flood Insurance Rate Map", Number 15003 0190D dated map of March 16, 1995.
3. R.M. Towill Corporation, Aerial Photographs, Honolulu, Hawaii.
4. Air Survey Hawaii, Aerial Photographs, Honolulu, Hawaii.
5. Sanborn Maps (no coverage)
6. U.S. Geological Survey, 7.5 Minute Topographic Map, Wailuku Quadrangle, Hawaii 1983 and 1997.
7. Vuich Environmental Consultants, Inc. Phase I ESA dated June 2004 conducted on Lot 6 & 8 of the Kanaha Industrial Subdivision II.
8. Various correspondence letters regarding the potential wetland conditions located on-site. See Appendix B.

8.3 Record of Personal Communications

Table 3.0. List of personal interviews conducted by VEC.

Date	Interviewee	Title & Organization	Address	Phone Number
6/8/06	Mr. Robert McDaniel	Buyer's agent	5618 Lower Kula Road Kula, HI 96790	(808) 283-8811
6/8/06	"Junior"	On-site squatter	Subject property	---
6/15/06	Rita	Maui County Real Property Tax Office	70 E. Kaahumanu Avenue Kahului, HI 96732	(808) 270-7297
6/15/06	Mr. Vernon Lindsey	Subject property owner	140 N. Market Street #200 Wailuku, HI 96793	(808) 283-7351
6/15/06	Mr. Alphonse Allen	Dept. of Health, Solid & Hazardous Waste Branch	919 Ala Moana Blvd, Rm 212 Honolulu, HI 96814	(808) 586-4226

Vuich Environmental End of Section

Appendix A:

Maps, Plans, and Photographs

Appendix B:

Regulatory Records Documentation
Site Specific Documentation

Appendix C:

Qualifications of Environmental Professionals

Appendix D:

Acronyms and Abbreviations

Abbreviation	Definition
AST	Aboveground Storage Tank
AHERA	(Federal) Asbestos Hazard Emergency Response Act
ASTM	American Society for Testing and Materials
BACT	Best Available Control Technology
BLM	Bureau of Land Management
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CAA	Clean Air Act: Regulates Air Quality
CAMU	Corrective Action management Unit
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act: Federal Superfund for Cleanup of Environmental Contamination (1980, 1986)
CERCLIS	CERCLA Information System (data base)
CESQG	Conditionally Exempt SQG: Hazardous Waste Generator less than 100 kg/mo.
C.F.R.	Code of Federal Regulations: National Standard Regulations
COLIWASA	Composite Liquid Waste Sampler
CRC	Chlorofluorocarbon
CMU	Concrete Masonry Unit
CWA	Clean Water Act: Regulates Water Quality (1972, 1987)
CZMA	Coastal Zone Management Act
DLNR	Department of Land and Natural Resources
DOT	Department of Transportation: Administers hazardous Waste Containers-Marking-Labeling-Placarding and Transportation Procedures.
DOH	Department Of Health (State Of Hawaii)
DRASTIC	EPA Standardized System for Evaluating Groundwater Pollution Potential Using Hydrogeologic Settings.
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency: Administers CERCLA, RCRA and SARA
FID	Flame Ionization Detector
FIFRA	Federal Insecticide, Fungicide and Rodenticide Act: Regulates Pesticides (1972, 1988)
FSP	Field Sampling Plan
FWPCA	Federal Water Pollution Control Act
HAP	Hazardous Air Pollutant
HCS	(OSHA) Hazard Communication Standard
HSWA	(Federal) Hazardous and Solid Waste Amendments of 1984
LEL	Lower Explosive Limit
LQG	Large Quantity Generators; Hazardous Waste Generator in Excess of 100 kg/mo.
LUST	Leaking Underground Storage Tank.
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MSDS	Material Safety Data Sheets: Hazard Information Required for Chemical Substances by OSHA
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants (Under CAA Regulations)
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
O&M	Operating and Maintenance
OCS	Outer Continental Shelf
OSHA	Occupational Safety and Health Act: Established Hazard Communication Program and Employee Right-to-Know Law (1970)
OVA	Organic Vapor Analyzer
PCB	Polychlorinated Biphenyls: Toxic Substance Used in Electric-Device Cooling.
PCi/l	Picocuries Per Liter
PEL	Permissible Airborne Exposure Level
PID	Photoionization Detector

POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
PWP	Project Work Plan
PRPs	Potentially Responsible Parties
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RBCA	Risk Based Corrective Action and Decision-Making at Sites with Contaminated Soil and Groundwater. (Hawaii DOH)
RCRA	Resource Conservation and Recovery Act: Federal Hazardous Waste Management Law. Regulates Waste Generation, Transportation, Treatment, Storage or Disposal Sites (1976, 1984)
RQ	Reportable Quantity
RUST	Registry of Underground Storage Tanks
SAP	Sampling & Analysis Plan
SARA	Superfund Amendments and Reauthorization Act: Amends CERCLA and includes Community Right to Know Law. Requires facilities report their chemical inventories and emissions (1986).
SDWA	Safe Drinking Water Act: Establishes maximum contaminant levels for drinking water (1974, 1986).
SHSP	Site Health & Safety Plan
SIC	Standard Industrial Classification
SIP	State implementation plan
SPCC	Spill Prevention Control and Countermeasure
SQG	Small Quantity Generator: Hazardous Waste Generator between 100-1000 kg/mo.
TCLP	Toxicity Characteristic Leaching Procedure: A toxicity test for certain substances declared hazardous by the EPA.
TMK	(Hawaii) Tax Map Key
TPH	Total Petroleum Hydrocarbons
TPQ	Threshold Planning Quantity
TSCA	Toxic Substances Control Act: Regulates PCBs in electrical devices and chromium in evaporative cooling towers, asbestos in schools. (1976)
TSD	Treatment, Storage, and Disposal
UEL	Upper Explosive Limit
UIC	Underground Injection Control
USGS	United States Geological Survey
UST	Underground Storage Tank
VOA	Volatile Organic Analyses
VOC	Volatile Organic Compound: EPA listed toxic or carcinogenic organic substances.
Minimal, Minor or Not Significant	1) An unlikely or remote event, i.e., possible, but not anticipated under current conditions and observed features. 2) Insignificant when compared to regulatory acceptance levels, guideline action levels or when compared to background and/or baseline conditions of the local environment. 3) Any potential effect or impact attributed to the subject factor may be considered as the least likely source among a number of potentially responsible factors. 4) Any potential effect may not be measurable or detected by current technology. 5) Education, experience, and background of the investigator were utilized to conclude the situation or condition as trifle.

APPENDIX C-1.

Geotechnical Engineering Exploration Report

GEOTECHNICAL ENGINEERING EXPLORATION
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

W.O. 5783-00 MARCH 16, 2007

Prepared for

MAUI MEDICAL PLAZA LLC

CLAYTON S. MIMURA
LICENSED PROFESSIONAL ENGINEER
No. 4176-C
HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION.

Clayton S. Mimura 4-30-08
SIGNATURE EXPIRATION DATE OF THE LICENSE

GEOLABS, INC.
Geotechnical Engineering and Drilling Services
2006 Kalihi Street • Honolulu, HI 96819

Hawaii • California

GEOLABS, INC.
Geotechnical Engineering and Drilling Services

March 16, 2007
W.O. 5783-00

Mr. Robert T. McDaniel III
Maui Medical Plaza LLC
5618 Lower Kula Road
Kula, HI 96790

Dear **Mr. McDaniel:**

Geolabs, Inc. is pleased to submit our report entitled "Geotechnical Engineering Exploration, Maui Medical Plaza, Kahului, Maui, Hawaii" prepared in support of the design of the project.

Our work was performed in general accordance with the scope of services outlined in our fee proposal dated September 29, 2006.

Please note the soil samples recovered during our field exploration (remaining after testing) will be stored for a period of two months from the date of this report. The samples will be discarded after that date unless arrangements are made for a longer sample storage period. Please contact our office for alternative sample storage requirements, if appropriate.

Detailed discussion and specific recommendations for design are contained in the body of this report. If there is any point that is not clear, please contact our office.

Very truly yours,

GEOLABS, INC.

Clayton S. Mimura
Clayton S. Mimura, P.E.
President

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Hawaii • California

GEOTECHNICAL ENGINEERING EXPLORATION
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII
W.O. 5783-00 MARCH 16, 2007

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GEOTECHNICAL ENGINEERING EXPLORATION
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII
W.O. 5783-00 MARCH 16, 2007

SUMMARY OF FINDINGS AND RECOMMENDATIONS

The project site is underlain by 1 to 2.5 feet of fill materials over loose and/or soft lagoonal deposits extending to depths of about 37.5 to 42.5 feet below the existing ground surface. Alluvial deposits consisting of medium dense sands, stiff silts, dense cobbles, and soft to medium hard siltstone and sandstone were encountered below the lagoonal deposits and extended to depths of about 90.5 to 92.3 feet below the existing ground surface. Below the alluvial deposits, basalt rock formation was encountered to the maximum depths explored. Groundwater was encountered at depths of about 1.6 to 3.6 feet below the existing ground surface at the time of our exploration.

Because ground settlements are anticipated when new fills (about 3 feet thick) are placed over the existing ground, we recommend implementing a settlement monitoring program to evaluate the magnitude and rates of settlement. We believe that a settlement waiting period of about 8 weeks should be incorporated into the construction schedule.

The loose/soft lagoonal deposits encountered at shallow depths would not provide the adequate foundation support if the proposed structures are supported on a shallow foundation system. Therefore, we recommend supporting the proposed medical building and parking garage structures on a deep foundation system consisting of 16.5-inch octagonal precast, prestressed concrete piles. An allowable compressive load capacity of about 75 tons per pile may be used for the 16.5-inch octagonal pile design. The piles would derive support mainly from end bearing on the dense cobble layer or the medium hard siltstone with some skin friction along the surrounding stiff alluvial deposits.

For preliminary estimating purposes, the piles would have to extend to a depth of about 75 feet below the current ground surface, which corresponds to elevations of approximately -70 to -72 feet Mean Sea Level (MSL), to achieve an allowable compressive load capacity of 75 tons. Because of the relatively short pile lengths anticipated, splicing of the precast piles should be avoided. The text of this report should be referred to for detailed discussion and specific recommendations for design.

END OF SUMMARY OF FINDINGS AND RECOMMENDATIONS

SECTION 1.0 - GENERAL

1.1 Introduction

This report summarizes our geotechnical engineering exploration performed for the proposed *Maui Medical Plaza* project located in the Kahului area on the Island of Maui, Hawaii. The project location and general vicinity are shown on the Project Location Map, Plate 1.

This report summarizes our findings and geotechnical recommendations derived from our field exploration, laboratory testing, and engineering analyses. These recommendations are intended for the design of foundations, slabs-on-grade, retaining structures, site grading, and pavements only. The findings and recommendations presented herein are subject to the limitations noted at the end of this report.

1.2 Project Considerations

The project site is located at Lot 8 of the Kanaha Industrial Subdivision in the Kahului area on the Island of Maui, Hawaii. The site is located between Kanaha Pond and Hana Highway as shown on the Site Plan, Plate 2.

We understand that the project involves the construction of a five to six-story medical building and a six to seven-story parking garage structure. The medical building is situated at the west side of the site. The medical building will consist of a Wing 1 (approximately 15,628 square feet in area) and a Wing 2 (approximately 13,666 square feet in area). The parking garage structure will be located at the east side of the site and will have a plan area of approximately 11,893 square feet. Based on the available information, the maximum column loads for the medical building and parking garage ranges between approximately 900 and 970 kips.

Based on the existing topography, we envision that site filling would be required. We anticipate fills on the order of about 3 feet may be required.

1.3 Purpose and Scope

The purpose of our exploration program was to obtain an overview of the surface and subsurface conditions to develop an idealized subsurface data set to formulate geotechnical engineering recommendations pertaining to the project design. The work was performed in general accordance with the scope of services outlined in our fee proposal dated September 29, 2006. Our scope of work included the following tasks and work efforts:

1. Mobilization and demobilization of a truck-mounted drill rig on the Island of Maui and two operators from Honolulu to the project site and back.
2. Coordination of trail clearing by our geologist to gain vehicular access to the borings locations.
3. Drilling and sampling of five borings extending to depths of about 81.5 to 102 feet below the existing ground surface for a total of 483.0 lineal feet of exploration.
4. Coordination of the field exploration and logging of the borings by our geologist.
5. Laboratory testing of selected soil samples obtained during the field exploration as an aid in classifying the materials and evaluating their engineering properties.
6. Analyses of the field and laboratory data to formulate geotechnical engineering recommendations pertaining to the design of the proposed medical plaza.
7. Preparation of this report summarizing our work and presenting our findings and recommendations.
8. Coordination of our work on the project by our project engineer.
9. Quality assurance of our work and client/design team consultation by our principal engineer.
10. Miscellaneous work efforts such as drafting, word processing, and clerical support.

Detailed descriptions of our field exploration methodology and the Logs of Borings are presented in Appendix A. Laboratory test results are presented in Appendix B.

END OF GENERAL

SECTION 2.0 - SITE CHARACTERIZATION

2.1 Regional Geology

The Island of Maui was built by two major volcanoes, the older West Maui (Tertiary Epoch) and the more recent East Maui, also known as Haleakala (Pleistocene Epoch). The Isthmus of Maui is a narrow, gently sloping plain located between these two volcanoes. The project site is located at the northern portion of this gently sloping plain.

The Isthmus of Maui was created by lava flows from Haleakala ponding on West Maui. It is comprised of alluvium washed from the slopes of West Maui and East Maui (Haleakala). The erosional processes were dominated by the detachment of soil and rock masses from the mountain walls, and the soil materials were transported downslope toward the Isthmus primarily by gravity as colluvium. Once these materials reached the stream in the central portion of a valley, alluvial processes became dominant, and the sediments were transported and deposited as alluvium.

In general, stream flows in Hawaii are intermittent and flashy, such that the stream flows transmit large volumes of water for very short duration. Because of this situation, the transport of sediments is intermittent, and the bulk of the stream's hydraulic load consists of a poorly sorted mixture of boulders, cobbles, gravel, sands, and fines. When the erosional base levels change, these sediment loads are left as deposits.

When deposits are left in-place for long periods of time, chemical processes begin to alter the materials, simultaneously causing a breakdown or weathering of the materials. Chemical processes also cause induration, or cementation, of the coarse-grained portion of the sediment into a poorly-consolidated sedimentary rock or conglomerate. Simultaneously, erosion continues in the areas above the valley floors and upstream in headwaters. This continued erosion generates materials, which are transported downslope covering the older alluvial soil deposits. Depending on the local base level and rate of transport, these newer sediments are generally transient in terms

of geologic time. In addition, their consistency and density are generally less than those of the older, partially consolidated deposits.

Underlying the alluvial soil deposits are overlapping lava flows from the West Maui and East Maui Volcanoes. The bulk of the Haleakala Shield was built during the late Pliocene and early Pleistocene Epoch by thinly bedded basaltic lava flows of the Honomanu Volcanic Series. During the Pleistocene Epoch, the characteristics of the lava changed to very hard, thickly bedded flows of andesitic composition. These lava flows have been grouped as the Kula Volcanic Series. Typically, the basalt rock formation consists of thinly to thickly bedded a'a and pahoehoe type lava flows.

2.2 Site Description

The project site is located at Lot 8 of the Kanaha Industrial Subdivision in the Kahului area on the Island of Maui, Hawaii. The site is located between Kanaha Pond and Hana Highway as shown on the Site Plan, Plate 2.

The project site is relatively level with existing ground surface elevations ranging from about +3.5 to +6.0 feet Mean Sea Level (MSL). Drainage channels were observed along the east and west sides of the site. A dirt road traverses the perimeter of the site. The site is highly vegetated with trees and shrubs. At the time of our field exploration, soft ground surface conditions were encountered at the central portion of the site.

2.3 Subsurface Conditions

Our field exploration program consisted of drilling and sampling five borings, designated as Boring Nos. 1 through 5, extending to depths of about 81.5 to 102 feet below the existing ground surface. The approximate boring locations are shown on the Site Plan, Plate 2.

The site is generally underlain by a thin layer of fills about 1 to 2.5 feet thick consisting of medium dense silty sands. Loose and soft lagoonal deposits consisting of silty sands and gravels and sandy silts underlay the fills. The lagoonal deposits extended to depths of about 37.5 to 42.5 feet below the existing ground surface. The lagoonal deposits were underlain by alluvial deposits consisting of medium dense sands and stiff silts extending to depths of about 60 to 70.5 feet below the existing ground surface. Below the alluvial sands and silts, dense cobbles and soft to medium hard siltstone and sandstone were encountered to depths of about 90.5 to 92.3 feet below the existing ground surface. The alluvial deposits were underlain by hard basalt formation extending to the maximum depths explored of about 96.5 to 102 feet below the existing ground surface.

Two generalized subsurface profiles depicting the interpreted subsurface conditions are provided on the Cross-Sections, Plates 3.1 and 3.2. The approximate surface locations of the subsurface profiles prepared for this report are shown on the Site Plan, Plate 2.

Groundwater was encountered in the drilled borings at depths varying from approximately 1.6 to 3.6 feet below the existing ground surface during our field exploration. Groundwater levels are expected to vary with seasonal precipitation, storm surge conditions, and other factors.

Detailed descriptions of the field exploration methodology and Logs of Borings are presented in Appendix A of this report. Laboratory test results of selected soil samples are presented in Appendix B.

2.4 Seismic Design Considerations

Based on the 1997 Uniform Building Code (UBC) (current code used by the County of Maui), the Island of Maui is located within Seismic Zone 2B with an effective peak ground acceleration of 0.20g. Therefore, the project site may be subjected to seismic activity, and seismic design considerations will need to be addressed for the project. The following sections provide discussions on the seismicity of the Island of Maui, the soil profile for seismic design and the potential for liquefaction.

2.4.1 Earthquakes and Seismicity

In general, earthquakes that occur throughout the world are caused by shifts in the tectonic plates. In contrast, earthquake activity in Hawaii is primarily linked to volcanic activity. Therefore, earthquake activity in Hawaii generally occurs before or

during volcanic eruptions. In addition, earthquakes may result from the underground movement of magma that comes close to the surface but does not erupt. The Island of Hawaii experiences thousands of earthquakes each year, but most of the earthquakes are so small that they can only be detected by instruments. However, some of the earthquakes are strong enough to be felt, and a few cause minor to moderate damage.

In general, earthquakes associated with volcanic activity are most common on the Island of Hawaii. Earthquakes directly associated with the movement of magma are concentrated beneath the active Kilauea and Mauna Loa Volcanoes on the Island of Hawaii. Because the majority of the earthquakes in Hawaii (over 90 percent of earthquakes) are related to volcanic activity, the risk of seismic activity and degree of ground shaking diminishes with increased distance from the Island of Hawaii. The Island of Hawaii has experienced numerous earthquakes greater than Magnitude 5 (M5+); however, earthquakes are not confined only to the Island of Hawaii.

To a lesser degree, the Island of Maui has experienced numerous earthquakes greater than M5+. Therefore, moderate to strong earthquakes have occurred in the County of Maui.

2.4.2 Site Classification

The site is generally underlain by a thin layer of fills about 1 to 2.5 feet thick consisting of medium dense silty sands. Loose and soft lagoonal deposits consisting of silty sands and gravels and sandy silts underlay the fills. The lagoonal deposits extend to depths of about 37.5 to 42.5 feet below the existing ground surface.

Based on the 1997 Uniform Building Code and average penetration resistance (N-values) of the subsurface materials encountered to a depth of about 100 feet, we believe that the project site may be classified as a "Soft Soil Profile." Therefore, we believe that the seismic design of the building structures should be designed based on a Soil Profile Type S_E in accordance with Table 16-J of the Uniform Building Code (1997).

2.4.3 Liquefaction Potential

Based on the 1997 Uniform Building Code (UBC), the project site may be subjected to seismic activity and should be evaluated for the potential for soil liquefaction. Based on the subsurface conditions encountered and a design peak ground acceleration of 0.20g, liquefaction may occur resulting in appreciable settlements to the ground surface. Therefore, the effects of potential liquefaction should be taken into consideration in the design of the proposed development.

Soil liquefaction is a condition where saturated cohesionless soils located near the ground surface undergo a substantial loss of strength due to the build-up of excess pore water pressures resulting from cyclic stress applications induced by earthquakes. In this process, when the loose saturated sand deposit is subjected to vibration (such as during an earthquake), the soil tends to densify and decrease in volume causing an increase in pore water pressure. If drainage is unable to occur rapidly enough to dissipate the build-up of pore water pressure, the effective stress (internal strength) of the soil is reduced. Under sustained vibrations, the pore water pressure build-up could equal the overburden pressure, essentially reducing the soil shear strength to zero and causing it to behave as a viscous fluid. During liquefaction, the soil acquires a mobility sufficient to permit both horizontal and vertical movements, and if not confined, will result in significant deformations.

Soils most susceptible to liquefaction are loose, uniformly graded, fine-grained sands and loose silts with little cohesion. It is generally acknowledged that liquefaction may not occur if the deposit is greater than 40 to 50 feet below the ground surface. In deeper deposits, the greater overburden pressure is generally sufficient to prevent liquefaction from occurring. The major factors affecting the liquefaction characteristics of a soil deposit are as follows:

1. Grain Size Distribution - Fine and uniform sands and silts are more susceptible to liquefaction than coarse or well-graded sands.

2. Initial Relative Density - Loose sands and silts are most susceptible to liquefaction. Liquefaction potential is inversely proportional to relative density.
3. Magnitude and Duration of Vibration - Liquefaction potential is directly proportional to the magnitude and duration of the earthquake.

In general, the subsurface information obtained from the borings indicates that the site is underlain by loose sands with varying amounts of silts between the depths of about 1.0 and 42.5 feet below the existing ground surface. The loose sands are potentially liquefiable during a seismic event of Magnitude 6.5 with an associated peak ground acceleration of 0.20g.

Based on our analyses, it appears that the loose sands below the surface fill, which extends to depths of about 37.5 to 42.5 feet below the existing ground surface, has a factor of safety of 0.8 to 1.0 against liquefaction. Therefore, it is our opinion that the project site could be subjected to appreciable ground settlements (on the order of 3 to 4 inches) in the event of liquefaction during a moderate earthquake (M6+). However, we believe that lateral spreading associated with liquefaction would not be a significant design consideration based on the relatively flat site topography.

END OF SITE CHARACTERIZATION

SECTION 3.0 - DISCUSSION AND RECOMMENDATIONS

Ground settlements are anticipated when new fills (about 3 feet thick) are placed over the existing ground to raise the site to the proposed finished elevations. Therefore, we recommend implementing a settlement monitoring program to evaluate the magnitude and rates of settlement. We believe that a settlement waiting period of about 8 weeks should be incorporated into the construction schedule.

We believe that the loose/soft lagoonal deposits encountered at shallow depths would not provide the adequate foundation support if the proposed structures are supported on a shallow foundation system. Therefore, we recommend supporting the proposed medical building and parking garage structures on a deep foundation system consisting of 16.5-inch octagonal precast, prestressed concrete piles. An allowable compressive load capacity of about 75 tons per pile may be used for the 16.5-inch octagonal pile design. The piles would derive support mainly from end bearing on the dense cobble layer or the medium hard siltstone with some skin friction along the surrounding stiff alluvial deposits.

To achieve an allowable compressive load capacity of 75 tons, the piles would have to extend to a depth of about 75 feet below the current ground surface, which corresponds to elevations of approximately -70 to -72 feet Mean Sea Level (MSL), Detailed discussion of these items and our geotechnical recommendations for project design are presented in the following sections of this report.

3.1 Ground Settlements

We anticipate that fills on the order of about 3 feet would be required at the site. Because of the loose and soft lagoonal deposits encountered at the site, ground settlements are anticipated when new fills are placed over the existing ground to raise the site to the proposed finished elevations. These settlements will affect the construction schedule and the earthwork quantity estimates for the project.

Due to the variable thickness of the lagoonal deposits and the variable thickness of the fills anticipated at the project site, some differential ground settlements should be

expected. We estimate ground settlements at the site to be on the order of 6 inches or less.

We recommend placing new fills as soon as practical to allow the anticipated ground settlements to occur prior to construction of the proposed structures planned for the project. After placement of the new fills, we recommend implementing a settlement monitoring program to evaluate the magnitude and rates of settlement.

We believe that a settlement waiting period of about 8 weeks should be incorporated into the construction schedule for the project. The settlement waiting period should commence after completion of the fill placement. It should be recognized that it is difficult to accurately predict the exact time required for the filled ground to settle, because the settlement rates will be affected by variations of the subsoil structure and the history of the subsoil deposition.

For the loose and/or soft subsoils anticipated at the project site, it is possible that the estimated settlement period could vary by as much as 50 to 100 percent from the actual settlement period. Therefore, the actual settlement rates should be monitored, and a settlement monitoring program should be established to evaluate the magnitude and rate of the estimated settlements during the settlement waiting period prior to construction of the new structures. In addition, provisions should be made for potential delays in the construction schedule if a longer settlement waiting period is required.

To monitor the actual settlement rate, we recommend that a minimum of six settlement gauges be installed. A typical settlement gauge detail is presented on Plate 4 of this report. A qualified professional surveyor should optically read the settlement gauges, and should transmit the readings in a timely manner to Geolabs for review. To establish a baseline, we recommend taking two readings (minimum 24 hours apart) for each settlement gauge prior to site filling. Subsequent settlement gauges readings should be taken on a weekly basis for the entire settlement waiting period.

3.2 Building Foundations

Due to the heavy column loads (on the order of about 900 kips) anticipated for the proposed medical building and parking garage structures, it is our opinion that the loose/soft lagoonal deposits encountered at shallow depths would not provide the adequate foundation support if the proposed structures are supported on a shallow foundation system. Therefore, we recommend supporting the proposed medical building and parking garage structures on a deep foundation system consisting of 16.5-inch octagonal precast, prestressed concrete piles.

An allowable compressive load capacity of 75 tons (150 kips) per pile may be used for the design of the pile foundations. The allowable compressive load capacity is for dead-plus-live loads and may be increased by one-third (1/3) for transient loads, such as those caused by wind or seismic forces. A factor of safety of 2.0 was used in arriving at the allowable compressive load capacity of 75 tons. To avoid reduction in the vertical compressive load capacity of the pile and to facilitate pile driving in groups, we recommend spacing the 16.5-inch octagonal piles a minimum of 3.5 feet from center-to-center.

The 16.5-inch octagonal pile would derive support mainly from end bearing on the dense cobble layer or the medium hard siltstone with some skin friction along the surrounding stiff alluvial deposits. In order to achieve an allowable compressive load capacity of up to 75 tons for the 16.5-inch octagonal concrete piles, the piles would have to extend to a depth of about 75 feet below the current ground surface, which corresponds to elevations of approximately -70 to -72 feet Mean Sea Level (MSL). Because of the relatively short pile lengths anticipated, pile splicing of the precast piles should be avoided. Due to possible variation in the length of the piles, unit prices should be obtained during bidding for add-ons, shorter piles, etc.

Seismically induced liquefaction may cause settlement of the lagoonal deposits resulting in negative skin friction forces (downdrag forces) acting on the pile shaft. Based on our foundation analyses, we estimate that the downdrag loads imposed on the vertical piles due to the potential for liquefaction of the lagoonal deposits may be on

the order of about 40 kips per pile. It should be noted that the allowable compressive load capacity of the piles (75 tons) is a net value; therefore, the allowable compressive load capacity has been reduced by the expected downdrag loads in the pile foundation analyses.

3.2.1 Predrilling

In order to facilitate the pile driving through the fills, and other potential obstructions, predrilling at the proposed pile locations will likely be required prior to pile installation and should be included in the contract documents. We anticipate that the predrilling depth should extend down to about 5 feet below the ground surface.

Geolabs should verify and/or modify the required predrilling depths during the test pile program depending on the subsurface conditions encountered and pile driving equipment used. We wish to emphasize that the diameter of the predrilled holes should be limited to approximately 22 inches or less for the 16.5-inch octagonal piles to provide the driven piles with sufficient soil contact for lateral load resistance. If an over-sized predrilled hole is encountered during construction, the annular space between the piles and predrilled holes should be backfilled with pea gravel or grouted with tremie concrete to provide the recommended lateral load capacity.

3.2.2 Uplift Load Resistance

Uplift loads may be resisted by a combination of the dead weight of the driven pile and shear along the pile surface and the adjacent soils. The recommended uplift load capacity (ultimate capacity) for the 16.5-inch octagonal piles are 70 kips per pile (assuming the piles are cast in one 75-foot long section). The uplift load capacity provided above includes the weight of the pile. The uplift load capacity of the piles provided is intended for transient load applications. Therefore, the uplift load capacities should not be further increased for transient load applications. For sustained uplift loads, we recommend reducing the uplift load capacities provided above by 50 percent to resist sustained uplift loads. The project structural engineer should check the capacity of the pile member in tension.

3.2.3 Lateral Load Resistance

Lateral loads imposed on the building structures may be resisted by a combination of the lateral load capacity of the driven piles and by the passive earth pressure acting against the near-vertical faces of the foundation caps and/or grade beams. Passive earth pressure against the near-vertical faces of the foundation caps and/or grade beams may be estimated using an equivalent fluid pressure of 350 and 150 pcf for above and below groundwater conditions, respectively.

Lateral load resistance of driven piles is a function of the stiffness of the surrounding soil, the stiffness of the pile, allowable deflection at the top of the pile, and the induced moment in the pile. The lateral load analyses were performed using the program LPILE-plus for Windows, which is a microcomputer adaptation of a finite difference, laterally loaded pile program originally developed at the University of Texas at Austin. The program solves for deflection and bending moment along a pile under lateral loads as a function of depth. The analysis was carried out with the use of non-linear "p-y" curves to represent soil moduli. The lateral deflection was then computed using the appropriate soil moduli at various depths.

The lateral load capacities, the maximum induced moments, and the depths at which the maximum moments occur for the piles, where the tops of piles are either free or fixed against rotation, are presented in the following table. The values provided in the table are based on an associated horizontal deflection of 0.5 inches assumed at the top of the 16.5-inch octagonal precast, prestressed concrete piles.

LATERAL LOAD CAPACITY AND MAXIMUM INDUCED MOMENT FOR 16.5-INCH OCTAGONAL PILES

Pile Condition	Lateral Load (kips)	Lateral Deflection (inches)	Maximum Induced Moment (kip-feet)	Depth to Maximum Moment (feet)
Single Pile Free-Head	7.0	0.5	29.6	4.5
Pile Group Free-Head	5.0	0.5	20.9	6.0

LATERAL LOAD CAPACITY AND MAXIMUM INDUCED MOMENT FOR 16.5-INCH OCTAGONAL PILES

Pile Condition	Lateral Load (kips)	Lateral Deflection (inches)	Maximum Induced Moment (kip-feet)	Depth to Maximum Moment (feet)
Single Pile Fixed-Head	18.0	0.5	-68.3	0
Pile Group Fixed-Head	11.0	0.5	-46.8	0

3.2.4 Foundation Settlements

Settlements of the driven pile foundations will result primarily from elastic compression of the pile member and subgrade response. We estimate the total settlement of the pile-supported foundations to be less than 0.75 inches with differential settlements between columns supported on piles not exceeding about one half of the estimated total settlement. We believe that these settlements are essentially elastic and should occur as the loads are applied.

3.2.5 Pile Hammer Selection

The piles should be driven with a hammer capable of delivering energies in the range of about 25,000 to 35,000 foot-pounds in the field. Significantly higher energy hammers (hammers with energies greater than 50,000 foot-pounds) are not recommended for this project. The hammer should be equipped with an energy level control such that driving within the soft and/or loose soils may be controlled at a lower energy to reduce the potential for tensile stress development, which could damage or cause cracking of the piles.

Selection of driving equipment to be used for this project should take into consideration the "matching" of the pile hammer with the weight of the piles to be driven. This will result in the pile hammer efficiently delivering the required energy to the top of the pile and also reducing the potential for damage to the piles. Geolabs should review the pile driving equipment proposed to evaluate whether the equipment is capable of installing the piles to the recommended capacity. The contractor should forward pile driving equipment data forms to Geolabs prior to construction for evaluation. Geolabs should be accorded the opportunity to review the submittal and to assess the driveability of the piles with the use of the selected hammer.

3.2.6 Pile Driving Criteria

For preliminary design purposes, pile driving may be terminated when aggregated blow counts reach the following termination criteria. These preliminary driving criteria should be confirmed after selecting the pile driving equipment and during test pile driving to accommodate variations in the subsurface conditions in the field.

PRELIMINARY PILE DRIVING CRITERIA

Pile Type	**Allowable Pile Capacity** (tons)	**Penetration Resistance** (Blows per foot)	**Penetration Resistance** (Blows per inch)
16.5-Inch Octagonal	75	60	6 (last 6 inches)

In general, each pile should be driven continuously without interruption. A pile may be rejected or its design capacity may be reduced when the driving resistance is interrupted for more than 4 hours and the pile cannot be driven to the required depth and/or meet the pile driving criteria. During soft driving, i.e., when the pile tip is within soft and/or loose soils, the hammer stroke (or energy) should be carefully controlled such that significant tensile stresses do not develop within the pile.

Because variations in soil strength characteristics are likely to exist in the bearing soils, the supporting capacity of each pile must be confirmed in the field by our office representative during pile driving. It should be noted that the pile design was developed from our pile analysis using the field exploration data. Therefore, a test pile program should be carried out to confirm our preliminary pile design and to establish pile driving criteria. It should be noted that the production pile driving criteria may be revised based on the results of the test pile program.

3.2.7 Test Pile Program

We recommend undertaking a test pile program, which includes at least one static load test, to fulfill the following objectives.

1. To examine the driveability of the piles with the use of the selected hammer.
2. To estimate the production pile lengths.
3. To assess the test pile driving criteria, which may be modified for use as the production pile driving criteria.
4. To confirm the recommended predrilling depths at the pile locations.

To achieve these objectives, we recommend that the test pile program consist of a minimum of 10 percent of the total number of piles for the project. The test piles may be incorporated into the actual foundation system upon the evaluation of the load test results. When the final foundation plans are available, Geolabs should be consulted for selection of the test pile locations.

The test piles should be cast about 10 feet longer than the pile lengths recommended in the "Building Foundations" section of this report to suit the test pile program for the project. In addition, the test pile program should provide flexibility to allow for addition or relocation of the test piles, as may be deemed necessary by our office, to suit the conditions encountered during the test pile driving. Re-striking of the test piles should be required as part of the test pile program.

We recommend performing one pile load test. The pile load test should be performed in general accordance with Quick Load Test Method of ASTM D 1143, loading the test pile to at least 200 percent of the design load. In addition, the static load test should be conducted no earlier than 7 days after the test pile has been driven to allow some set up of the soils surrounding the test pile.

It should be noted that the project site is underlain by complex subsurface conditions. Therefore, we recommend that a representative from Geolabs be present during the pile driving operations to observe the actual driving behavior and to further evaluate the field performance. It should be noted that the pile design and preliminary pile driving criteria provided in this report were developed from our pile analyses using the field exploration data. Therefore, it is necessary for Geolabs to observe the pile driving operations to confirm our design assumptions, and should be designated a "Special Inspection" item in accordance with Section 1701 of the Uniform Building Code (1997).

3.3 Slabs-On-Grade

We anticipate that the ground floor slabs for the new structures will consist of concrete slabs-on-grade. Based on the existing topography and the anticipated finished floor elevations, we envision that the slabs-on-grade for the new structures will be supported on new compacted fills placed to raise the existing ground surface to the finished subgrades.

As indicated previously, the project site could be subjected to appreciable ground settlements in the event of liquefaction caused by a moderate seismic event (M6+). Seismically induced ground settlements on the order of about 3 to 6 inches may be anticipated, and the building slabs-on-grade may sustain some damage. Therefore, there is a potential for damage and distress to the slabs-on-grade (not structurally supported). However, we believe that the potential for damage may be significantly reduced by increasing the building slab thickness and by incorporating steel reinforcement into the concrete slab.

As an alternative to slabs-on-grade, consideration may be given to structurally supporting the ground floor slab on the deep foundation system to reduce the potential for damage to the building slab in the event of seismically induced ground settlements.

New fills needed to raise the project site to the finished subgrades will induce ground settlements as a result of consolidation of the underlying highly compressible lagoonal deposits. Therefore, we recommend placing the new fills as soon as practical to allow the anticipated ground settlements to occur prior to slab-on-grade construction. In addition, a settlement monitoring program (discussed in the "Ground Settlements" section of this report) should be implemented as part of the project.

For the interior building slabs (not subjected to vehicular traffic), we recommend providing a minimum 4-inch thick layer of cushion fill consisting of open-graded gravel (ASTM C 33, No. 67 gradation) below the slabs. The open-graded gravel cushion fill would serve as a capillary moisture break and would provide for uniform support of the slabs. To reduce the potential for appreciable future moisture infiltration through the slab and subsequent damage to floor coverings, an impervious moisture barrier is recommended on top of the open-graded gravel cushion layer. It is also recommended the interior wall incorporate some flexibility to accommodate a small amount of possible ground movements.

Where the slabs-on-grade will be subjected to vehicular traffic, such as the ground floor level of the parking structure, we recommend providing a 6-inch layer of aggregate subbase below the slabs in lieu of the 4-inch thick gravel cushion layer. The moisture barrier may be omitted for these slabs. The aggregate subbase should consist of crushed basaltic aggregates compacted to a minimum of 95 percent relative compaction. For the design of structural slabs supported on 6 inches of aggregate subbase, a modulus of subgrade reaction of about 200 pounds per square inch per inch of deflection (pci) may be used for the slab resting on the compacted aggregate subbase. Where slabs are intended to function as rigid pavements for trucks, a minimum slab thickness of 6 inches may be used for preliminary design purposes. In addition, provisions should be made for proper load transfer across the slab joints that will be subjected to vehicular traffic.

The thickened edges of slabs adjacent to unpaved areas should be embedded at least 12 inches below the lowest adjacent grade. It should be emphasized that the areas adjacent to the slabs should be backfilled tightly against the slab edges with relatively impervious soils. These areas should also be graded to divert water away from the slabs and to reduce the potential for water ponding around the slabs.

3.4 Retaining Structures

We envision that retaining structures will be required for the proposed project. Parameters for design of foundations for retaining structures that are structurally connected to (or abutting) the proposed building structures should be designed in accordance with the "Building Foundations" section of this report. Design of foundations for the other walls (not structurally connected to or abutting the building structures) may be designed based on the parameters presented in the following "Retaining Structure Foundations" subsection of this report.

3.4.1 Retaining Structure Foundations

Based on the medium dense surface fill soils that were generally encountered at the project site, we believe that shallow continuous strip footings may be used for support of low retaining walls that are planned. An allowable bearing pressure of up to 2,000 pounds per square foot (psf) may be used for the design of shallow foundations bearing on the re-compacted surface fill soils. This bearing value is for dead-plus-live loads and may be increased by one-third (1/3) for transient loads, such as those caused by wind or seismic forces.

Generally, wall footings should have a minimum width of 18 inches. In addition, wall footings on relatively flat areas should be embedded a minimum depth of 24 inches below the lowest adjacent finished grade. The embedment of the shallow footings should be limited to a maximum depth of 30 inches below the lowest adjacent grade. The bottom of the footing excavations should be re-compacted to a minimum of 90 percent relative compaction to provide a relatively firm and smooth bearing surface prior to the placement of reinforcing steel or concrete.

Soft and/or loose materials encountered at the bottom of the footing excavations should be over-excavated to expose the underlying firm and/or dense materials. The over-excavation may be backfilled with on-site soils compacted to a minimum of 90 percent relative compaction.

Lateral loads acting on the retaining structure may be resisted by friction developed between the bottom of the foundation and the bearing soil and by passive earth pressure acting against the near-vertical faces of the foundation system. A coefficient of friction of 0.35 may be used for footings bearing on the compacted fill soils. Resistance due to passive earth pressure may be estimated using an

equivalent fluid pressure of 350 and 150 pcf for above and below groundwater conditions, respectively. This assumes that the soils around the footings are well compacted. Unless covered by pavements or slabs, the passive resistance in the upper 12 inches of soil should be neglected.

3.4.2 Static Lateral Earth Pressures

Retaining structures, such as the elevator pits and/or other retaining walls, should be designed to resist the lateral earth pressures due to the adjacent soils and surcharge effects. The recommended lateral earth pressures for design of retaining structures, expressed in equivalent fluid pressures of pounds per square foot per foot of depth (pcf), are presented below.

LATERAL EARTH PRESSURES FOR DESIGN OF RETAINING STRUCTURES

Level Backfill Condition	Water Condition	Active (pcf)	At-Rest (pcf)
Above Groundwater	Without Hydrostatic Pressure	37	57
Below Groundwater	With Hydrostatic Pressure	82	92
	Without Hydrostatic Pressure	19	30

The values provided above assume that the on-site soils or non-expansive, select granular fill materials will be used to backfill behind the walls. It is assumed that the backfill behind retaining structures will be compacted to between 90 and 95 percent relative compaction. Over-compaction of the retaining structure backfill should be avoided.

In general, an active condition may be used for gravity walls and walls that are free to deflect by as much as 0.5 percent of the wall height. If the tops of the walls are not free to deflect beyond this degree, or are restrained, the walls should be designed for the at-rest condition. The lateral earth pressures presented for the above groundwater conditions do not include hydrostatic pressures that might be caused by groundwater trapped behind the walls.

Surcharge stresses due to areal surcharges, line loads, and point loads within a horizontal distance equal to the depth of the wall should be considered in the design. For uniform surcharge stresses imposed on the loaded side of the wall, a rectangular distribution with uniform pressure equal to 28 percent of the vertical surcharge pressure acting over the entire height of the wall, which is free to deflect (cantilever), may be used in design. For walls that are restrained, a rectangular distribution equal to 44 percent of the vertical surcharge pressure acting over the entire height of the wall may be used for design. Additional analyses during design may be needed to evaluate the surcharge effects of point loads and line loads.

3.4.3 Drainage

Retaining structures (above the groundwater) should be well drained to reduce the potential for build-up of hydrostatic pressures. A typical drainage system for site retaining walls would consist of 1 cubic foot of permeable material, such as open graded gravel (ASTM C 33, No. 67 gradation), wrapped with non-woven filter fabric placed at each of the weephole locations. The weepholes should be spaced no more than 6 feet apart.

The backfill from the bottom of the wall to the bottom of the weephole should consist of relatively impervious materials to reduce the potential for significant water infiltration into the subsurface. In addition, the upper 12 inches of the retaining wall backfill should consist of relatively impervious materials to reduce the potential for significant water infiltration behind the retaining structure unless covered by concrete slabs at the surface.

3.5 Site Grading

Based on the existing topography, we envision that fills on the order of about 3 feet would be required at the site. Items of grading that are addressed in the following subsections include the following:

- Site Preparation
- Fill and Backfill Materials
- Fill Placement and Compaction Requirements
- Cut and Fill Slopes

It is important that our office representative monitor site grading operations to observe whether undesirable materials are encountered during the site preparation operations, and to confirm whether the exposed soil/rock conditions are similar to those encountered in our field exploration.

3.5.1 Site Preparation

At the on-set of earthwork, areas within the contract grading limits should be cleared and grubbed thoroughly. Vegetation, debris, deleterious, and other unsuitable materials should be removed and disposed properly off-site to reduce the potential for contamination of the excavated materials.

It should be noted that soft areas were encountered during our field exploration. If soft and yielding areas are encountered during clearing and grubbing below areas designated to receive fill, these areas should be over-excavated a minimum of 24 inches below the existing ground surface. The resulting over-excavation should be backfilled with No. 2 rock (ASTM C 33, No. 4 gradation) wrapped in a non-woven filter fabric, such as Mirafi 180N or equivalent. The excavated soft soils should be properly disposed off-site. Contract documents should include additive and deductive unit prices for over-excavation and engineered fill placement to account for variations in the over-excavation quantities.

After clearing and grubbing, the areas to receive fills and the finished subgrades in cut areas should be scarified to a depth of about 8 inches, moisture-conditioned to at least 2 percent above the optimum moisture, and compacted to no less than 90 percent relative compaction. The compaction requirement should be increased to no less than 95 percent relative compaction in areas where vehicular traffic is anticipated. Relative compaction refers to the in-place dry density of soil expressed as a percentage of the maximum dry density of the same soil established in accordance with ASTM D 1557 test procedures. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density.

Saturation and subsequent yielding of the exposed subgrade due to inclement weather and poor drainage may require over-excavation of the soft areas and replacement with well-compacted fill.

3.5.2 Fill and Backfill Materials

We envision that imported fill materials will be required for the project. Imported general fill materials needed to fill the site may consist of materials with a low to moderate expansion potential. Imported general fill materials should consist of soil materials with a maximum particle size of 3 inches or less with sufficient fines (between 10 and 60 percent particles passing the No. 200 sieve) to prevent the occurrence of voids in the compacted mass. In addition, general fill materials should have a CBR value of 12 or greater and a swell of 1 percent or less when tested in accordance with ASTM D 1883. It should be noted that the general fill requirements presented herein are intended as guidelines only and may be modified based on our additional laboratory testing and field observations on the available fill materials.

The aggregate base and subbase course materials should consist of crushed basaltic aggregate and should conform to the State of Hawaii, Standard Specifications for Road and Bridge Construction (2005). Geolabs should test the imported fill materials for conformance with these recommendations prior to delivery to the project site for the intended use.

3.5.3 Fill Placement and Compaction Requirements

Fills and backfills should be moisture-conditioned to at least 2 percent above the optimum moisture content, placed in level lifts not exceeding 8 inches in loose thickness, and compacted to not less than 90 percent relative compaction. The requirement should be increased to 95 percent relative compaction for the upper 2 feet of fills placed in areas subjected to vehicular traffic. Relative compaction refers to the in-place dry density of the soil expressed as a percentage of

the maximum dry density of the same soil established in accordance with ASTM D 1557 test procedures. Optimum moisture is the water content (percentage by dry weight) corresponding to the maximum dry density. Compaction should be accomplished by sheepsfoot rollers, vibratory rollers, multiple-wheel pneumatic-tired rollers, or other types of acceptable compaction equipment. Water tamping, jetting or ponding should not be allowed to compact the fill material for this project.

3.5.4 Cut and Fill Slopes

Cuts and fill slopes should be designed with a slope inclination of two horizontal to one vertical (2H:1V) or flatter. Fills placed on slopes steeper than 5H:1V should be keyed and benched into the existing slope to provide stability of the new fill against sliding. The filling operations should start at the lowest point and continue up in level horizontal compacted layers in accordance with the above fill placement recommendations. Fill slopes should be constructed by overfilling and then cutting back to the design slope ratio to obtain a well-compacted slope face.

3.6 Excavation

In order to install the utility lines and other below-grade structures, we anticipate that excavations below the existing ground surface will be required for the project construction. We envision that temporary shoring of the excavations will be required at the project site.

In general, the contractor should determine the method and equipment to be used for making the excavations should be determined by the contractor, subject to practical limits and safety considerations. Based on the field exploration, the surface fill materials and underlying soft and/or loose lagoonal deposits encountered in the borings may be excavated with conventional earthmoving equipment.

In general, we believe that interlocking steel sheet piling may be used for temporary shoring purposes, especially where dewatering of the excavations will be necessary. However, it should be noted that use of a vibratory hammer to install the interlocking steel sheet piles should be done with care to reduce the potential for inducing a liquefaction condition in the underlying lagoonal deposits, which would cause some settlements of the ground adjacent to the sheet pile shoring.

We also recommend that the contractor develop and implement a monitoring program to detect ground movement and/or subsidence adjacent to the excavations, which may result in damage to nearby structures and pavements. It should be noted that minor settlements of the adjacent ground may occur during and after installation of the interlocking steel sheet piles. Therefore, we recommend that the contractor retain a qualified geotechnical engineer to design and evaluate the shoring system used.

3.7 Dewatering

Based on our field explorations, groundwater was encountered at depths of about 1.6 to 3.6 feet below the existing ground surface. Due to the relatively shallow groundwater levels encountered, we anticipate that the elevator pits and some of the underground utility lines to be installed may extend below the groundwater table. Therefore, dewatering of some of the excavations may be necessary for the utility line installations and/or the pile caps.

In general, the dewatering operation should be conducted in such a manner that dewatering will not cause areal ground subsidence, which may cause potential damage to nearby existing structures. Therefore, consideration should be given to a dewatering system that includes a cut-off wall to reduce the volume of water to be removed within the excavation and to reduce the areal extent of groundwater drawdown outside of the excavation.

Because the excavation dewatering may involve discharge of groundwater from the dewatering operation into adjacent drainage systems, a National Pollutant Discharge Elimination System (NPDES) permit may be necessary. The contractor should consult their independent consultant or the State of Hawaii, Department of Health for the latest regulations and information pertaining to the NPDES permit application.

3.7.1 Subsurface Soil Permeability

Based on our borings, the near-surface fills were underlain by lagoonal deposits consisting of loose silty sands and soft sandy silts. Therefore, the actual subsurface soil permeability may range broadly and also vary locally in terms of orders of magnitude. The permeability of the subsoils at the site may be considered moderately permeable based on the materials encountered. Therefore, the contractor should pay special attention to the site-specific dewatering plan for the proposed excavations. It should be noted that in-situ permeability tests were not conducted for this project.

3.7.2 Dewatering Method

The contractor is responsible for dewatering. The selection of equipment and methods of dewatering should be left up to the contractor, and he/she should be aware that modifications to the dewatering system may be required during construction depending on the conditions encountered. The dewatering method selected should have minimal impact on the groundwater level surrounding the proposed excavation. As previously indicated, the underlying lagoonal deposit may be moderately permeable and are capable of transmitting moderate quantities of water.

It is our opinion that the definition of "Dewatering" in the contract documents should be written to include all works or systems required to lower the natural groundwater table and/or to exclude the water from the excavations to allow construction of the proposed structures under safe and dry conditions. These works or systems may include, but are not limited to, grouting, cut-off walls, tremie concrete plugs or any combination of the above and/or other possible methods.

It should be noted that the subsurface conditions within the excavation depths at the site consist of soft and/or loose lagoonal deposits, which are considered to be moderately permeable soils. The dewatering operation should be conducted in such a manner that the dewatering will not cause areal ground subsidence, which may cause potential damage to existing structures and utilities. Therefore, consideration should be given to a dewatering system that includes a cut-off wall.

3.7.3 Dewatering Considerations

We suggest that the following three basic criteria be considered in selecting a suitable method of dewatering.

a. The dewatering method should result in the least disturbance or damage to existing structures, roads, and environment.

b. The dewatering method should maintain stability of, and provide safe and dry working conditions in, the excavation.

c. The dewatering method should be sufficiently flexible to allow modifications to accommodate various ground conditions.

3.7.4 Dewatering Precaution and Monitoring

The contractor must carefully evaluate the potential impact of the dewatering system selected on depressing the natural groundwater table prior to dewatering. It is recommended that the contractor retain a qualified geotechnical engineer to design and evaluate the dewatering system used.

The contractor should be soley responsible for the impact and safety of the dewatering operations. His/her qualified representative, who should be required to be continuously present on-site during dewatering activities, will have the best opportunity to promptly observe the effects of dewatering during construction and to implement, as soon as possible, necessary precautionary or remedial measures including, but not limited to, slowing down or stopping the dewatering operations.

Where encountered at the bottom of excavations, permeable granular soils may be susceptible to piping and "quick" conditions. The dewatering operations should be carried-out without creating a "quick" condition or softening at the excavation bottoms. Therefore, the project dewatering operations should be performed without pumping out soil fines (pumping clear water only) and should be coordinated with shoring installation such that the excavation stability is not adversely affected.

Excessive pumping, which removes soil fines, may result in a "blowing" or heaving of the excavation bottom or sides.

Special caution should also be taken to avoid dewatering utility trenches connected to excavations. If this occurs, the granular bedding and/or backfill in the utility trenches could act as subdrains and cause significant areal groundwater drawdown resulting in settlements and potential damage to utility lines and/or other existing adjacent structures.

3.8 Pavements

In general, we anticipate that the vehicle loading for the project will consist primarily of passenger vehicles and light pick-up trucks with occasional heavy trucks. We have made our preliminary pavement design assuming the pavement subgrade soil will consist of general fill materials as described in "Fill and Backfill Materials" subsection of this report. Based on the above assumptions, we recommend using the following pavement sections for preliminary design purposes:

Flexible Pavements

2.5-Inch Asphaltic Concrete
6.0-Inch Aggregate Base Course (95 Percent Relative Compaction)
8.5-Inch Total Pavement Thickness on Moist Compacted Subgrade

Rigid Pavement Section

6.0-Inch Portland Cement Concrete
6.0-Inch Aggregate Subbase Course (95 Percent Relative Compaction)
12.0-Inch Total Pavement Thickness on Moist Compacted Subgrade

In general, the pavement subgrades should be scarified to a depth of about 8 inches, moisture-conditioned to above the optimum moisture, and compacted to a minimum of 95 percent relative compaction. The aggregate base and subbase course materials should consist of crushed basaltic aggregate compacted to a minimum of 95 percent relative compaction. CBR and field density tests should be performed on the actual subgrade soils encountered during construction to evaluate the adequacy of the above pavement sections.

In addition, paved areas should be sloped, and drainage gradients should be maintained to carry the surface water off the site. Surface water ponding should not be allowed on the site during or after construction. Where concrete curbs are used to isolate landscaping in or adjacent to the pavement areas, we recommend extending the curbs a minimum of 2 inches into the soils below the aggregate base and subbase course layers to reduce the potential for migration of excessive landscape water into the pavement section. Alternatively, a subdrain system could be constructed to collect the excess water from landscaping irrigation. For long-term performance, we recommend constructing a subdrain system adjacent to the paved/landscaped areas.

3.9 Underground Utilities

We envision that some new utility lines and connections will be installed for the proposed project. In general, granular bedding consisting of 6 inches of open-graded gravel (ASTM C 33, No. 67 gradation) is recommended below the pipes for uniform support. Where soft and/or loose soils are encountered at or near the invert of the pipes, a stabilization layer consisting of additional 18 to 24 inches of open-graded gravel wrapped in a non-woven filter fabric (Mirafi 180N or equivalent) should be provided below the bedding layer for uniform support.

Free-draining granular materials, such as open-graded gravel (ASTM C 33, No. 67 gradation), should also be used for the initial trench backfill up to about 12 inches above the pipes or about 12 inches above the groundwater level to provide adequate support around the pipes. It is critical that the free-draining materials be used around the pipes to reduce the potential for formation of voids below the haunches of pipes and to provide adequate support around the sides of the pipes. Improper trench backfill around the pipe could result in backfill settlement and pipe damage.

The upper portion of the trench backfill from the level 12 inches above the pipes or groundwater level to the top of the subgrade may consist of the excavated on-site soils, provided that they are free of deleterious materials and over-sized materials (greater than 6 inches in maximum particle size). Due to the relatively shallow groundwater table, the excavated on-site soils may require aeration to reduce the

moisture content of the soils prior to being re-used as backfill materials. The backfill should be moisture-conditioned to above the optimum moisture, placed in maximum 8-inch level loose lifts, and mechanically compacted to a minimum of 90 percent relative compaction to reduce the potential for appreciable future ground subsidence. Where trenches will be located below areas subjected to vehicular traffic, the upper 3 feet of the trench backfill below the pavement grade should be compacted to a minimum of 95 percent relative compaction.

3.10 Drainage

The finished grades outside the building structures should be sloped to shed water away from the foundations and to reduce the potential for ponding. We recommend installing gutter systems around the building structures and diverting discharge away from the foundation areas. Excessive landscape watering near the foundations and slabs should also be avoided. Planters next to foundations should be avoided or have concrete bottoms and drains to reduce the potential for excessive water infiltration into the subsurface.

These drainage requirements are essential for the proper performance of the above foundation recommendations since ponded water could cause subsurface soil saturation and subsequent heaving or loss of strength. In addition, the foundation excavations should be properly backfilled against the walls or slab edges immediately after setting of the concrete to reduce the potential for significant water infiltration into the subsurface.

In addition, drainage swales should be provided as soon as possible and should be maintained to drain surface water runoff away from the foundations and slabs.

3.11 Design Review

Preliminary and final drawings and specifications for the project should be forwarded to Geolabs for review and written comments prior to bid advertisement. This review is necessary to evaluate conformance of the plans and specifications with the intent of the geotechnical engineering recommendations provided herein. If this review is not made, Geolabs cannot be responsible for misinterpretation of our recommendations.

3.12 Post-Design Services/Services During Construction

It is highly recommended that Geolabs be retained to provide geotechnical engineering support and continued services during construction for the project. The critical items of construction monitoring that require "Special Inspection" for this project include the following:

- Review of driven pile foundation installation submittals
- Observation of the test pile program
- Observation of the pile load test
- Observation of the production pile installation
- Observation of the subgrade soil preparation
- Observation of fill placement and compaction

A Geolabs representative should also monitor other aspects of earthwork construction to observe compliance with the intent of the design concepts, specifications, or recommendations and to expedite suggestions for design changes that may be required in the event that subsurface conditions differ from those anticipated at the time this report was prepared. The recommendations provided in this report are contingent upon such observations.

If the actual subsurface conditions encountered during construction are different from those assumed or considered in this report, then appropriate modifications to the design should be made.

END OF DISCUSSION AND RECOMMENDATIONS

SECTION 4.0 - LIMITATIONS

The analyses and recommendations submitted in this report are based, in part, upon information obtained from our field borings and laboratory test data. Variations of subsurface conditions between and beyond our field borings may occur, and the nature and extent of these variations may not become evident until construction is underway. If variations then appear evident, it will be necessary to re-evaluate the recommendations provided in this report.

The boring locations indicated in this report were measured by taping from the physical features shown on the Conceptual Plan transmitted by Maui Medical Plaza LLC on September 22, 2006. Elevations of the borings were estimated by interpolation from the elevation points shown on the Topographic Survey Map prepared by R.T. Tanaka Engineers, Inc. on June 29, 2006. The physical locations and elevations of the borings should be considered accurate only to the degree implied by the methods used.

The stratification lines shown on graphic representations of the borings depict the approximate boundaries between soil types and, as such, may denote a gradual transition. Water level data from the borings were measured at the times shown on the graphic representations and/or in the text of this report. These data have been reviewed and interpretations made in the formulation of this report. However, it must be noted that the fluctuation may occur due to variation in tidal fluctuation, rainfall, temperature and other factors.

This report has been prepared for the exclusive use of Maui Medical Plaza LLC and their project consultants for specific application to the proposed *Maui Medical Plaza* project in accordance with generally accepted geotechnical engineering principles and practices. No warranty is expressed or implied.

This report has been prepared solely for the purpose of assisting the architect and engineer in the preparation of design drawings and specifications for the project. Therefore, this report may not contain sufficient data, or proper information, to serve as the basis for preparation of construction cost estimates. A contractor wishing to bid on this project is urged to retain a competent geotechnical engineer to assist in the interpretation of this report and/or in the performance of additional site-specific exploration for bid estimating purposes.

The owner/client should be aware that unanticipated soil conditions are commonly encountered. Unforeseen soil conditions, such as soft deposits, hard layers, undocumented fills, or cavities may occur in localized areas and may require additional probing or corrections in the field (which may result in construction delays) to attain a properly constructed project. Therefore, a sufficient contingency fund is recommended to accommodate these possible extra costs.

This geotechnical exploration conducted at the project site was not intended to investigate the potential presence of hazardous materials existing at the site. The equipment, techniques, and personnel used to conduct a geo-environmental exploration differ substantially from those applied in geotechnical engineering.

END OF LIMITATIONS

CLOSURE

The following plates and appendices are attached and complete this report:

Plate 1	-	Project Location Map
Plate 2	-	Site Plan
Plates 3.1 and 3.2	-	Generalized Subsurface Profiles
Plate 4	-	Typical Settlement Gauge Detail
Appendix A	-	Field Exploration
Plate A	-	Boring Log Legend
Plates A-1 and A-5	-	Logs of Borings
Appendix B	-	Laboratory Testing
Plates B-1 and B-2	-	Laboratory Test Data

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Respectfully submitted,

GEOLABS, INC.

By Gl Barut

Glenn Barut, P.E.
Project Engineer

By Clayton S. Mimura

Clayton S. Mimura, P.E.
President

CSM:GB:cj

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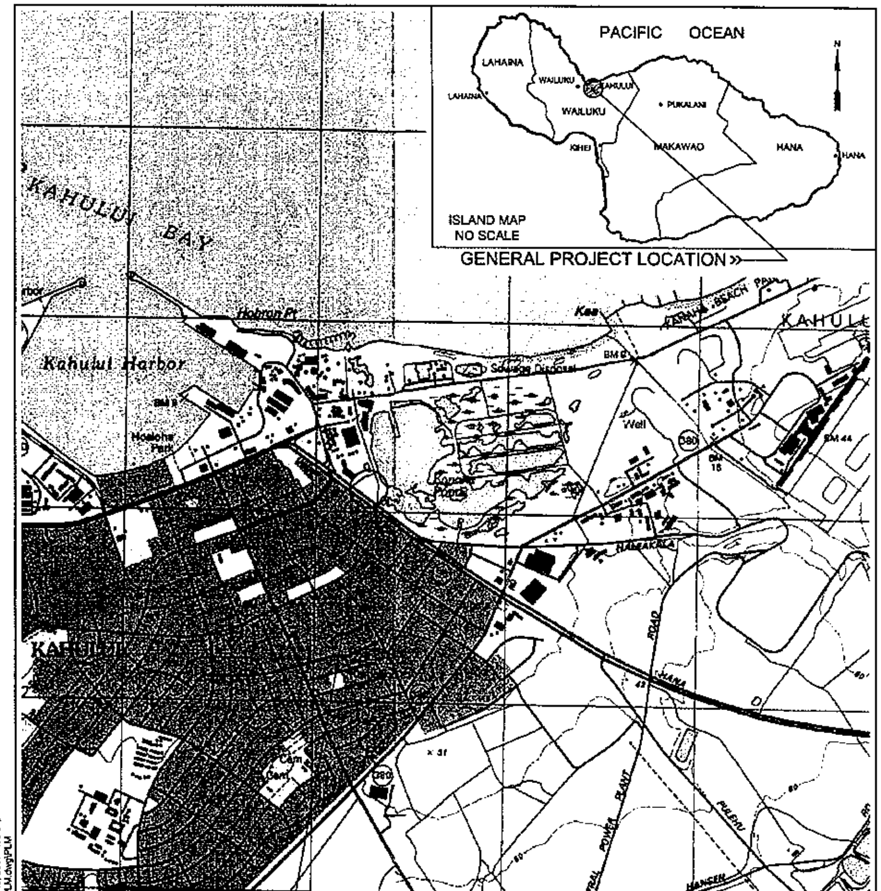
PLATES



PROJECT LOCATION »

PROJECT LOCATION MAP

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

2000 1000 0 2000 FT.
GRAPHIC SCALE

N

REFERENCE: MAP CREATED WITH TOPO!® ©2001 NATIONAL GEOGRAPHIC (WWW.NATIONALGEOGRAPHIC.COM/TOPO).

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DATE	DRAWN BY	PLATE
MARCH 2007	JRP	
SCALE	W.O.	
1" = 2,000'	5783-00	1

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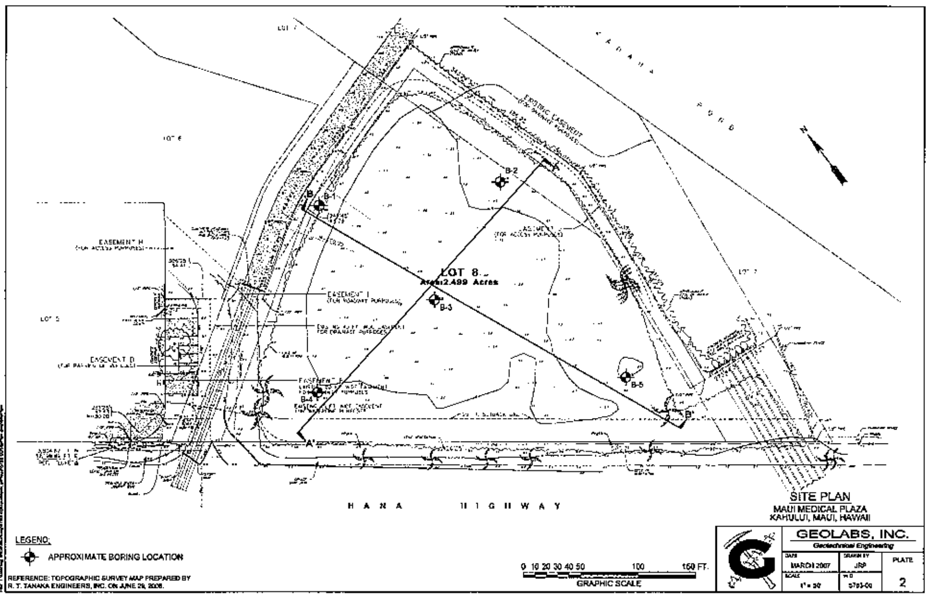
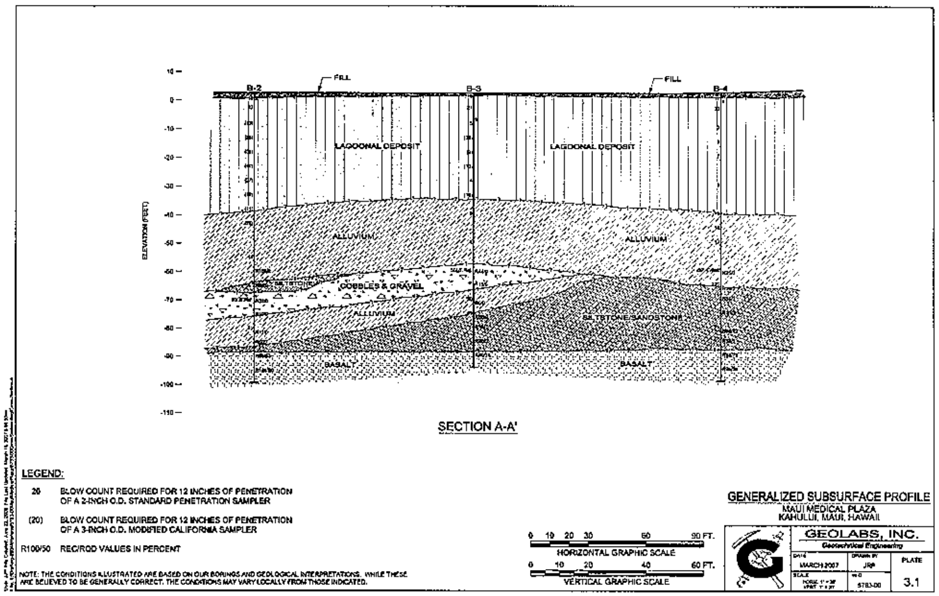
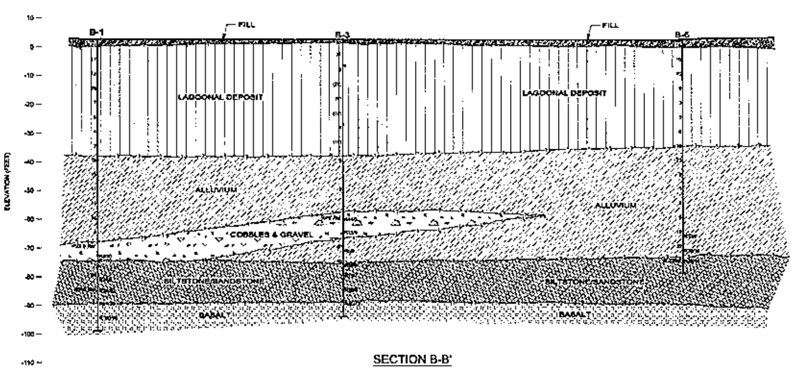

LOT 8
Area=2.499 Acres
B-1
B-2
B-3
B-4
B-5
A
A'
HANA HIGHWAY
KANAHA POND
EASEMENT H
EASEMENT I
EASEMENT D
LOT 5
LOT 6
LOT 7
N
LEGEND:
APPROXIMATE BORING LOCATION
REFERENCE: TOPOGRAPHIC SURVEY MAP PREPARED BY R. T. TANAKA ENGINEERS, INC. ON JUNE 29, 2006.
0 10 20 30 40 50 100 150 FT.
GRAPHIC SCALE
SITE PLAN
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII
GEOLABS, INC.
Geotechnical Engineering
MARCH 2007
JRP
1" = 50'
5783-00
PLATE
2


B-2
B-3
B-4
FILL
LAGOONAL DEPOSIT
ALLUVIUM
COBBLES & GRAVEL
SILTSTONE/SANDSTONE
BASALT
ELEVATION (FEET)
SECTION A-A'
LEGEND:
20 BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 2-INCH O.D. STANDARD PENETRATION SAMPLER
(20) BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 3-INCH O.D. MODIFIED CALIFORNIA SAMPLER
R100/50 REC/RQD VALUES IN PERCENT
NOTE: THE CONDITIONS ILLUSTRATED ARE BASED ON OUR BORINGS AND GEOLOGICAL INTERPRETATIONS. WHILE THESE ARE BELIEVED TO BE GENERALLY CORRECT, THE CONDITIONS MAY VARY LOCALLY FROM THOSE INDICATED.
HORIZONTAL GRAPHIC SCALE
VERTICAL GRAPHIC SCALE
GENERALIZED SUBSURFACE PROFILE
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII
GEOLABS, INC.
Geotechnical Engineering
MARCH 2007
JRP
5783-00
PLATE
3.1



SECTION B-B'

LEGEND:

20 BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 2-INCH O.D. STANDARD PENETRATION SAMPLER

(20) BLOW COUNT REQUIRED FOR 12 INCHES OF PENETRATION OF A 3-INCH O.D. MODIFIED CALIFORNIA SAMPLER

R100/50 REC/RQD VALUES IN PERCENT

NOTE: THE CONDITIONS ILLUSTRATED ARE BASED ON OUR BORINGS AND GEOLOGICAL INTERPRETATIONS. WHILE THESE ARE BELIEVED TO BE GENERALLY CORRECT, THE CONDITIONS MAY VARY LOCALLY FROM THOSE INDICATED.

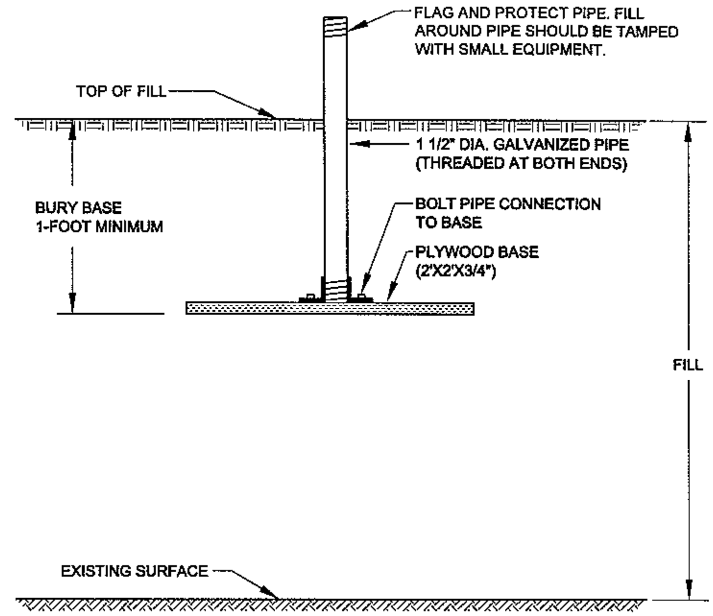
HORIZONTAL GRAPHIC SCALE (0 10 20 30 60 90 FT.)

VERTICAL GRAPHIC SCALE (0 10 20 40 60 FT.)

GENERALIZED SUBSURFACE PROFILE
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

GEOLABS, INC.
Geotechnical Engineering

DATE	DRAWN BY	PLATE
MARCH 2007	JRP	3.2
SCALE	W.O.	
	5783-00	



TYPICAL SETTLEMENT GAUGE
MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

GEOLABS, INC.
Geotechnical Engineering

DATE	DRAWN BY	PLATE
MARCH 2007	KHN	4
SCALE	W.O.	
NOT TO SCALE	5783-00	

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File: T:\Drafting-9804\Working\5783-00MauiMedicalPlaza\5783-00SettlementGauge.dwg\Model

APPENDIX A

Field Exploration

APPENDIX A

Field Exploration

The subsurface conditions at the site were explored by drilling and sampling five borings extending to depths about 81.5 and 102 feet below the existing ground surface. The approximate boring locations are shown on the Site Plan, Plate 2. The borings were drilled using a truck-mounted drill rig equipped with augers and rotary coring equipment.

The materials encountered in the borings were classified by visual and textural examination in the field by our geologist, who monitored the drilling operations on a near-continuous basis. These classifications were further reviewed visually and by testing in the laboratory. Soils were classified in general conformance with the Unified Soil Classification System as shown on Plate A. Graphic representations of the materials encountered are presented on the Logs of Borings, Plates A-1 through A-5.

Relatively "undisturbed" soil samples were obtained in general accordance with ASTM D 3550, Ring-Lined Barrel Sampling of Soils, by driving a 3-inch OD Modified California sampler with a 140-pound hammer falling 30 inches. In addition, some samples were obtained from the drilled borings in general accordance with ASTM D 1586, Penetration Test and Split-Barrel Sampling of Soils, by driving a 2-inch OD standard penetration sampler using the same hammer and drop. The blow counts needed to drive the sampler the second and third 6 inches of an 18-inch drive are shown as the "Penetration Resistance" on the Logs of Borings at the appropriate sample depths.

Pocket penetrometer and torvane shear tests were performed on selected cohesive soil samples retrieved in the field. The pocket penetrometer test provides an indication of the unconfined compressive strength of the sample. The torvane shear test provides a quick estimate of the undrained shear strength of the soil. Results of the pocket penetrometer and torvane shear tests are summarized on the Logs of Borings at the appropriate sample depths.

Core samples of the rock formations encountered at the site were obtained using diamond core drilling techniques in general accordance with ASTM D 2113, Diamond Core Drilling for Site Investigation. Core drilling is a rotary drilling method that uses a hollow bit to cut into the rock formation. The material left in the hollow core of the bit is mechanically recovered for examination and description.

Recovery (REC) is used as a subjective guide to the interpretation of the relative quality of rock masses. Recovery is defined as the actual length of material recovered from a coring attempt versus the length of the core attempt. For example, if 3.7 feet of material is recovered from a 5.0-foot core run, the recovery would be 74 percent and would be shown on the Logs of Borings as REC = 74%.

The Rock Quality Designation (RQD) is also a subjective guide to the relative quality of rock masses. RQD is defined as the percentage of the core run that is sound material in excess of 4 inches in length without discontinuities, discounting drilling induced fractures or breaks. If 2.5 feet of sound material is recovered from a 5.0-foot core run, the RQD would be 50 percent and would be shown on the Logs of Borings as RQD = 50%. Generally, the following is used to describe the relative quality of the rock, based on the "Practical Handbook of Physical Properties of Rocks and Minerals."

Rock Quality	RQD (%)
Very Poor	0 – 25
Poor	25 – 50
Fair	50 – 75
Good	75 – 90
Excellent	90 – 100

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Log Legend

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

MAJOR DIVISIONS			USCS	TYPICAL DESCRIPTIONS
COARSE-GRAINED SOILS	GRAVELS	CLEAN GRAVELS	GW	WELL-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
		LESS THAN 5% FINES	GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES	GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
		MORE THAN 12% FINES	GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
	SANDS	CLEAN SANDS	SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
MORE THAN 50% OF MATERIAL RETAINED ON NO. 200 SIEVE		LESS THAN 5% FINES	SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	50% OR MORE OF COARSE FRACTION PASSING THROUGH NO. 4 SIEVE	SANDS WITH FINES	SM	SILTY SANDS, SAND-SILT MIXTURES
		MORE THAN 12% FINES	SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE-GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50	ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
			OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
50% OR MORE OF MATERIAL PASSING THROUGH NO. 200 SIEVE	SILTS AND CLAYS	LIQUID LIMIT 50 OR MORE	MH	INORGANIC SILT, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

LEGEND

(2-INCH) O.D. STANDARD PENETRATION TEST
(3-INCH) O.D. MODIFIED CALIFORNIA SAMPLE
SHELBY TUBE SAMPLE
GRAB SAMPLE
CORE SAMPLE

LL LIQUID LIMIT
PI PLASTICITY INDEX
TV TORVANE SHEAR (tsf)
PEN POCKET PENETROMETER (tsf)
UC UNCONFINED COMPRESSION (psi)
WATER LEVEL OBSERVED IN BORING

Plate
A

LOG LEGEND 5783-00.GPJ GEOLABS.GDT 3/12/07

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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring 1

Approximate Ground Surface Elevation (feet MSL): 4.7 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)
	23				21	
	28				17	
	32				12	
	30				28	
	35				7	
	32				8	
	51				4	

Depth (feet): 5, 10, 15, 20, 25, 30, 35

USCS	Description
SM	Light brown to gray **SILTY SAND** with traces of gravel, medium dense, moist (fill)
SM	Light gray poorly graded **SILTY SAND**, medium dense, wet (shallow marine)
SM	Light grayish white **SILTY SAND** with gravel (coralline), medium dense (lagoonal deposit/coralline detritus)
GM	Light grayish white **SILTY GRAVEL (CORALLINE)**, loose (lagoonal deposit/coralline detritus)
ML	Gray **GRAVELLY SILT**, very soft (lagoonal deposit)

Date Started:	December 27, 2006	Water Level: ∇	2.7 ft. 12/27/06 0850 HRS
Date Completed:	December 27, 2006		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 1.1

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC.
Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring 1

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)
	39				2	
	52				19	
	38				13	1.3
	38				11	1.0
	39				11	1.0
	38				12	1.0
	43				4	1.0

Depth (feet): 40, 45, 50, 55, 60, 65, 70

USCS	Description
ML	
SM	Reddish brown **SILTY SAND**, medium dense (alluvium)
ML	Reddish brown **SILT**, stiff (alluvium)

Date Started:	December 27, 2006	Water Level: ∇	2.7 ft. 12/27/06 0850 HRS
Date Completed:	December 27, 2006		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 1.2

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC.
Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **1**

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description (Continued from previous plate)
									grades with gravel and cobbles (basaltic)
	9		80		50/.5' Ref.				Gray **COBBLES AND GRAVEL (BASALTIC)**, dense (river deposit/conglomerate)
							75		
			17	0					
									Brown **SILTSTONE**, severely fractured, moderately to highly weathered, soft to medium hard
							80		
	49				57				
			26	0					
							85		
	36		38	20	50/.4' Ref.				locally interbedded with well cemented sandstone
							90		
			87	70					
									Gray vesicular to vugular **BASALT**, slightly fractured, unweathered to slightly weathered, hard to very hard
							95		
			100	95					
							100		
									Boring terminated at 101.5 feet
									* Elevations estimated from Topographic Survey Map prepared by R. T. Tanaka Engineers, Inc. on 6/29/06.
							105		

Date Started:	December 27, 2006	Water Level: ⊻ 2.7 ft. 12/27/06 0850 HRS		Plate
Date Completed:	December 27, 2006			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53	A - 1.3
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring	
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/15/07

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **2**

Approximate Ground Surface Elevation (feet MSL): 4.9 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
								SM	Tannish gray **SILTY FINE SAND** with traces of organic matter, medium dense, moist (fill)
	24				10		⊻	SP	Light gray poorly graded fine **SAND**, medium dense, wet (shallow marine)
	25				22		5	SM	Light gray **SILTY SAND** with some gravel (basaltic and coralline), medium dense (shallow marine/lagoonal deposit)
	24	98			13		10		
									grades finer
								SM	Light grayish white **SILTY FINE SAND**, medium dense to dense (lagoonal deposit/marine deposit)
	30	94			35		15		
	30	91			36		20		
	30	92			40		25		
	33	92			27		30		
							35		

Date Started:	January 22, 2007	Water Level: ⊻ 2.5 ft. 1/22/07 1025 HRS		Plate
Date Completed:	January 22, 2007			
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53	A - 2.1
Total Depth:	102 feet	Drilling Method:	4" Auger, 4" Casing & HQ Coring	
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/15/07

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **2**

(Continued from previous plate)

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	32	90			19			SM	
							40		
	33	90			11				
								SM	Reddish brown **SILTY SAND**, medium dense (alluvium)
							45		
	44	77			23				
								CL/ML	Reddish brown **CLAYEY SILT**, stiff to very stiff (alluvium)
							50		
						2.5			
							55		
LL=36 PI=12	34				15	1.5			
							60		
								MH	Brown **SILTY CLAY**, hard (alluvium)
			100	0					
							65		
						>4.5			
									Brown **SILTSTONE** with sand, severely fractured, highly weathered, soft to medium hard
			30	0					
							70		

Date Started:	January 22, 2007	Water Level: ▽	2.5 ft. 1/22/07 1025 HRS
Date Completed:	January 22, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	102 feet	Drilling Method:	4" Auger, 4" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 2.2

GEOLABS, INC.
Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **2**

(Continued from previous plate)

Other Tests (Laboratory)	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
									Gray round **COBBLES AND GRAVEL (BASALTIC)** with sand, slightly cemented, very dense (river deposit/conglomerate)
	9		32	0	50/.5' Ref.				
							75		
			10	0					
								SM	Brownish gray **SILTY SAND** with rounded gravel, dense (river deposit/alluvium)
							80		
	111				61				
			17	0					
							85		
			50	7					grades to sandstone
									Brown **SANDSTONE**, moderately fractured, slightly weathered, hard
							90		
			90	53					Brownish gray to gravel vesicular **BASALT**, moderately fractured, slightly to moderately weathered, hard
							95		
			100	90					grades to slightly fractured, very hard
							100		
									Boring terminated at 102 feet
							105		

Date Started:	January 22, 2007	Water Level: ▽	2.5 ft. 1/22/07 1025 HRS
Date Completed:	January 22, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	102 feet	Drilling Method:	4" Auger, 4" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 2.3

GEOLABS, INC.
Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring 3

Approximate Ground Surface Elevation (feet MSL): 3.8 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
	34				10		0	SM	Light grayish tan **SILTY SAND**, medium dense, moist (fill)
								SM	Light gray poorly graded **SILTY SAND**, loose to medium dense, moist to wet (shallow marine)
	22				21		5		
									grades to coarse
	28				5		10	GM	Light grayish white **SILTY GRAVEL (CORALLINE)** with sand, loose (lagoonal deposit/coralline detritus)
	31				28		15	GW	Light grayish white **SANDY GRAVEL (CORALLINE)** with silt, medium dense (coralline detritus)
	32				9		20	GM/ML	Light gray **SILTY GRAVEL/GRAVELLY SILT**, soft (lagoonal deposit/coralline detritus)
	36				10		25		
									grades to very soft
					4	0.0	30		grades with clayey silt
							35		

Date Started:	January 24, 2007	Water Level: ∇ 9.6 ft. 1/24/07 1100 HRS	Plate
Date Completed:	January 24, 2007		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53	
Total Depth:	96.5 feet	Drilling Method: 4" Auger, 3" & 4" Casing & HQ Coring	A - 3.1
Work Order:	5783-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring 3

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
					16			SM	Gray **SILTY SAND**, medium dense (lagoonal deposit/shallow marine)
								SM	Reddish brown **SILTY SAND**, medium dense (alluvium)
							40	ML	Reddish brown **SANDY SILT**, stiff (alluvium)
	45				9	1.0			
							45		
							50		
	39				8	1.0			
							55		
									grades with cobbles
							60		Gray rounded **COBBLES AND GRAVEL (BASALTIC)** with sand, very dense (river deposit/conglomerate)
	12		44		50/.5' Ref.				
							65		
			15						
							70	SM	

Date Started:	January 24, 2007	Water Level: ∇ 9.6 ft. 1/24/07 1100 HRS	Plate
Date Completed:	January 24, 2007		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53	
Total Depth:	96.5 feet	Drilling Method: 4" Auger, 3" & 4" Casing & HQ Coring	A - 3.2
Work Order:	5783-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC.
Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **3**

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
							SM	Brown **SILTY SAND**, medium dense to dense (alluvium)
	79				50			
			0					
	48				49			
								Brown **SILTSTONE**, severely fractured, highly weathered, soft to medium hard
			50	0				
			75	7				
								Brown to gray **SANDSTONE** with traces of cobbles (basaltic), moderately to highly cemented, closely fractured, moderately weathered, medium hard
			30	0				
								Brown **SILTSTONE**, severely fractured, moderately weathered, medium hard
			40	10				Gray coarsely vesicular **BASALT**, closely fractured, slightly weathered, hard
								Boring terminated at 96.5 feet

Depth (feet): 75, 80, 85, 90, 95, 100, 105

Date Started:	January 24, 2007	Water Level: ⊻	9.6 ft. 1/24/07 1100 HRS
Date Completed:	January 24, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	96.5 feet	Drilling Method:	4" Auger, 3" & 4" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 3.3

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **4**

Approximate Ground Surface Elevation (feet MSL): 4.4 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	USCS	Description
							SP	Tan poorly graded **SAND**, medium dense, moist (fill)
	31				17			
							SM	Light gray poorly graded **SILTY FINE SAND**, medium dense, moist to wet (shallow marine)
	27				20			
								grades to coarse with traces of gravel
							SM	Light grayish white **SILTY SAND** with traces of gravel, very loose (lagoonal deposit)
	30				3			
							GM	Light gray **SILTY GRAVEL (CORALLINE)**, loose (lagoonal deposit/coralline detritus)
	32				6			
	41				7			
								grades to gravelly silt locally
							ML	Light gray **GRAVELLY SILT** with traces of sand, soft (lagoonal deposit)
	39				3			

Depth (feet): 5, 10, 15, 20, 25, 30, 35

Date Started:	January 23, 2007	Water Level: ⊻	3.5 ft. 1/23/07 0905 HRS
Date Completed:	January 23, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 4.1

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **4**

Other Tests (Laboratory)	Moisture Content (%) (Laboratory)	Dry Density (pcf) (Laboratory)	Core Recovery (%) (Field)	RQD (%) (Field)	Penetration Resistance (blows/foot) (Field)	Pocket Pen. (tsf) (Field)	Depth (feet)	USCS	Description (Continued from previous plate)
								ML	
							40		
	40				19				
								SM	Reddish brown **SILTY SAND**, medium dense (alluvium)
							45		
	51				18				
								MH/CH	Reddish brown **SILTY CLAY**, stiff to very stiff (alluvium)
							50		
	37				13	1.5			
							55		
									grades with more clay
							60	ML	Brown **SILT**, hard (alluvium)
LL=39 PI=13	31				50/.4' Ref.	>4.5			
			25						
							65		
	39				120	>4.5			
			57	0					Brown **SILTSTONE** with sand, severely fractured, highly weathered, soft to medium hard
							70		

Date Started:	January 23, 2007	Water Level: ∇	3.5 ft. 1/23/07 0905 HRS
Date Completed:	January 23, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 4.2

GEOLABS, INC.
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MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **4**

Other Tests (Laboratory)	Moisture Content (%) (Laboratory)	Dry Density (pcf) (Laboratory)	Core Recovery (%) (Field)	RQD (%) (Field)	Penetration Resistance (blows/foot) (Field)	Pocket Pen. (tsf) (Field)	Depth (feet)	USCS	Description (Continued from previous plate)
			87	0					
							75		
			20	0					
									grades with traces of gravel (basaltic)
							80		
	51				71				
			64	12					grades to closely fractured, moderately weathered
							85		
			38	0					
							90		Brownish gray to gray coarsely vesicular **BASALT**, moderately fractured, slightly to moderately weathered, hard
			93	73					
							95		
			95	38					
							100		
									Boring terminated at 101.5 feet
							105		

Date Started:	January 23, 2007	Water Level: ∇	3.5 ft. 1/23/07 0905 HRS
Date Completed:	January 23, 2007		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	101.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 4.3

GEOLABS, INC. Geotechnical Engineering	MAUI MEDICAL PLAZA KAHULUI, MAUI, HAWAII	Log of Boring 5

Approximate Ground Surface Elevation (feet MSL): 4.0 *

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
								SM	Tannish gray **SILTY FINE SAND** with traces organic matter, medium dense, moist (fill)
					15				
								SP	Light gray poorly graded **SAND**, medium dense, wet (shallow marine)
							5	SM	Gray **SILTY SAND** with some gravel (coralline), loose to medium dense (lagoonal deposit)
					10				
							10	GM	Light gray **SILTY GRAVEL (CORALLINE)**, loose (lagoonal deposit/coralline detritus)
					10				
							15		
					5				
							20		grades to very loose
					3			SM	Light gray **SILTY SAND (CORALLINE)** with gravel, very loose (lagoonal deposit)
							25		
					3				
							30	ML	Light gray **SANDY SILT** with traces of gravel (coralline), soft (lagoonal deposit)
					6				
							35		

Date Started:	December 26, 2006	Water Level: ▽ 2.6 ft. 12/26/06 1000 HRS	Plate
Date Completed:	December 26, 2006		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53	
Total Depth:	81.5 feet	Drilling Method: 4" Auger, 3" Casing & HQ Coring	A - 5.1
Work Order:	5783-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC. Geotechnical Engineering	MAUI MEDICAL PLAZA KAHULUI, MAUI, HAWAII	Log of Boring 5

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	USCS	Description
								ML	grades with silty sand, medium dense
					19				
								SM	Reddish brown **SILTY SAND**, medium dense (alluvium)
							40		
					23				grades with some rounded gravel
								ML	Reddish brown **SILT**, stiff (alluvium)
							45		
					9	1.0			
							50		
					7	1.0			
							55		
					6	0.8			
							60		
					8	1.3			
							65		
					19				grades with some rounded pebbles
			33						
							70	SM	Brown **SILTY SAND** with some rounded gravel, medium dense (alluvium)

Date Started:	December 26, 2006	Water Level: ▽ 2.6 ft. 12/26/06 1000 HRS	Plate
Date Completed:	December 26, 2006		
Logged By:	S. Latronic	Drill Rig: MOBILE B-53	
Total Depth:	81.5 feet	Drilling Method: 4" Auger, 3" Casing & HQ Coring	A - 5.2
Work Order:	5783-00	Driving Energy: 140 lb. wt., 30 in. drop	

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

GEOLABS, INC.

Geotechnical Engineering

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Log of Boring **5**

(Continued from previous plate)

Other Tests	Moisture Content (%)	Dry Density (pcf)	Core Recovery (%)	RQD (%)	Penetration Resistance (blows/foot)	Pocket Pen. (tsf)	Depth (feet)	Sample	Graphic	USCS	Description
					32					SM	
			29	14							
							75				
			21	14	50/.2' Ref.						Brown to brownish gray **SILTSTONE** with some cemented sand lenses, closely fractured, highly weathered, soft to medium hard
							80				
											Boring terminated at 81.5 feet
							85				
							90				
							95				
							100				
							105				

Date Started:	December 26, 2006	Water Level: ▽	2.6 ft. 12/26/06 1000 HRS
Date Completed:	December 26, 2006		
Logged By:	S. Latronic	Drill Rig:	MOBILE B-53
Total Depth:	81.5 feet	Drilling Method:	4" Auger, 3" Casing & HQ Coring
Work Order:	5783-00	Driving Energy:	140 lb. wt., 30 in. drop

Plate A - 5.3

BORING LOG 5783-00.GPJ GEOLABS.GDT 3/16/07

APPENDIX B

Laboratory Testing

APPENDIX B

Laboratory Testing

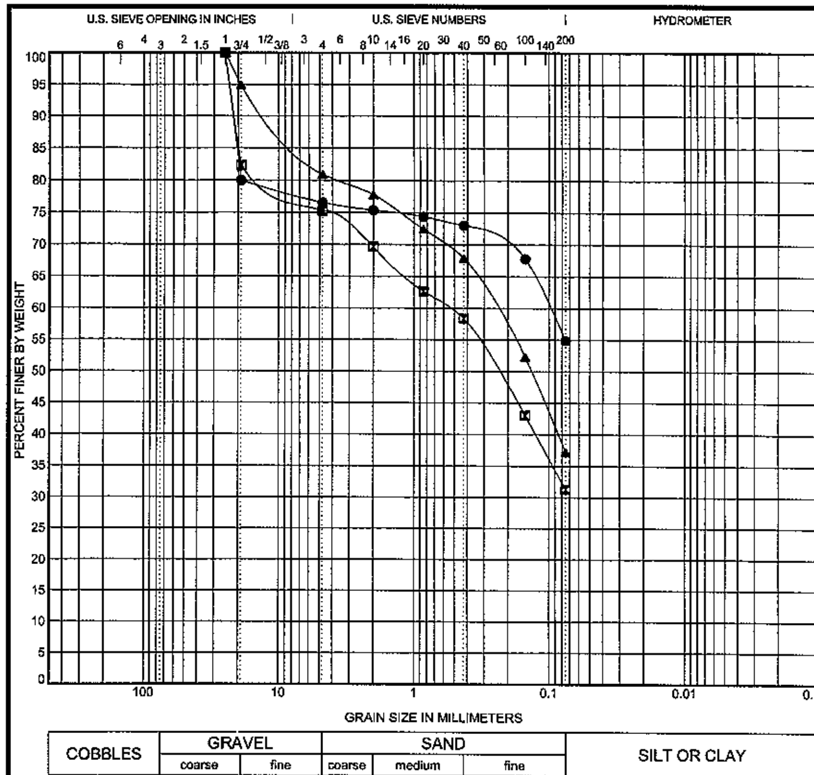
Moisture Content (ASTM D 2216) and Unit Weight (ASTM D 2937) determinations were performed on selected soil samples as an aid in the classification and evaluation of soil properties. The test results are presented on the Logs of Borings at the appropriate sample depths.

Two Atterberg Limits tests (ASTM D 4318) were performed on selected soil samples to evaluate the liquid and plastic limits and to aid in soil classification. Test results are summarized on the Logs of Borings at the appropriate sample depth.

Three Sieve Analysis tests (ASTM C 117 & C 136) were performed on selected soil samples to evaluate the gradation characteristics of the soils and to aid in soil classification. Graphic presentations of the grain size distribution are provided on Plate B-1.

One Consolidation test (ASTM D 2435) with time rates was performed on a selected soil sample to evaluate the compressibility characteristics of the encountered materials. The test results are presented on Plate B-2.

(h:\5700 Series\5783-00.gb1-p.46)



	Sample	Depth (ft)	Description	LL	PL	PI	Cc	Cu
●	B-1	36.5-38.0	Tannish gray gravelly silt (ML) with sand					
⊠	B-7	21.5-23.0	Tannish gray silty sand (SM) with gravel					
▲	B-7	26.5-28.0	Tannish gray silty sand (SM) with gravel					

	Sample	Depth (ft)	D100 (mm)	D60 (mm)	D30 (mm)	D10 (mm)	%Gravel	%Sand	%Fine
●	B-1	36.5-38.0	25	0.099			23.4	21.7	54.9
⊠	B-7	21.5-23.0	25	0.55			24.7	44.0	31.3
▲	B-7	26.5-28.0	25	0.251			19.0	43.7	37.2

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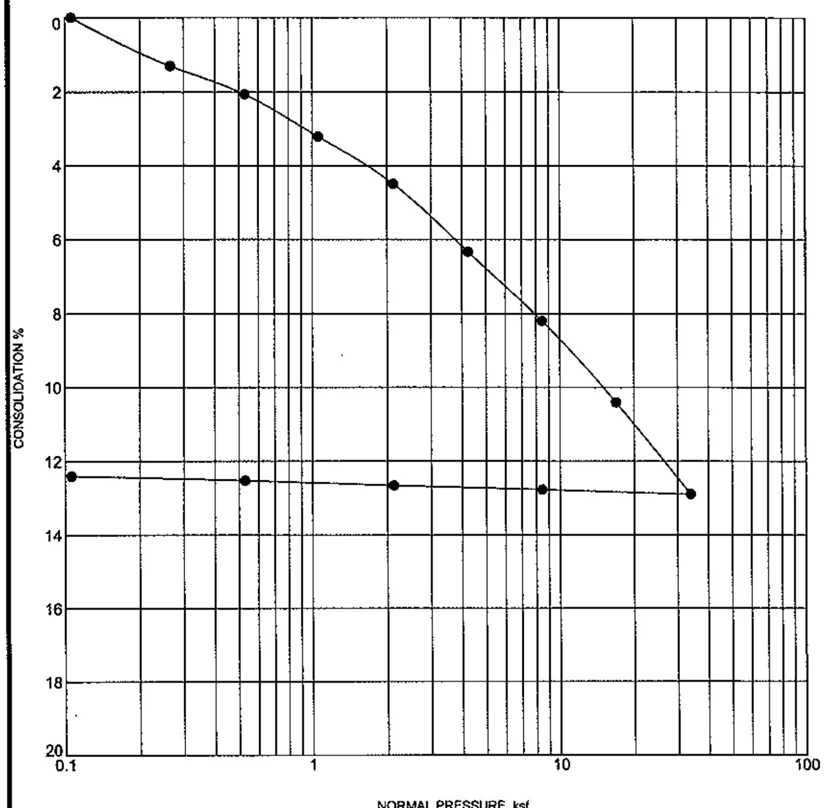
W.O. 5783-00

GRAIN SIZE DISTRIBUTION - ASTM C 117 & C 136

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Plate B - 1

G GRAIN SIZE 5783-00.GPJ GEOLABS.GDT 3/16/07



	Initial	Final
water content, %:	41.7	31.6
dry density, pcf:	83.1	94.9

Sample: B-3
Depth: 30.0 - 32.0 feet
Description: Gray clayey sand with gravel (coralline)

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W.O. 5783-00

CONSOLIDATION TEST - ASTM D 2435

MAUI MEDICAL PLAZA
KAHULUI, MAUI, HAWAII

Plate
B - 2

APPENDIX D.

Preliminary Engineering and Drainage Report

PRELIMINARY ENGINEERING AND DRAINAGE REPORT

FOR

MAUI MEDICAL PLAZA AT KANAHA

Kahului, Maui, Hawaii

T.M.K.: (2) 3-7-011: 028

Prepared for:

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April 2010

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FOR
MAUI MEDICAL PLAZA AT KANAHA
T.M.K.: (2) 3-7-011: 028

1.0 INTRODUCTION

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

The subject property is identified as T.M.K.: (2) 3-7-011: 028, which contains approximately 2.499 acres. It is also Lot 8 of the Kanaha Industrial Subdivision II. The project site is bordered by developed and undeveloped industrial lands (Lots 5, 6 and 7 of the Kahana Industrial Subdivision II) to the north, a drainage canal and culverts to the east and south, and Hana Highway to the west. The Kanaha Pond Wildlife Sanctuary is situated beyond the existing network of drainage canals.

The development plan is to construct a state-of-the-art six-story medical office building to service the local doctors and community. Associated improvements include utility connections, parking structure, modular planting system on the exterior lanais, and landscaping.

2.0 EXISTING INFRASTRUCTURE

2.1 ROADWAYS

There are three highways under the jurisdiction of the State Department of Transportation (SDOT) that provide access to the project site. Kamehameha Avenue is a County-owned roadway in the immediate vicinity of the project site.

Hana Highway is a State-owned, four-lane highway, providing access between Paia and Central Maui. Most of the intersections along the highway have separate turning lanes. The posted speed limit is 45 miles per hour (mph) to the east of the project site and reduces to 30 mph fronting the project site. Hana Highway turns into Kaahumanu Avenue at the Hobron Triangle.

There are two intersections on Hana Highway in the vicinity of the project site which are controlled by traffic signals. They are at the intersection with Dairy Road and at the intersection of Hobron Avenue and Kamehameha Avenue.

Kaahumanu Avenue is a State-owned, six-lane highway that provides access between Kahului and Wailuku. In the vicinity of the project site, it intersects with the Wharf Street/Maui Mall driveway and Puunene Avenue. Both intersections are signalized.

Puunene Avenue is a State-owned highway that connects Kaahumanu Avenue with Kuihelani Highway and Mokulele Highway. It is a four-lane roadway between Kaahumanu Avenue and Wakea Avenue. The remainder of the roadway is a two-lane roadway. The intersection with Kamehameha Avenue is signalized.

Kamehameha Avenue is a County-owned roadway which provides east-west access from Hana Highway to Puunene Avenue. It is a four-lane roadway between Hana Highway and Lono Avenue. The remainder of the roadway is a two-lane roadway. Kamehameha Avenue serves the adjoining commercial areas from Hana Highway to Puunene Avenue.

2.2 DRAINAGE

The elevation on the site ranges from elevation 6 feet above mean sea level along the western (Hana Highway) boundary to 4.4 feet above mean sea level at the northern end of the site. Approximately 0.94 acres of the parcel is determined to be a severely disturbed jurisdictional wetland. Based on agency site reviews and determination, the wetland has been determined to have little or no functional value. Generally, the wetland boundary lies within the 4-foot elevation contour line located approximately in the middle of the parcel.

According to Panel No. 1500030392E of the Flood Insurance Rate Map, revised September 25, 2009, the project site is situated in Flood Zone X. Flood Zone X is designated as areas determined to be outside the 0.2% annual chance flood plain.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, the soil within the project site is classified as Jaucas sand, saline, 0 to 12 percent slopes (JcC). This soil occurs near the ocean in areas where the water table is near the surface and salts have accumulated. It is somewhat poorly drained in depressions but excessively drained on knolls. The water table is normally within a depth of 30 inches.

Presently, onsite runoff sheet flows toward the middle of the project site and ponds in the low-lying area. It is estimated that approximately 10,700 cubic feet of runoff currently ponds in the low area on the site before it overflows into the adjacent drainage canal, which is situated between the project site and Kanaha Pond. The drainage canal conveys runoff to an outlet at the ocean. No runoff from the project site is expected to enter into Kanaha Pond. It is estimated that the existing 50-year, 1-hour onsite runoff is 2.84 cfs. The corresponding volume generated by the runoff is 2,728 cubic feet.

Offsite runoff from the two westbound lanes and shoulder area of Hana Highway immediately fronting the project site sheet flows onto the project site. It is estimated that the existing 50-year, 1-hour offsite runoff is 2.37 cfs and the corresponding volume is 996 cubic feet.

2.3 SEWER

There are no existing sewer facilities on or immediately adjacent to the project site. The nearest sewer system is the recently installed sewerline traversing across Kamehameha Avenue, between Alamaha Street and Hana Highway. The sewerline crossing is located approximately 630 feet to the northwest of the project site. An 8-inch sewerline was recently installed as part of the Consent Decree Sewer Rehabilitation Project, 24-Hour Fitness Line.

Wastewater collected in the Kahului area is conveyed to the Kahului Wastewater Pump Station, which is located to the northwest and on the opposite side of Hana Highway of the project site. Wastewater collected from the pump station is transported to the Kahului Wastewater Reclamation Facility in Naska.

2.4 WATER

Domestic water and fire flow will be provided by the County's water system. There are existing 8-inch and 16-inch waterlines which traverse along the southbound lanes of Hana Highway.

Domestic water and fire flow for the Kahului area are serviced from the 3.0 million gallon Mokuhau tank and wells in Happy Valley, which is at elevation of 358 feet. The source for this water system is from the Central Maui source.

2.5 ELECTRIC, TELEPHONE AND CABLE TV

There are existing overhead utility lines traversing on both sides of Hana Highway fronting the project site. Electrical service is available from the existing overhead lines immediately fronting the project site. There are existing underground telephone and cable TV services to the northwest of the entry driveway.

3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

3.1 ROADWAYS

The proposed medical plaza building will be facing Hana Highway. A six-story parking structure will be located behind the building, which will provide approximately 360 parking stalls.

Access to the proposed medical building will be from two driveways. The northwest driveway will be constructed over the existing access that currently serves the commercial complex to the northwest of the project site. A new driveway will be constructed along the southerly boundary and will serve as a right turn only exit driveway. The traffic movement within the project site will create a clockwise traffic pattern within the site.

The conclusions and recommendations in the *Traffic Impact Analysis Report for Maui Medical Plaza at Kanaha*, prepared by AECOM recommended the following mitigation measures for the project:

"Several improvements would be made to Hana Highway to accommodate the above traffic movements. The northwest bound approach of Hana Highway would be widened from two to four lanes to provide a third through lane and an acceleration/deceleration lane. The third through lane would be designed to accommodate the future widening of Hana Highway and would provide an additional lane for traffic exiting the project site to merge onto Hana Highway. The acceleration/deceleration lane would be a continuous lane beginning at the new exit driveway and terminating at the northwest access roadway. A shuttle bus stop would also be located in the acceleration/deceleration lane to encourage transit access to the project. This design would minimize the reconstruction activity fronting the project site when Hana Highway is widened. A left turn lane in the median of Hana Highway would accommodate the left turn movements from southeast bound Hana Highway into the project site. U-turns would not be permitted at this median opening. A landscaped median with a four foot high hedge would be installed to form a physical barrier to prevent pedestrians from jaywalking across Hana Highway.

Other off-site improvements include converting the single right turn lane on the Kamehameha Avenue approach to double right turn lanes to accommodate the very high number of turns currently being made. Also, a left turn storage lane would be added to the existing U-turn median opening on Hana Highway on the Wailuku side of the Hobron Avenue/Kamehameha Highway intersection."

3.2 DRAINAGE

After the development of the proposed project, it is estimated that the onsite 50-year, 1-hour storm runoff will be approximately 6.69 cfs, which will generate a volume of 5,615 cubic feet, a net increase of 3.85 cfs and 2,887 cubic feet of storage volume. The offsite runoff from Hana Highway will not change from existing conditions and 2.37 cfs will continue to sheet flow into the project site. The offsite volume is estimated to be 996 cubic feet.

In accordance with the County's drainage standards, the project's drainage system will be required to accommodate the increase in runoff generated from the project of 3.85 cfs and 2,887 cubic feet of storage. The onsite detention basins will create a total storage volume of 16,850 cubic feet. The existing site condition currently provides approximately 10,700 cubic feet of onsite storage. Therefore, the proposed onsite detention basins will create an additional 6,150 cubic feet of storage, which is greater than the 2,887 cubic feet required. The detention basins will have sufficient volume to accommodate the total post-development flow from the project site for the 50-year, 1-hour storm event. During extreme rain events, any runoff that exceeds the storage capacity of the onsite detention basins will continue to overflow into the adjacent drainage canal as it is presently doing. No post-development runoff from the project site is expected to enter into Kanaha Pond.

The onsite drainage plan is to intercept runoff by grated catch basins and area drains and convey it to the detention basins. Gutter and/or downspouts from the building will be connected to the site drainage system to convey runoff into the detention basins.

As part of the best management practices plan (BMP), the onsite detention basins will be graded and grassed prior to commencement of construction of the project. In addition, silt and dust fences will be strategically located along the perimeter of the project site to control the movement of dust and silt from the project site to the adjacent properties. Said measures will be reviewed and approved by the State Department of Health to secure the NPDES permit and the County Department of Public Works to secure the grading permit.

It is estimated that the onsite post-development runoff for a 2-year, 24-hour storm is 2.08 cfs with a corresponding volume of 13,171 cubic feet. Should this rainfall event occur during the construction period, the onsite detention basins have sufficient capacity to accommodate the runoff volume generated by this storm event.

The proposed drainage plan is to provide onsite detention basins with sufficient storage capacity accommodate the runoff generated from the post-development conditions. The drainage design criteria is to maintain the existing runoff pattern of the onsite of offsite runoff.

There will be no additional runoff sheet flowing from the project site to adjacent properties as a result of the development of the project. The proposed drainage system will be designed in accordance with Chapter 4, "Rules for the Design of Storm Drainage Facilities in the County of Maui."

The subject parcel is a severely disturbed site of minimal wetland value in its current state. Offsite wetland mitigation will be done at the Waihee Coastal Dunes and Wetland Refuge. Mitigation work will involve the removal of invasive species and the reestablishment of native plants on approximately five acres within the wetland portions of the Refuge. The wetland mitigation work is being done offsite due to the FAA restrictions on activity in the initially proposed mitigation site adjacent to Lot 8.

3.3 <u>SEWER</u>

The proposed 131,500 square feet professional plaza is expected to accommodate up to 200 medical professionals and staff. Based on this expectation, it is estimated that the proposed facility will generate 4,000 gallons of wastewater daily (See Appendix C). An offsite sewerline will be constructed from the northwest end of the project, along Hana Highway, along Kamehameha Avenue, and connecting to the recently installed 8-inch sewerline on Kamehameha Avenue. No sewer lift station is anticipated.

The Kahului Wastewater Reclamation Facility has a plant capacity of 7.9 million gallons per day (mgd). As of March 2010, the Wastewater Reclamation Division reported that the Kahului Wastewater Reclamation Facility has an allotted capacity of 6.95 mgd and the average daily flow is approximately 4.9 mgd. Therefore, the facility currently has the capacity to accommodate wastewater flow from the project.

3.4 WATER

In accordance with the Department of Water Supply's Domestic Consumption Guidelines for a business development, the average daily demand for the proposed project is approximately 15,000 gallons per day (See Appendix B). Fire flow demand for commercial development is 2,000 gallons per minute for a 2-hour duration. The water system will be designed to meet the domestic and fire flow demands of the project.

The project will connect to the existing 16-inch waterline on Hana Highway to provide for domestic and fire protection services. The required water meter size will be determined at the time the building permit is applied for. At the present time, the Department of Water Supply (DWS) cannot guarantee water for the project. The project may be subject to the Water Availability Ordinance which was recently passed by the Maui County Council. A water meter can be applied for and secured after the required improvements are installed, inspected and accepted by the DWS.

3.5 ELECTRIC, TELEPHONE AND CABLE TV

The proposed electrical, telephone and cable TV distribution systems for the subject project will be installed underground from the existing facilities along Hana Highway. The existing overhead utility lines along Hana Highway will remain overhead. All outdoor lighting will be in compliance with the applicable County lighting standards.

APPENDIX A
HYDROLOGIC CALCULATIONS

Hydrologic Calculations

Purpose: Determine the increase in surface runoff from the development of the proposed project based on a 50-year storm.

A. Determine the Runoff Coefficient (C):

PAVEMENT AREAS:

Infiltration (Negligible)	= 0.20
Relief (Flat)	= 0.00
Vegetal Cover (None)	= 0.07
Development Type (Pavement)	= <u>0.55</u>
	C= 0.82

ROOF AREAS:

Infiltration (Negligible)	= 0.20
Relief (Hilly)	= 0.06
Vegetal Cover (None)	= 0.07
Development Type (Roof)	= <u>0.55</u>
	C= 0.88

LANDSCAPED AREAS:

Infiltration (Medium)	= 0.07
Relief (Flat)	= 0.00
Vegetal Cover (High)	= 0.00
Development Type (Landscape)	= <u>0.15</u>
	C= 0.22

<u>EXISTING CONDITION (SITE):</u>

Pavement Areas = 0.13 Acres
Landscaped Areas = 2.37 Acres

WEIGHTED C = 0.25

<u>EXISTING CONDITION (HANA HIGHWAY):</u>

Pavement Areas = 0.45 Acres
Landscaped Areas = 0.14 Acres

WEIGHTED C = 0.68

DEVELOPED CONDITION:

Roof Areas = 0.92 Acres
Paved Areas = 0.42 Acres
Landscaped Areas = 1.16 Acres

WEIGHTED C = 0.56

B. Determine the 50-year 1-hour rainfall:

i_{50} = 2.5 inches

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Condition (Site):

T_c = 16 minutes

I = 4.55 inches/hour

Existing Condition (Hana Highway):

T_c = 5 minutes

I = 5.91 inches/hour

Developed Condition:

T_c = 12 minutes

I = 5.04 inches/hour

C. Drainage Area (A) = 2.50 Acres (Site)

Drainage Area (A) = 0.59 Acres (Hana Highway)

D. Compute the 50-year storm runoff volume (Q):

Q = CIA

Existing Condition (Site):

Q = (0.25)(4.55)(2.50)

= 2.84 cfs

Existing Condition (Hana Highway):

Q = (0.68)(5.91)(0.59)

= 2.37 cfs

Developed Conditions:

Q = (0.56)(4.78)(2.50)

= 6.69 cfs

The increase in runoff due to the proposed development is 6.69 - 2.84 = 3.85 cfs. The required onsite storage volume required to accommodate the increase in runoff generated from the proposed project is 5,615 cubic feet - 2,728 cubic feet = 2,887 cubic feet.

Hydrograph Plot

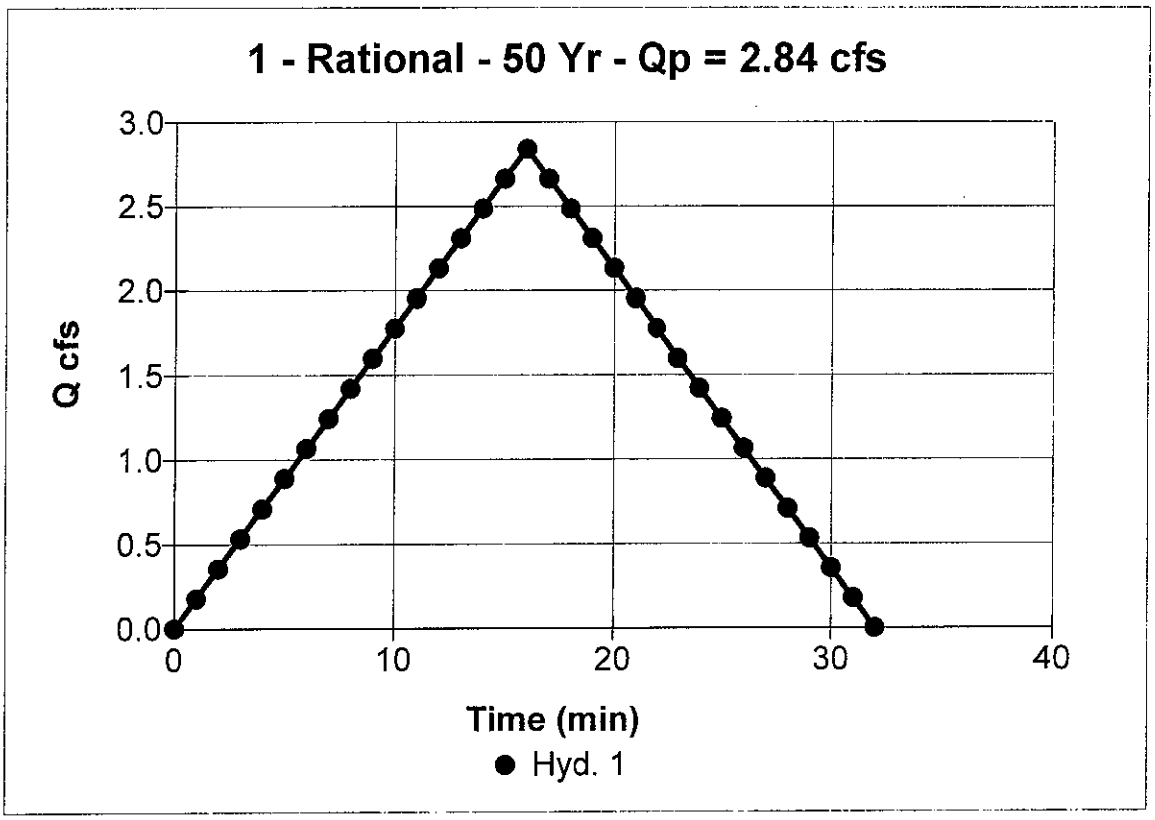
English

Hyd. No. 1

EXISTING CONDITION (SITE)

Hydrograph type	= Rational	Peak discharge	= 2.84 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 2.5 ac	Runoff coeff.	= 0.25
Intensity	= 4.55 in	Time of conc. (Tc)	= 16 min
I-D-F Curve	= 2-5.IDF	Reced. limb factor	= 1

Total Volume = 2,728 cuft



Hydrograph Plot

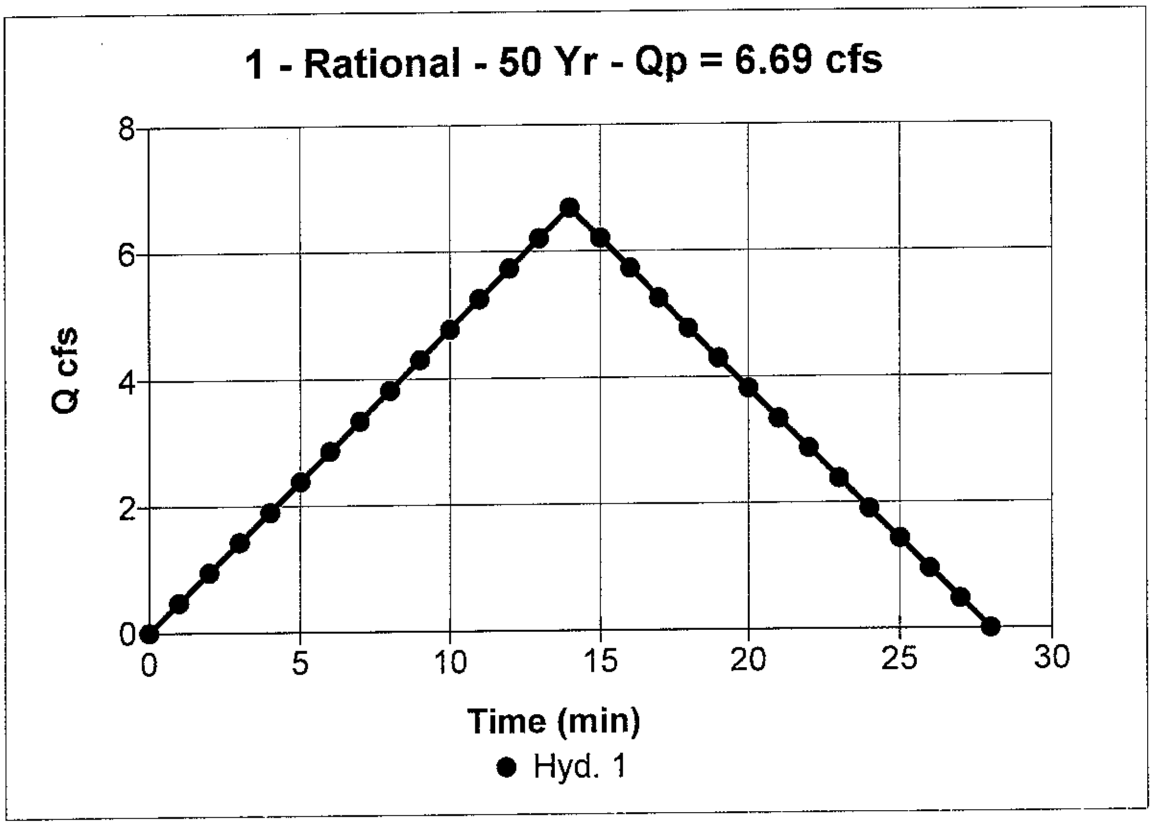
English

Hyd. No. 1

DEVELOPED CONDITION

Hydrograph type	= Rational	Peak discharge	= 6.69 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 2.5 ac	Runoff coeff.	= 0.56
Intensity	= 4.78 in	Time of conc. (Tc)	= 14 min
I-D-F Curve	= 2-5.IDF	Reced. limb factor	= 1

Total Volume = 5,615 cuft



Hydrograph Plot

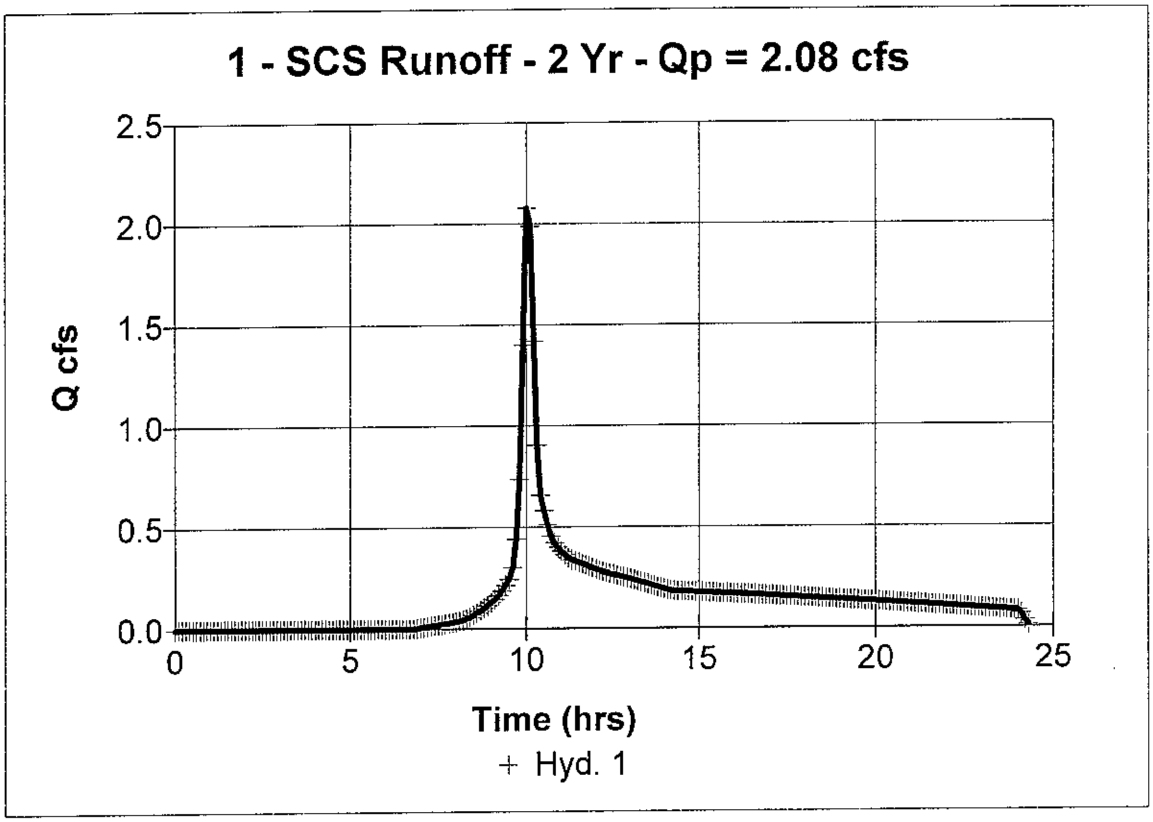
English

Hyd. No. 1

Maui Medical Plaza-Developed

Hydrograph type	= SCS Runoff	Peak discharge	= 2.08 cfs
Storm frequency	= 2 yrs	Time interval	= 6 min
Drainage area	= 2.50 ac	Curve number	= 81
Basin Slope	= 1.0 %	Hydraulic length	= 350 ft
Tc method	= USER	Time of conc. (Tc)	= 13.3 min
Total precip.	= 3.30 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484

Total Volume = 13,171 cuft



Hydrograph Plot

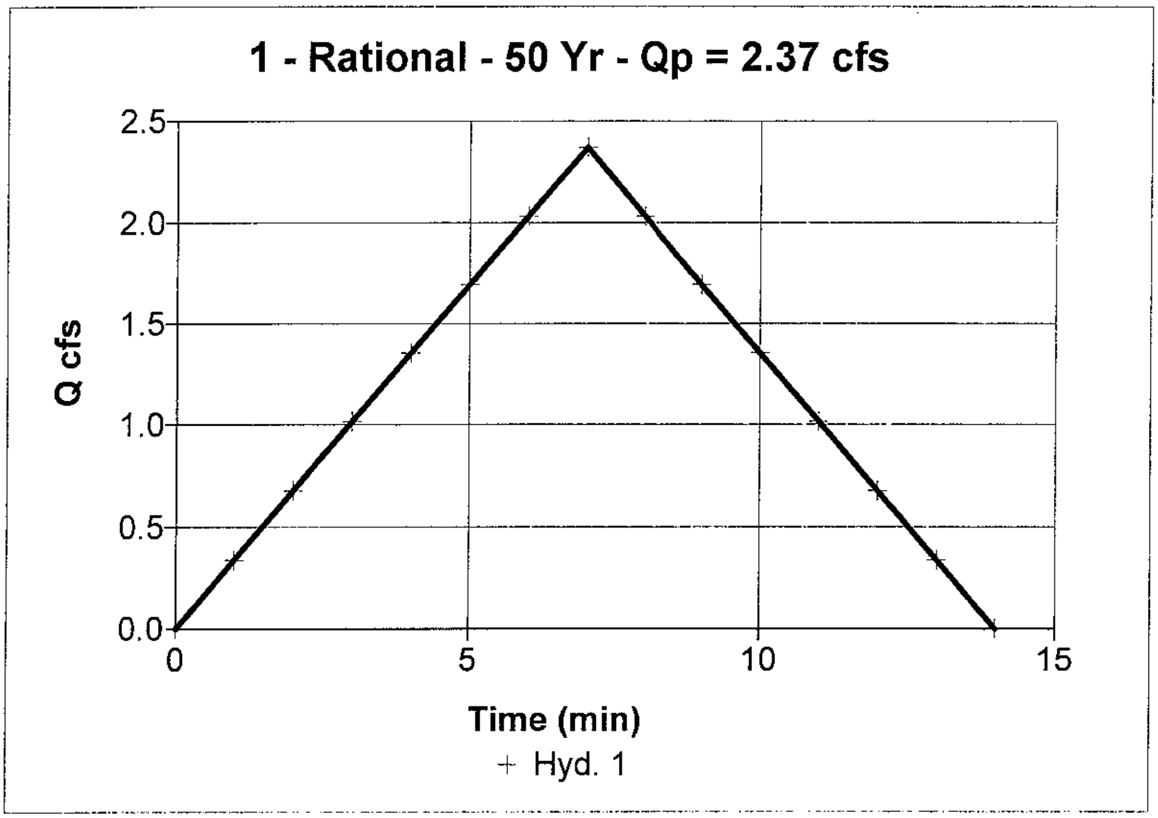
English

Hyd. No. 1

EXISTING CONDITION (HANA HIGHWAY)

Hydrograph type	= Rational	Peak discharge	= 2.37 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 0.6 ac	Runoff coeff.	= 0.68
Intensity	= 5.91 in	Time of conc. (Tc)	= 7 min
I-D-F Curve	= 2-5.IDF	Reced. limb factor	= 1

Total Volume = 996 cuft



APPENDIX B
WATER DEMAND CALCULATIONS

WATER DEMAND CALCULATIONS

Per 2002 Water System Standards:

Average Daily Demand (ADD) = 6,000 gallons per acre for commercial use

ADD = (6,000 gal/acre) (2.50 acres) = 15,000 gpd

APPENDIX C
WASTEWATER CALCULATIONS

WASTEWATER CALCULATIONS

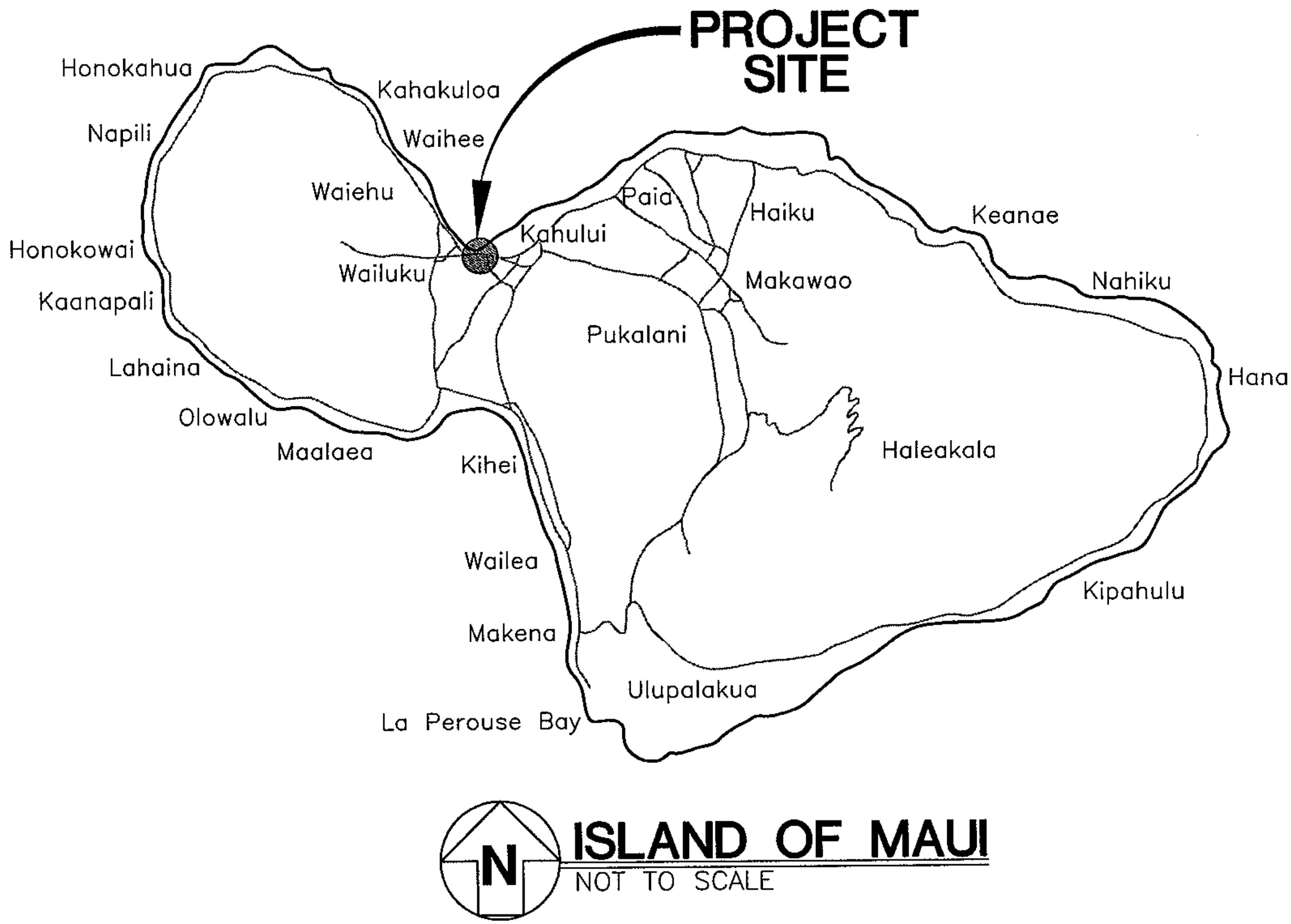
Per the 2000 Wastewater Flow Standards:

Wastewater Contribution for Office use is 20 gallons/employee/day

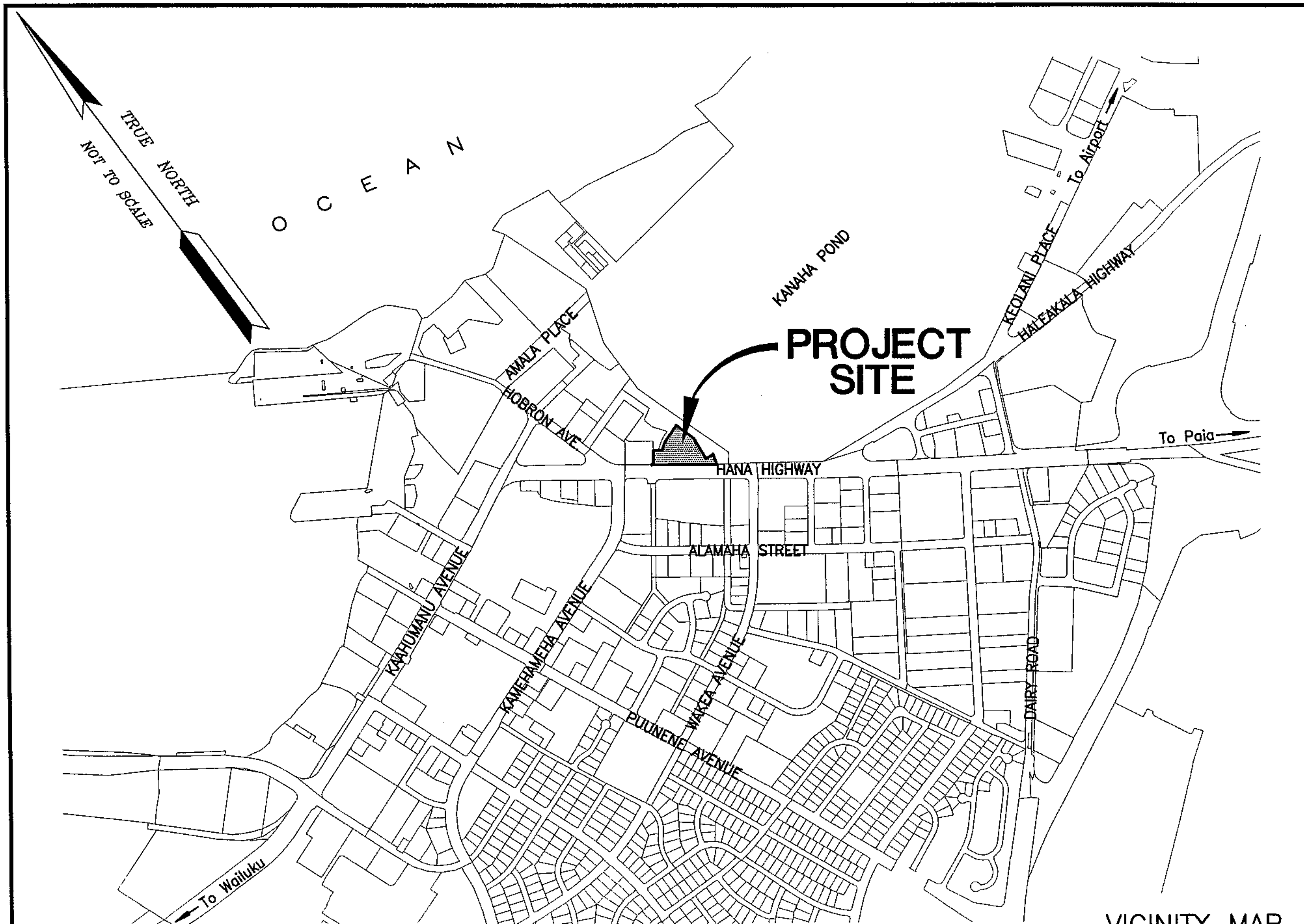
When fully occupied, the Maui Medical Plaza at Kanaha is expected to accommodate up to 200 medical professionals and staff.

Wastewater Contribution = (200 employees) x (20 gallons/employee/day)
= 4,000 gpd

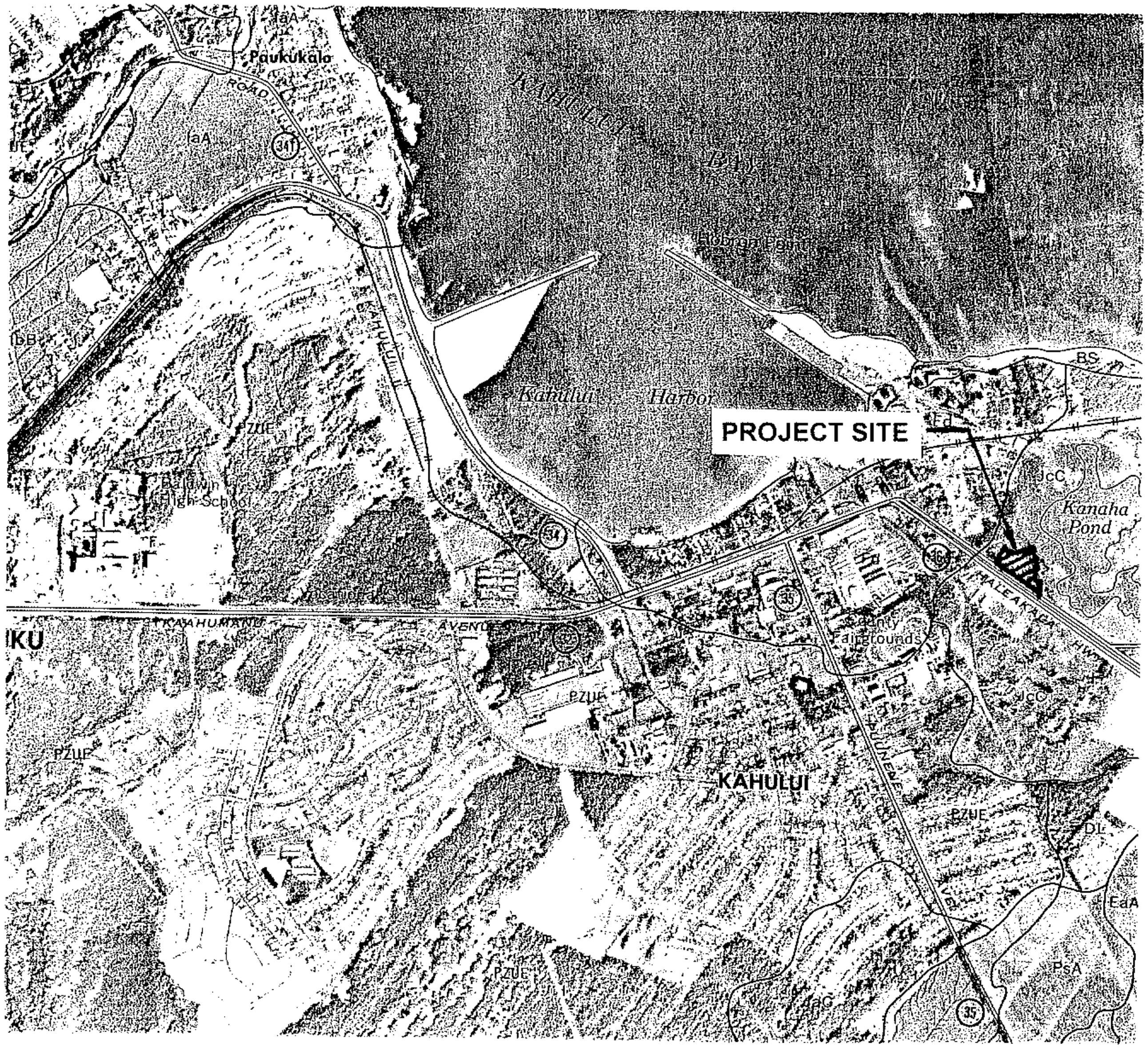
EXHIBITS



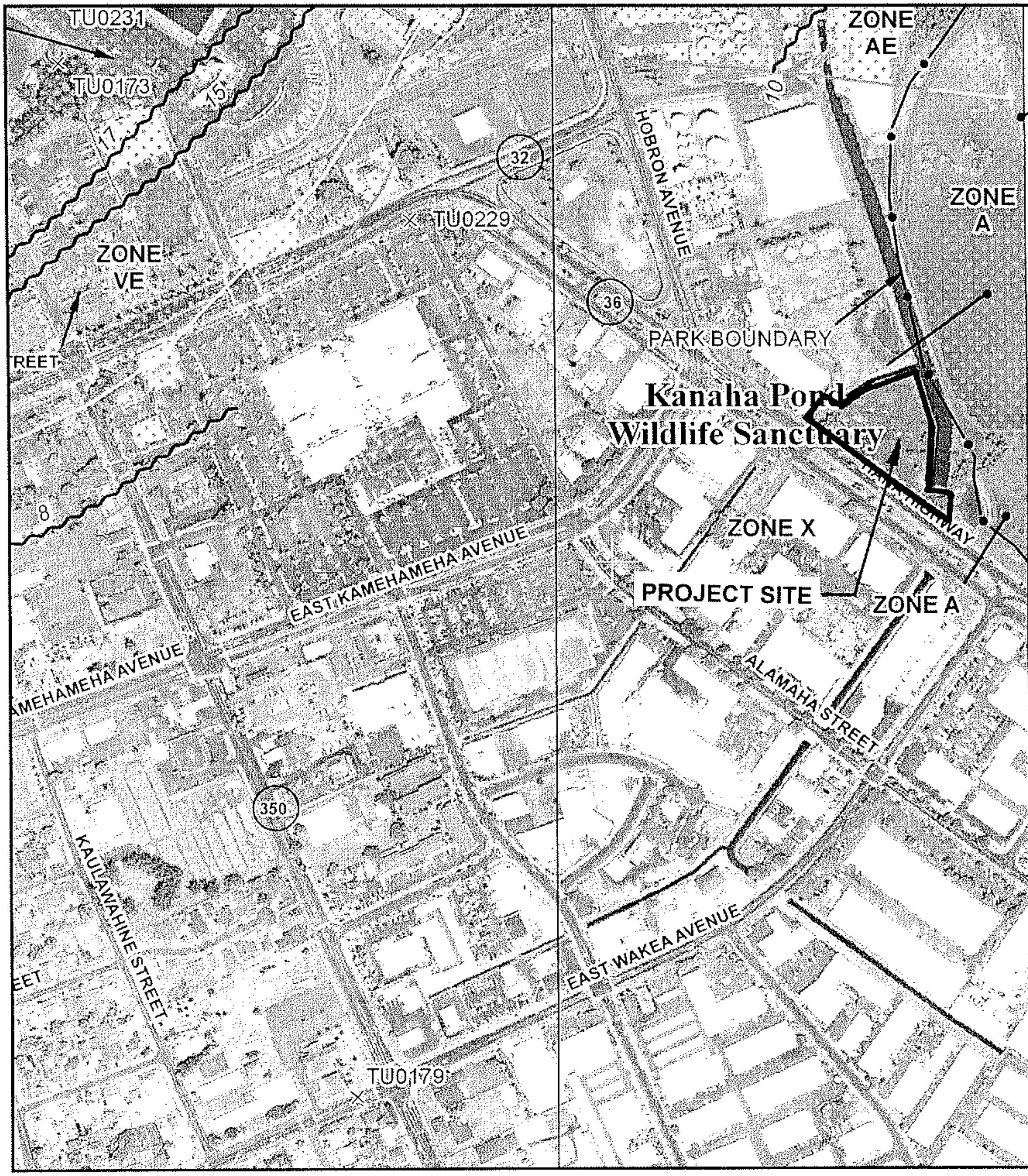
LOCATION MAP
EXHIBIT 1



VICINITY MAP
EXHIBIT 2



SOIL SURVEY MAP
EXHIBIT 3



od Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

50 0 500 1000 FEET

METER

NFIP NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0392E

FIRM

FLOOD INSURANCE RATE MAP

MAUI COUNTY, HAWAII

PANEL 392 OF 825

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
MAUI COUNTY	150003	0392	E

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community

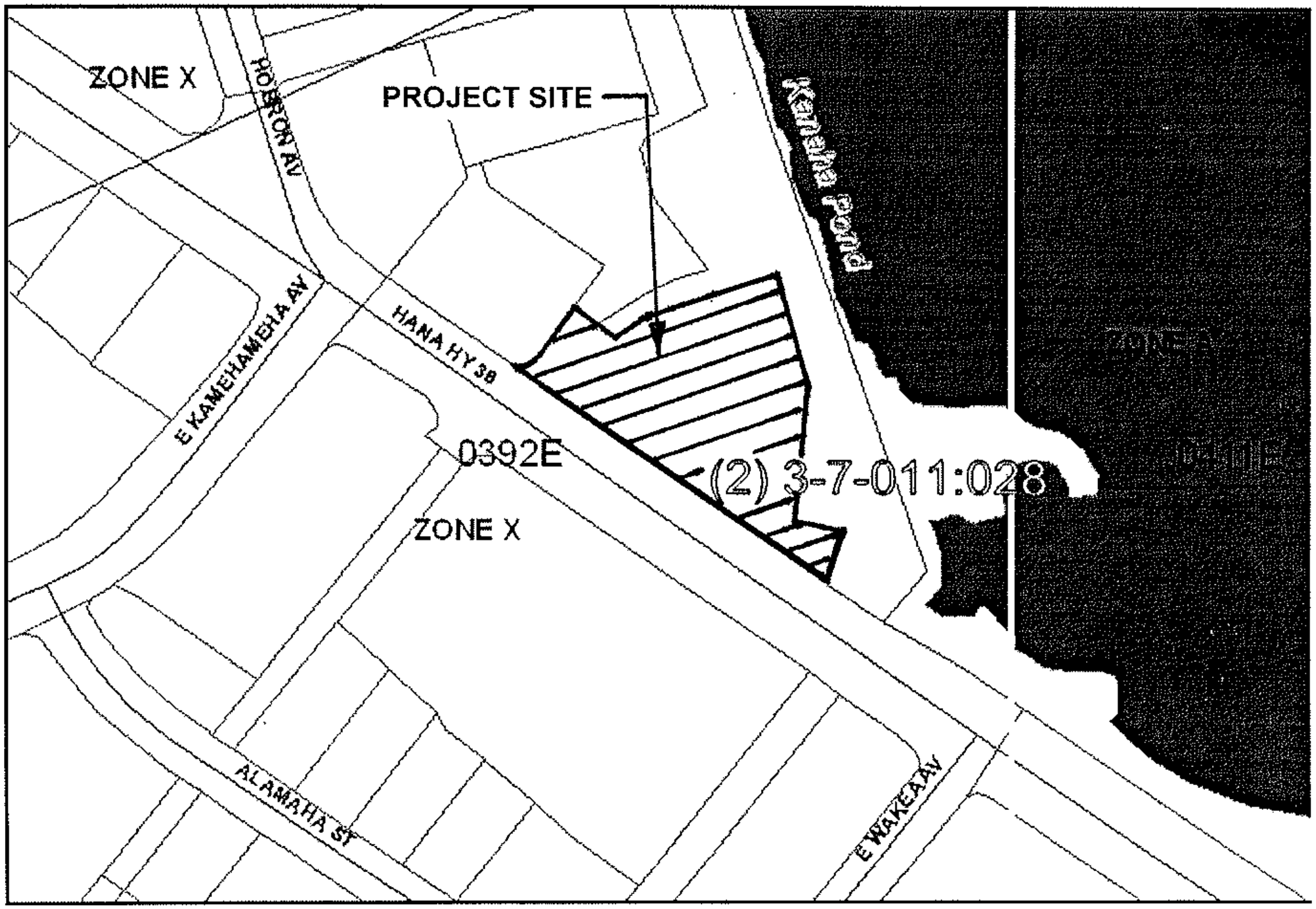
MAP NUMBER
1500030392E

MAP REVISED
SEPTEMBER 25, 2009

Federal Emergency Management Agency

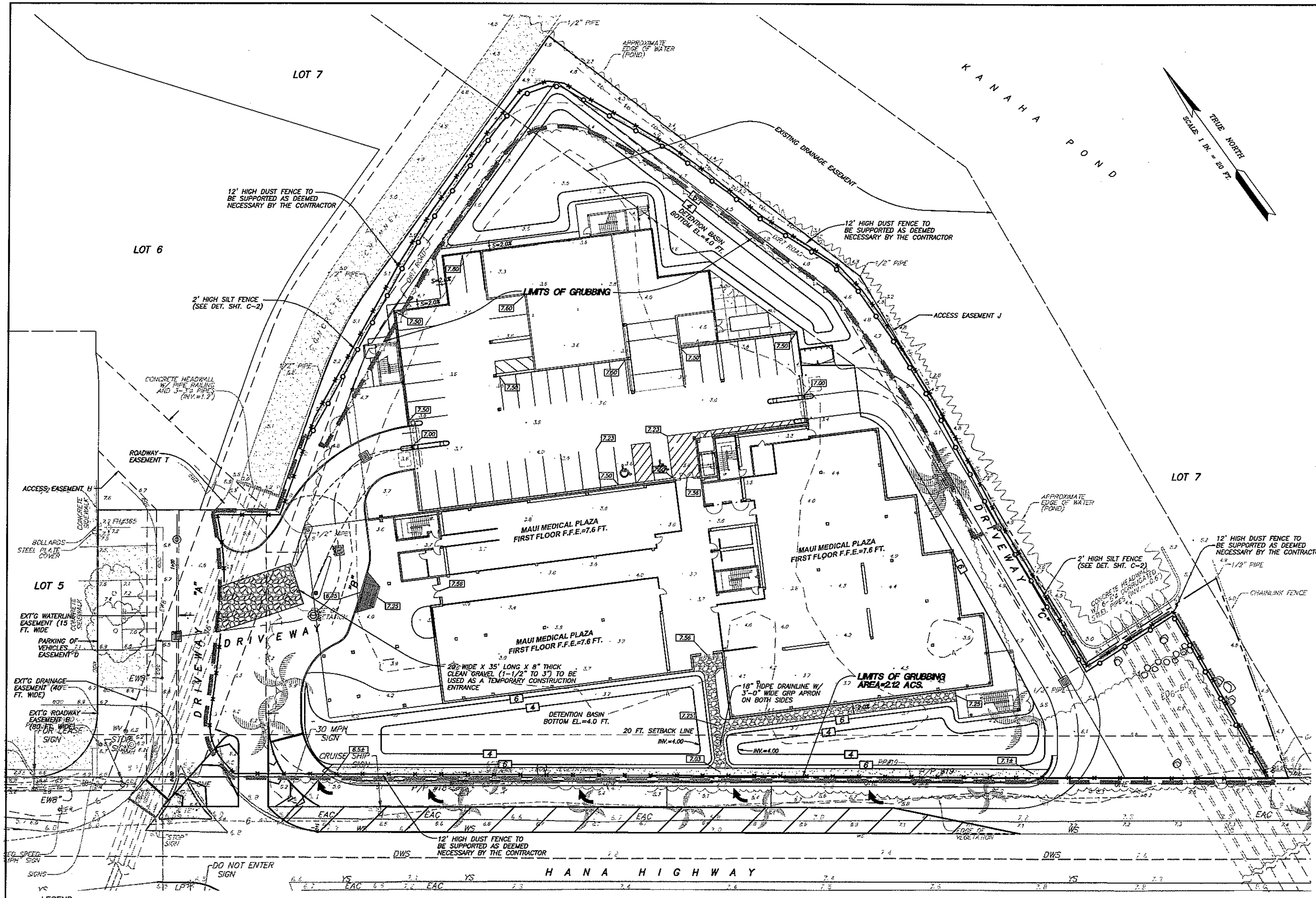
This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

FLOOD INSURANCE RATE MAP
EXHIBIT 4



County: **MAUI** TMK: **(2) 3-7-011:028** Address: **151 HANA HWY** LOMC: **NONE**

ENLARGED FLOOD MAP
EXHIBIT 5



LEGEND:

300.0	EXISTING GRADE SPOT ELEVATION
300	EXISTING CONTOUR LINE
300	FINISH GRADE CONTOUR LINE
	DIRECTION OF EXISTING ONSITE RUNOFF
	12' HIGH DUST FENCE
	2' HIGH SILT FENCE
	TEMPORARY CONSTRUCTION ACCESS

GRADING & BMP PLAN
SCALE: 1 IN. = 20 FT.

APPROXIMATE EARTHWORK QUANTITIES

THE EARTHWORK QUANTITIES SHOWN HEREIN ARE FOR SECURING THE GRADING PERMIT ONLY. THE CONTRACTOR SHALL VERIFY THE QUANTITIES AND COMPLETE THE GRADING AS SHOWN ON THE PLAN.

CLEARING AND GRUBBING = 2.12 ACRES±
EMBANKMENT = 6,456 C.Y.
EXCAVATION = 144 C.Y.

OTOMO ENGINEERING, INC.
CONSULTING CIVIL ENGINEERS
305 S. HIGH STREET, STE. 102
WAILUKU, MAUI, HAWAII 96793
PHONE: (808) 242-0032
FAX: (808) 242-5779

STACY A. OTOMO LICENSED PROFESSIONAL ENGINEER No. 5115-C HAWAII, U.S.A.

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. ("OBSERVATION OF CONSTRUCTION" AS DEFINED UNDER SECTION 16-115-2 OF THE HAWAII ADMINISTRATIVE RULES, PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS.

Stacy A. Otomo 10-5-09
SIGNATURE DATE

NOTE: THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS AT THE JOB SITE BEFORE PROCEEDING WITH THE WORK.

MAUI MEDICAL PLAZA
TMK: (2) 3-7-11: 28
KAHULUI, MAUI, HAWAII
GRADING & BMP PLAN

REVISION	DATE	NOTE
△		
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△		
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△		

DESIGNED BY: S.A.O.
DRAWN BY: L.C.O.
PROJECT NO.: 2006-52
DRAWING NAME: GRAD-00
DATE: 10-5-09 (PERMIT SUBMITTAL)

SHEET NO.
C-2.1
OF SHEETS

APPENDIX E.

Biological Resources Survey

BIOLOGICAL RESOURCES SURVEY

for the

KANAHA LOT 8 PROJECT

KANAHA, KAHULUI, MAUI

by

ROBERT W. HOBDY
ENVIRONMENTAL CONSULTANT
Kokomo, Maui
September 2006

Prepared for:
Kanaha Professional Plaza, LLC
8056 Molt Road, Billings, MT 59106

KANAHA, KAHULUI, MAUI

INTRODUCTION

The Kanahā Industrial Subdivision Lot 8 property lies on 2.5 acres TMK (2 3-7-11:028) of undeveloped land in central Maui (Figure 1). The property is bounded on the east by a 50 foot wide drainage canal and levee (Lot 7) that separates it from the Kanahā Pond Wildlife Sanctuary, is bounded on the north by a 20 foot wide drainage canal and levee, and is bounded on the southwest by Hāna Highway (Figure 2).

SITE DESCRIPTION

The terrain within the project area is nearly level. It is situated on a low-lying coastal plain near to (but separate from) a large wetland area. Elevations range from 3 feet above sea level in the central part of the property up to 5 and 6 feet above sea level on the peripheral levees and Hāna Highway. The soils on the property are entirely Jaucus Sand, Saline, 0-12% (JcC) (Foote et al, 1972). This soil occurs near the ocean where the water table is near the surface and where salts have accumulated. These soils can become temporarily inundated following heavy rainfall events. Rainfall in this area averages 20-25 inches per year with the bulk falling between November and March (Armstrong, 1983).

PHYSICAL AND BIOLOGICAL HISTORY OF THE AREA

Kanahā Pond and its twin pond, Mau'oni, were built in the middle 1500's by Kiha a Pi'ilani, the King of Maui, taking advantage of a natural wetland at this location. A chant celebrates this feat and mentions a stone wall that separated the lower pond, Mau'oni, from the upper pond, Kanahā. The earliest map, dated September 1881, that accurately depicts the ponds and the Kahului coastline prior to any major land alterations (Figure 3) shows their location and shape and the placement of the stone wall. The pond extended to a narrow arm on its northwestern corner where an outlet (not shown on the map) was said to have connected to the ocean near an old landing just west of the present Pier 1. A small estuary still exists here alongside of the canoe hale. The same general pond configuration continued up through 1910 when Kahului Harbor was dredged (Figure 4).

When Kahului Harbor was dredged, great amounts of coral and sand were removed and spread out along the shoreline from the intersection of Ka'ahumanu Avenue and Kahului Beach Road to eastward of Hobron Point. The extent of the depositions of fill material is documented in the previously cited Soil Survey of Islands of Kaua'i, O'ahu, Maui, Moloka'i and Lāna'i, State of Hawai'I (Foote et al, 1972) (Figure 5). This deposition of fill raised the ground surface several feet, turning what must have been low-lying saline flats into dry land. Apparently buried during the process was the western arm of the lower pond which extended over to the present Hobron Lane. All maps since this time show the pond in this reduced configuration. At no time since 1881, according to maps, photos and soils data, does it appear that the subject property was either covered with fill from Kahului Harbor or included within the permanently inundated expanse of Kanahā Pond. It lies within an intermediate area between the filled land and the pond, albeit rather close to both (Figure 6).

During the late 1970's a Corps of Engineers approved project saw the development of a network of drainage canals that channeled ground water out of the Kahului Industrial Area, along the western edge of Kanahā Pond and out to the ocean (Figure 7). This network of canals was constructed along the east and north sides of the subject property further isolating it from the permanent wetlands in the Wildlife Sanctuary. During the construction of these canals dredged material was deposited on both sides of the canal to create levees and to discard excess material. This material was leveled to create a narrow access road along each side of the canal, but additional material outside of the road was not leveled and has created a raised berm. The raised roadway and berm deposits have resulted in a 25-30 foot wide ring bordering the north and east sides of the subject property. There is also a raised manmade bank along the southwest side of the property where a slope rises to the grade of the Hāna Highway.

During the past 25 years this property has lain idle and is now densely overgrown with non-native shrubs, sourbush (*Pluchea indica*), grasses, seashore saltgrass (*Distichlis spicata*) and a few scattered trees, Kiawe (*Prosopis pallida*) and date palm (*Phoenix x dactylifera*) (Figure 8).

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the Kanahā Lot 8 property which was conducted in June, 2006. The objectives of the survey were to:

1. Document what plant, bird and mammal species occur on the property or may likely occur in the existing habitat.
2. Document the status and abundance of each species.
3. Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.
4. Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.
5. Note which aspects of the proposed development pose significant concerns for plants or for wildlife and recommend measures that would mitigate or avoid these problems.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey was conducted on all parts of this small property. Areas most likely to harbor native plants such as drainage canal margins were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

The majority of the area is nearly monotypic dense shrubland of Indian fleabane (*Pluchea indica*). Interspersed within it and along the disturbed margins are patches of seashore saltgrass (*Distichlis spicata*) and Bermuda grass (*Cynodon dactylon*). A few trees: Kiawe (*Prosopis pallida*) and hybrid datepalm (*Phoenix x dactylefera*) are scattered across the property, and a few wetland plants: kaluhā (*Bolboschoenus maritimus subsp. paludosus*) and ‘ae’ae (*Bacopa monnieri*) can be found along the canal margins. Thirty two plant species were recorded during the survey. Five species were indigenous to Hawaii as well as to other areas; kaluhā, ‘ae’ae, ‘akulikuli (*Sesuvium potulacastrum*), kipukai (*Heliotropium curassavicum*) and popolo (*Solanum americanum*). These are all of common occurrence. The remaining 27 plant species were all weeds or landscape species.

DISCUSSION AND RECOMMENDATIONS

The project area consists of a highly altered environment dominated by introduced plants and weeds. No Federally listed Endangered or Threatened plant species (USFWS, 1999) occur on the property nor were any plants that are candidates for such status observed. No special plant habitats were found on the property either, although important wetland vegetation does occur in the nearby Kanahā Pond Wildlife Sanctuary.

From a vegetation standpoint there is little of interest or concern regarding this property in its current state, and any proposed land use changes are not expected to have a significant negative impact on the botanical resources in this part of Maui.

No recommendations are deemed appropriate regarding the vegetation on this property.

PLANT SPECIES LIST

Following is a checklist of all those vascular plant species inventoried during the field studies. Plant families are arranged alphabetically within each of two groups: Monocots and Dicots. Monocots and Dicots are in accordance with Wagner et al. (1999) and Staples and Herbst (2005).

For each species, the following information is provided:

1. Scientific name with author citation

2. Common English or Hawaiian name.
3. Bio-geographical status. The following symbols are used:
   endemic = native only to the Hawaiian Islands; not naturally occurring anywhere else in the world.
   indigenous = native to the Hawaiian Islands and also to one or more other geographic area(s).
   non-native = all those plants brought to the islands intentionally or accidentally after western contact.
4. Abundance of each species within the project area:
   abundant = forming a major part of the vegetation within the project area.
   common = widely scattered throughout the area or locally abundant within a portion of it.
   uncommon = scattered sparsely throughout the area or occurring in a few small patches.
   rare = only a few isolated individuals within the project area.

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
MONOCOTS			
ARECACEAE (Palm Family)			
Phoenix x dactylifera	hybrid date palm	non-native	uncommon
Washingtonia filifera (Andre) S. Watson	California washingtonia	non-native	rare
CYPERACEAE (Sedge Family)			
Bolboschoenus maritimus (L.) Palla subsp. paludosus (A.Nels) T.Koyama	kaluhā	indigneous	rare

POACEAE (Grass Family)			
Brachiaria mutica (Forssk.) Stapf	California grass	non-native	rare
Cenchrus ciliaris L.	buffelgrass	non-native	uncommon
Cenchrus echinatus L.	common sandbur	non-native	rare
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	uncommon
Distichlis spicata (L.) Greene	seashore saltgrass	non-native	uncommon
DICOTS			
ACANTHACEAE (Acanthus Family)			
Asystasia gangetica (L.) T. Anderson	Chinese violet	non-native	rare
AIZOACEAE (Fig-marigold Family)			
Sesuvium potulacastrum (L.) L.	'akulikuli	indigenous	uncommon
ASTERACEAE (Sunflower Family)			
Bidens pilosa L.	Spanish needle	non-native	rare
Conyza bonariensis (L.) Cronq.	hairy horseweed	non-native	rare
Eclipta prostrata (L.) L.	false daisy	non-native	rare
Lactuca sativa L.	prickly lettuce	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	rare
Pluchea x fosbergii Cooperr. & Galang	-------------------	non-native	rare
Pluchea indica (L.) Less.	Indian fleabane	non-native	abundant
Sonchus oleraceus L.	pualele	non-native	rare
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	non-native	rare
BORAGINACEAE (Borage Family)			
Heliotropium curassavicum L.	kipukai	indigenous	rare
SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
Heliotropium procumbens Mill.	-------------------	non-native	rare
BRASSICACEAE (Mustard Family)			
Lepidium virginicum L.	pepperwort	non-native	rare
CARYOPHYLLACEAE (Pink Family)			
Spergularia marina (L.) Griseb.	saltmarsh sand spurry	non-native	uncommon
CHENOPODIACEAE (Goosefoot Family)			
Atriplex suberecta Verd.	-------------------	non-native	rare
Bassia hyssopifolia (Pall.) Kuntze	-------------------	non-native	uncommon
EUPHORBIACEAE (Spurge Family)			

Chamaesyce hirta (L.) Millsp.	hairy spurge	non-native	rare
FABACEAE (Pea Family)			
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Leuceaena leucocephala (Lam.) de Wit	koa haole	non-native	rare
Prosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	kiawe	non-native	uncommon
SCROPHULARIACEAE (Snapdragon Family)			
Bacopa monnieri (L.) Pennell	'ae'ae	indigenous	rare
SOLANACEAE (Nightshade Family)			
Solanum americanum Mill.	popolo	indigenous	rare

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. All parts of the project area were covered. Field observations were made with the aid of binoculars and by listening to vocalizations. Notes were made on species abundance, activities and location as well as observations of trails, tracks scat and signs of feeding. In addition an evening visit was made to the area to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat (*Lasiurus cinereus semotus*) in the area.

RESULTS

MAMMALS

No mammals were observed during four site visits to the property. Not seen but of expected occasional occurrence are such rodents as mice (*Mus domesticus*) and rats (*Rattus rattus*) as well as such predators as cats (*Felis catus*) and Mongoose (*Herpestes auropunctatus*) that hunt for and feed on the rodents. Also expected would be the occasional domestic dog (*Canis familiaris*) which might wander on to the property.

A special effort was made to look for the native Hawaiian hoary bat by making an evening survey of the area. When present in an area these bats can be easily identified as they forage for insects, their distinctive flight patterns clearly visible in the glow of twilight. No evidence of such activity was observed though visibility was excellent and plenty of flying insects were seen. This area does not represent ideal bat habitat and there have been no reports of bat sightings in the vicinity.

BIRDS

Birdlife was moderate but diversity was low on this small property. Just four species of non-native birds and one endemic waterbird were observed during four visits to the property. Taxonomy and nomenclature follow American Ornithologists' Union (2005).

<u>Common mynah</u> (*Acridotheres tristis*) – Mynas were common, usually in pairs or small groups in the kiawe trees or flying over the property.

<u>House sparrow</u> (*Passer domesticus*) - Sparrows were also common in small groups in the kiawe trees, chattering and feeding on small caterpillars.

<u>Spotted dove</u> (*Streptopelia chinensis*) – Several individuals of these large doves were seen flying over the property or landing in the trees.

<u>Zebra doves</u> (*Geopelia striatus*) – A few groups of these small doves were seen flying about and feeding in grassy clearings.

<u>Ae'o, Hawaiian Stilt</u> (*Himantopus mexicanus knudseni*) - A few ae'o were seen flying over the property at all times of the day. None of these Endangered birds were seen to land on the property as the dense brushy vegetation is unattractive as habitat for them. Ae'o are fairly common in the nearby Kanahā Pond Wildlife Sanctuary where there is ample habitat which is managed for these and other native waterbirds. Ae'o are opportunistic feeders that range widely searching for suitable habitat, even if temporary in nature. They also occasionally land in clearings near wetlands to rest and preen. They do use the nearby drainage channels as well as

Kanahā Pond so their presence in the neighborhood is on a regular basis even if it is only flying overhead.

Other birds that might occasionally occur on the property, but which were not seen, include House finch (*Carpodacus mexicanus*), Japanese white-eye (*Zosterops japonicus*), cattle egret (*Bubulcus ibis*) and the migratory Pacific golden plover (*Pluvialis fulva*). Other more strictly aquatic Endangered waterbirds that frequent Kanahā Pond, the 'alae ke'oke'o or Hawaiian coot (*Fulica alai*) and the koloa or Hawaiian duck (*Anas wyvilliana*), were not seen on the property and would not use it as habitat.

INSECTS

While insects in general were not tallied, one native Sphingid moth species, Blackburn's sphinx moth (*Manduca blackburni*), has been put on the Endangered Species list and this designation requires special focus (USFWS, 2000). Blackburn's sphinx moth occurs on Maui and is known from nearby areas. Its native host plants are native species of 'aiea (*Nothocestrum spp.*) and a non-native alternative host species is tree tobacco (*Nicotiana glauca*). None of these host species occur on or near this property and no Blackburn's sphinx moth or their larvae were observed.

DISCUSSION

Fauna surveys are seldom comprehensive due to the short window of observation, the seasonal nature of animal activities and the usually unpredictable nature of their daily movements. This survey might have yielded a greater diversity of non-native mammals and lowland birds had it been expanded and included observations at other times of the year, but it would be unlikely to have turned up any species that would have been of environmental concern.

No Endangered species were seen on or using the property. One Endangered species, the ae'o or Hawaiian stilt, was observed flying overhead and other Endangered waterbirds are known to breed and nest in the nearby Kanahā Pond Wildlife Sanctuary. These occurrences and this proximity requires consideration and discussion to evaluate potential threats to these native birds and their habitat.

Kanahā Pond Wildlife Sanctuary has been in place for nearly 50 years, and during that time Kahului has grown around it to include an airport, industrial area businesses, parks and highways. During the early years the waterbirds struggled to survive, but not because of human activities but because of predation by cats, mongoose, dogs and rodents. When fencing and predator control programs were instituted, the waterbirds in Kanahā Pond started to recover and are now doing fairly well. These birds have adapted to human activities and can be seen daily feeding in ponds alongside highways and industrial activities with minimal apparent adverse effect.

It would appear that as long as there are adequate buffers between the birds habitat and human activities, and possible pollutants, that the birds will be fine. These buffers need to be both spatial as well as visual to be successful.

The main drainage channel to the east of this property provides a buffer between it and Kanahā Pond that is about 100 feet wide. The levee on the Kanahā Pond side of the channel is high enough that it also makes a visual barrier so that one cannot see the water or the birds in it from the property and vice versa. Buffering thus appears to be reasonable.

The drainage channel constructed was designed to remove excess surface and ground water from the Kahului Industrial Area. In so doing it undoubtedly transports some minor levels of road generated pollutants through the canal to the ocean. The levee on the east side of the channel prevents the direct intermixing of these waters with the pond and thus provides another level of buffering. None-the-less it would be important to prevent the addition of any significant pollutants into this drainage system.

The property was recently evaluated for wetland status and was found to largely qualify as a wetland by Corps of Engineers standards, based on its vegetation, shallow water table and waterlogged soils. This wetland status is somewhat marginal, however, because the property only maintains temporary surface water for less than 1% of the time following large rainfall events and the ground is covered by dense brush. The property has been in this condition for over 100 years, not quite an open water habitat, but qualifying as a wetland by proximity and marginal conditions. With the development of the drainage canal system nearly 40 years ago, this property was functionally separated from the larger wetland ecosystem and its natural ground water drainage pattern has been altered.

The property is not suitable as waterbird habitat in its present condition and none of the Endangered waterbirds were observed using it. It is serving no use in this capacity and is likely to do so indefinitely. Its only value to waterbirds is as additional buffering of Kanahā Pond from Kahului.

In light of the above discussion it is felt that, should this property be developed, it would not result in significant negative impacts to the adjacent wetland habitat and species if carefully designed and constructed.

RECOMMENDATIONS

If this property is to be approved for development the following recommendations are offered.

1. Buildings be placed with their backs to the drainage canal so that human use is concentrated on the Kahului side.

2. A tall hedge be planted along the drainage canal boundary to provide a visual barrier between the Kanahā Pond Wildlife Sanctuary and the project structures.

3. That material and chemical pollutants be carefully managed in the construction and use of the facilities.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within one group: Birds. For each species the following information is provided:

1. Common name

2. Scientific name

3. Bio-geographical status. The following symbols are used:

   endemic = native only to Hawaii; not naturally occurring anywhere else in the world.
   indigenous = native to the Hawaiian Islands and also to one or more

other geographic area(s).

non-native = all those animals brought to Hawaii intentionally or accidentally after western contact.

migratory = spending a portion of the year in Hawaii and a portion elsewhere. In Hawaii the migratory birds are usually in the overwintering/non-breeding phase of their life cycle.

4. Abundance of each species within the project area:

abundant = many flocks or individuals seen throughout the area at all times of day.

common = a few flocks or well scattered individuals throughout the area.

uncommon = only one flock or several individuals seen within the project area.

rare = only one or two seen within the project area.

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
BIRDS			
Common myna	*Acridotheres tristis*	non-native	common
House sparrow	*Passer domesticus*	non-native	common
Spotted dove	*Streptopelia chinensis*	non-native	common
Zebra dove	*Geopelia striata*	non-native	uncommon
Ae'o, Hawaiian stilt	*Himantopus mexicanus knudseni*	endemic	uncommon

Literature Cited

American Ornithologists' Union 2005. Check-list of North American Birds. 7th edition. American Ornithologists' Union. Washington D.C.

Armstrong, R. W. (ed.) 1983. Atlas of Hawaii. (2^{nd}. ed.) University of Hawaii Press.

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Staples, G.W. and Dr. R. Herbst. 2005. A Tropical Garden Flora, Plants Cultivated in the Hawaiian Islands and other Tropical Places. Bishop Museum Press.

U.S. Fish and Wildlife Service. 1999. Endangered and threatened wildlife and

Plants. 50 CFR 17.11 & 17.12

U.S. Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants: determination of endangered status for Blackburn's sphinx moth from Hawaii. Federal Register 65(21): 4770-4779.

Wagner, W. L., D.R. Herbst, and S. H. Sohmer. 1999. Manual of the flowering plants of Hawai'i. Univ. of Hawai'I Press and Bishop Museum Press. Honolulu.

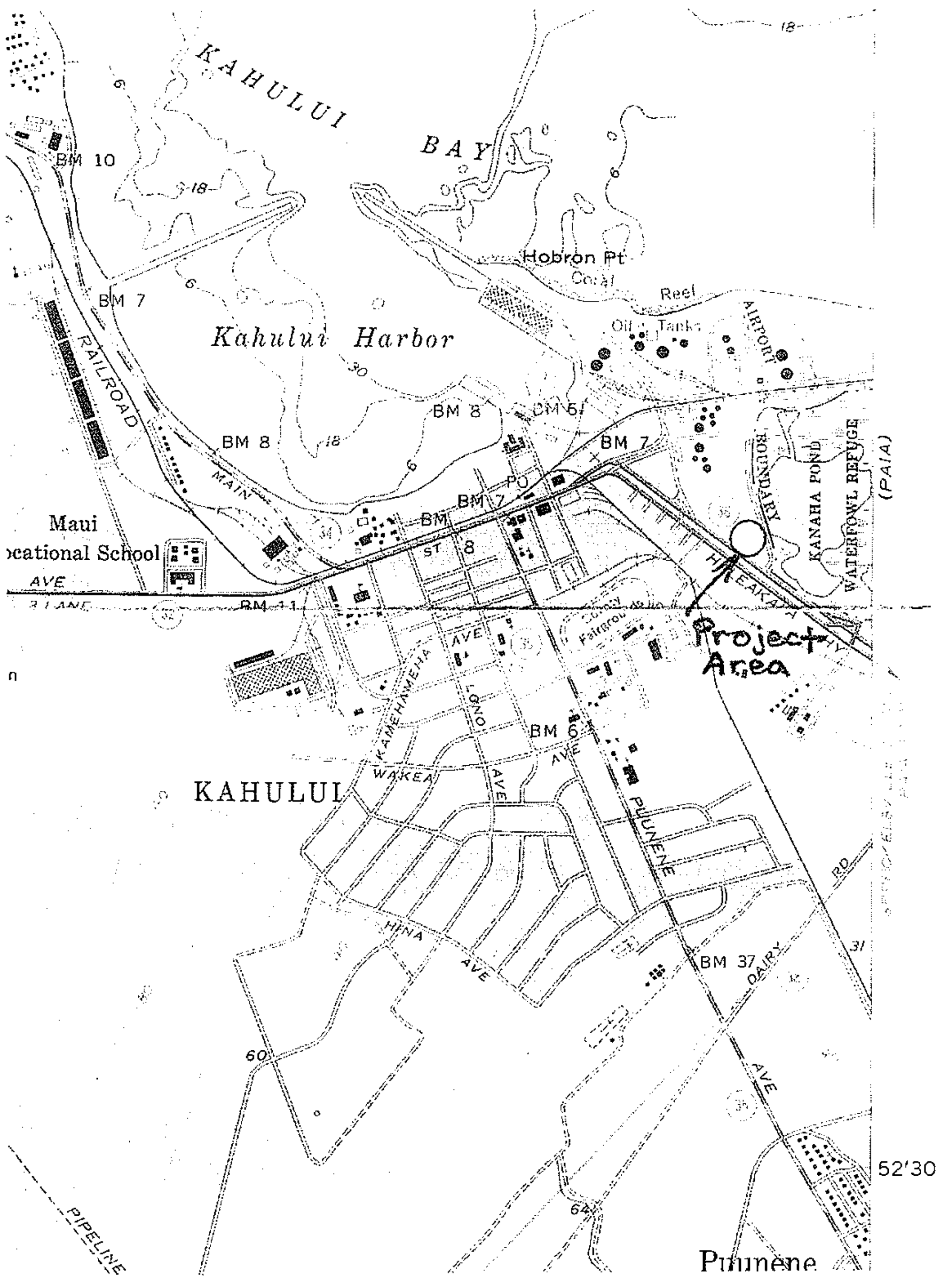


Figure 1 – USGS 1954 Wailuku Quadrant Map
Project Location – Kanahā, Kahului, Maui.

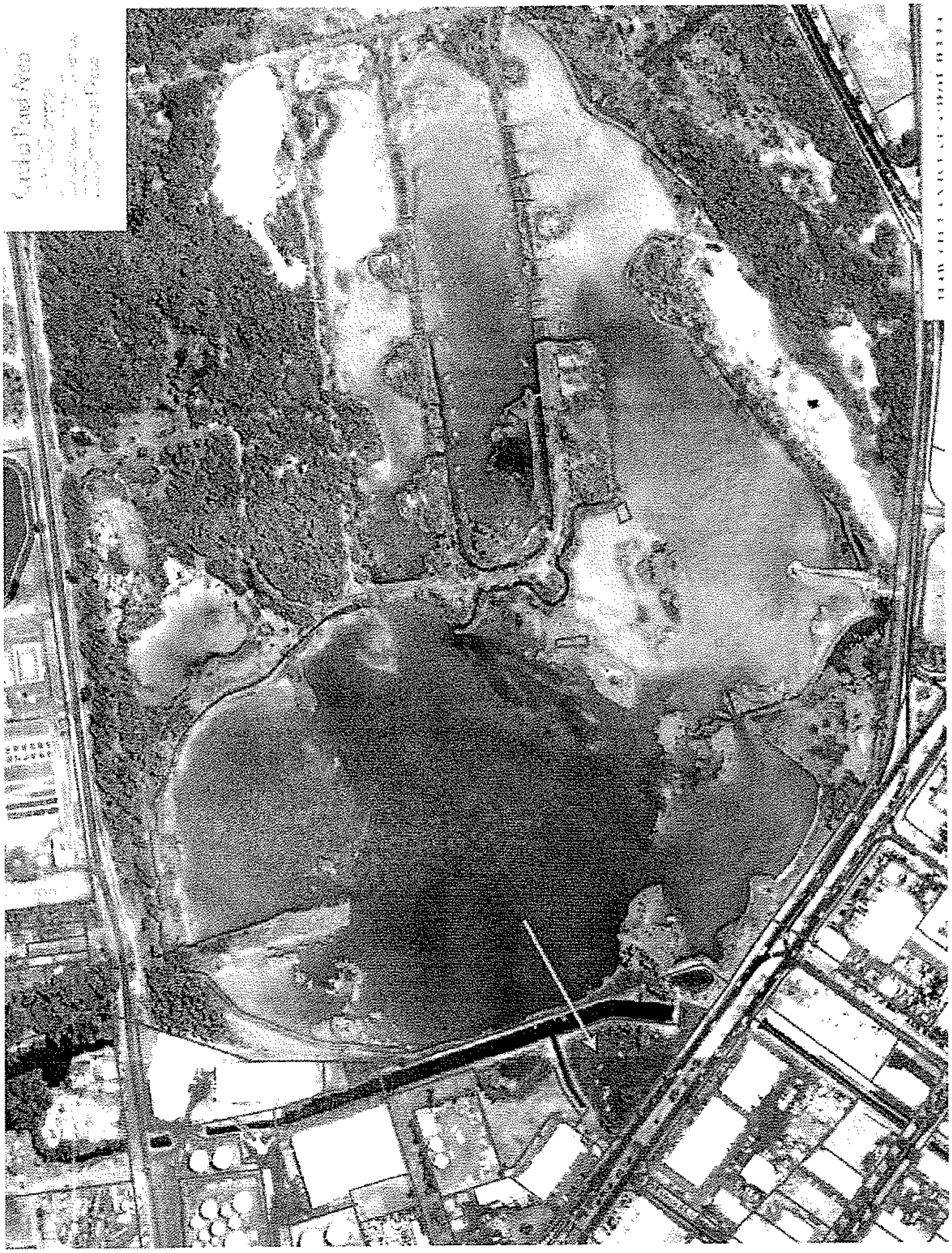


Figure 2 – Site Location – TMK (2) 3-7-011:028

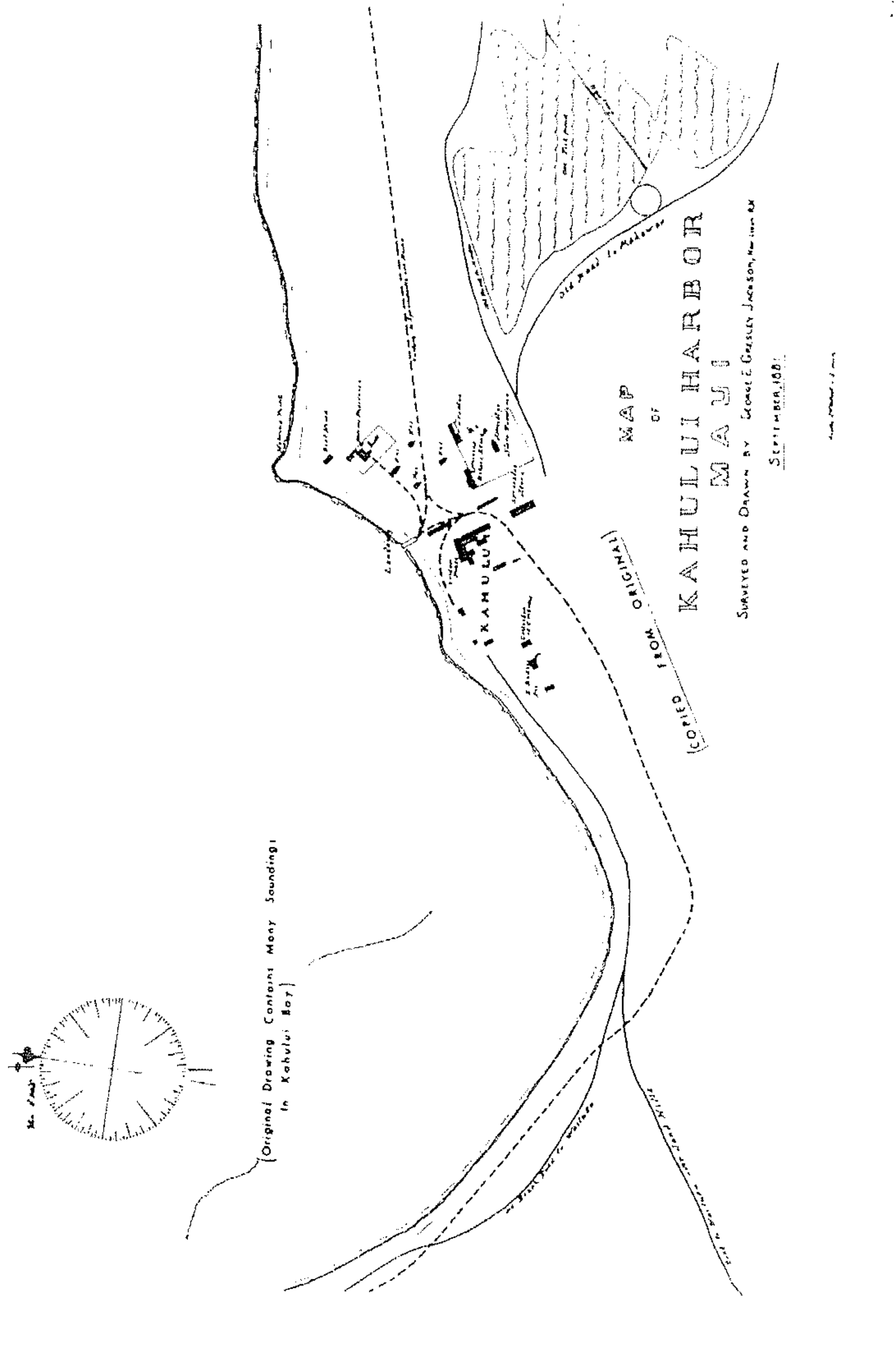


Figure 3 – Location of Kanahā – Mau'oni Pond relative to Kahului, in 1881.
Red circle = Project Location

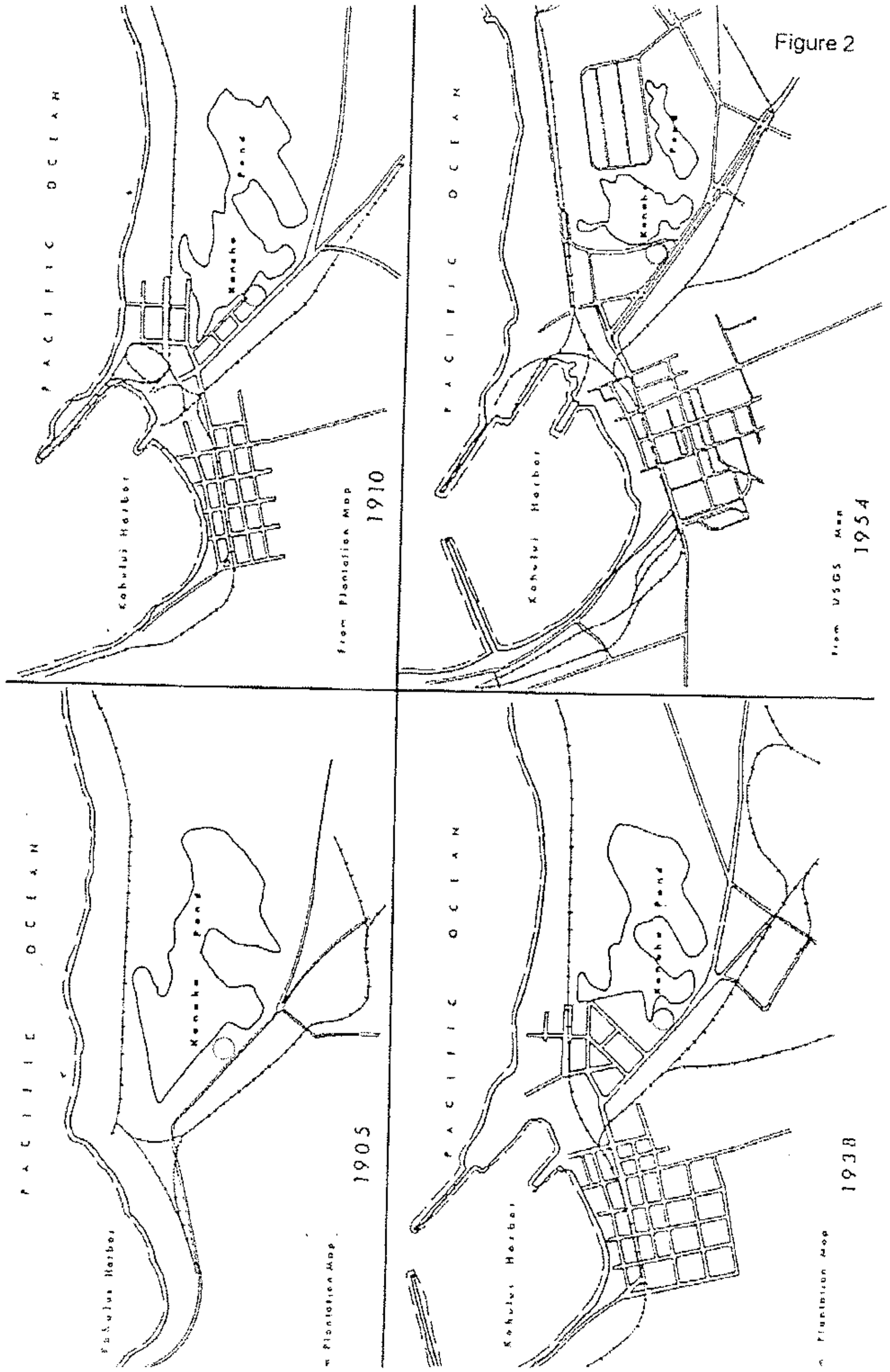


Figure 4 – Kahului and Kanahā Pond in 1905, 1910, 1938 & 1954.
Red circles = Project location

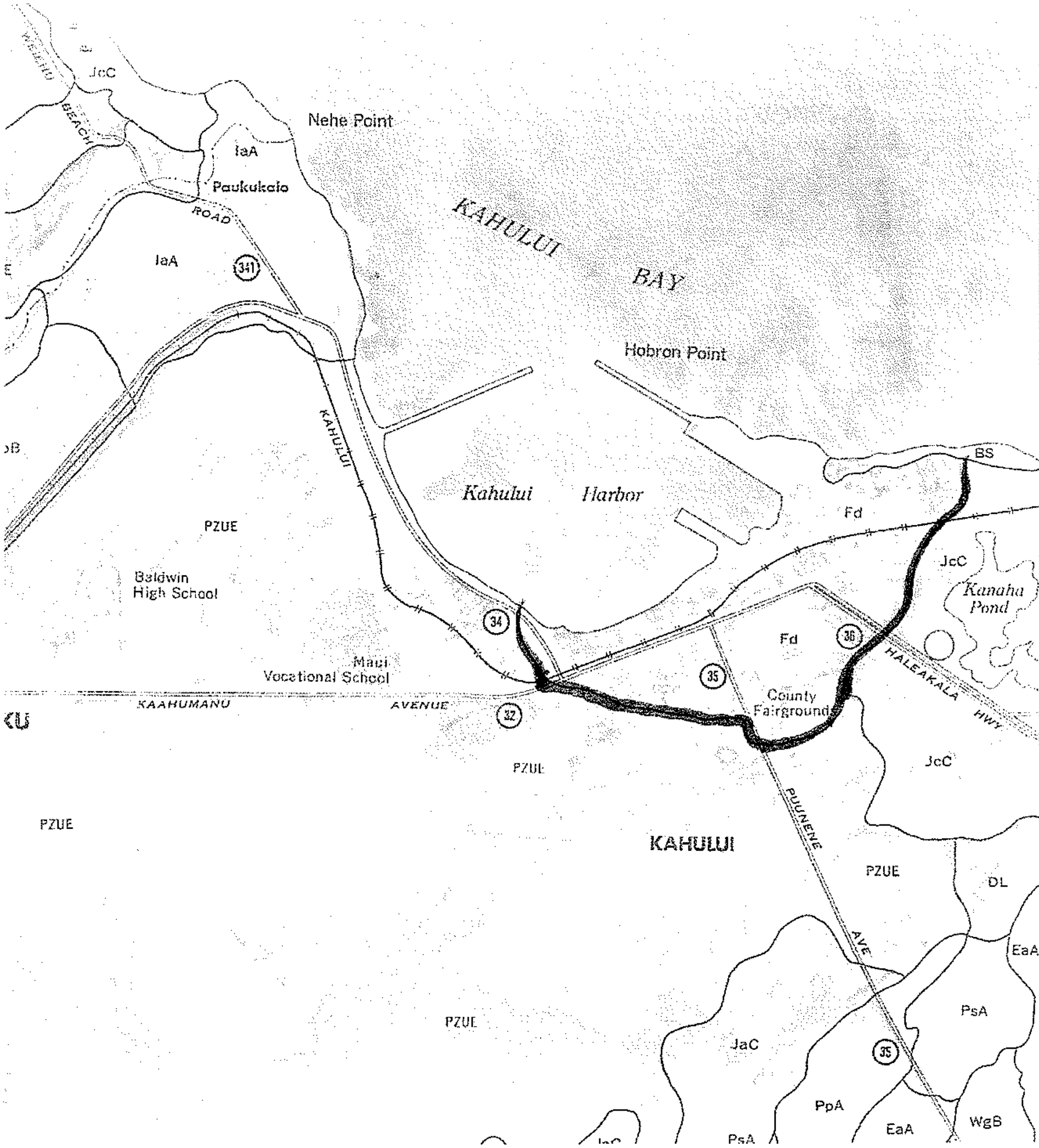


Figure 5 –
Soil survey of Islands of Kaua'i, O'ahu, Maui, Moloka'i and Lana'i,
State of Hawai'i (1952).
Extent of Fill Deposition from the Dredging of Kahului Harbor, 1910.
Red circle = Project location

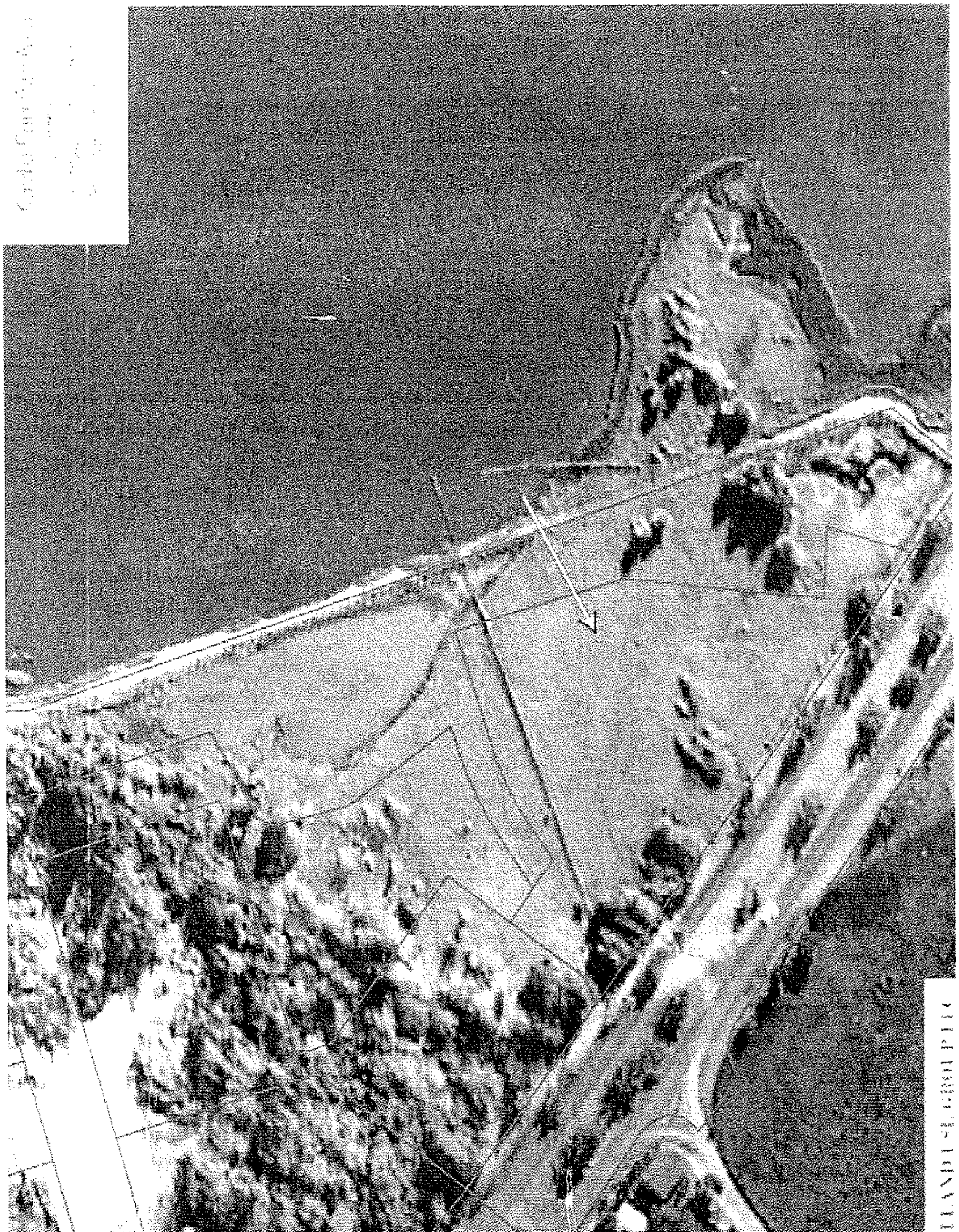


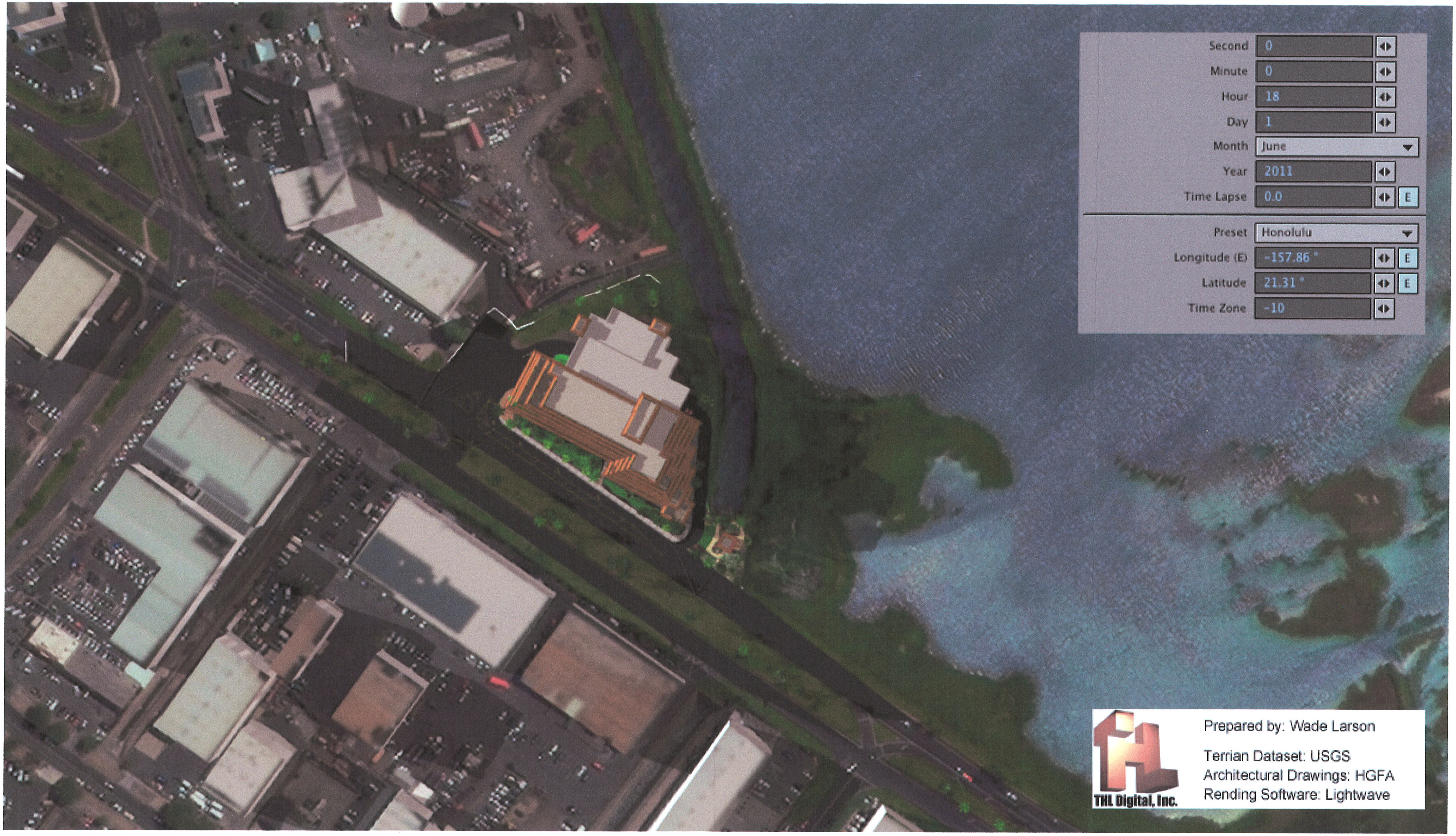
Figure 6 – Property prior to drainage canal construction. Vegetation consists of grasses and a few trees. No standing water.

Figure 7 – Property after construction of drainage canal. Grass being taken over by Pluchea indica shrubs.

Figure 8 – Current situation. Area completely taken over by Pluchea indica.

APPENDIX E-1.

Shadow Analysis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Day 1
Month June
Year 2011
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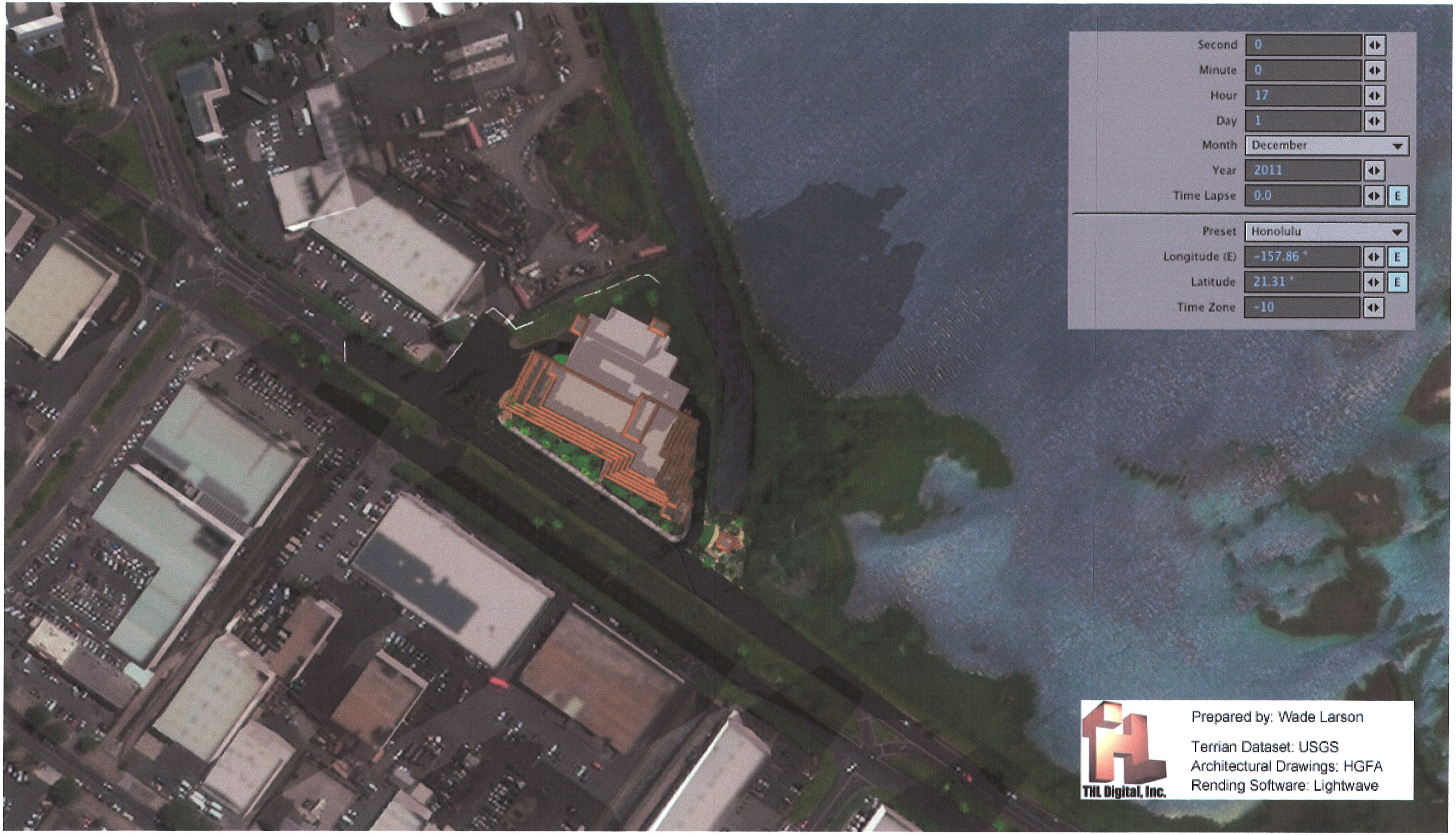
Latitude 21.31 °
Time Zone -10
THL Digital, Inc.
Prepared by: Wade Larson
Terrian Dataset: USGS
Architectural Drawings: HGFA
Rending Software: Lightwave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Longitude (E) -157.86 °
Latitude 21.31 °
Time Zone -10
THL Digital, Inc.
Prepared by: Wade Larson
Terrian Dataset: USGS
Architectural Drawings: HGFA
Rending Software: Lightwave

APPENDIX E-2.

Conceptual Lighting Plans

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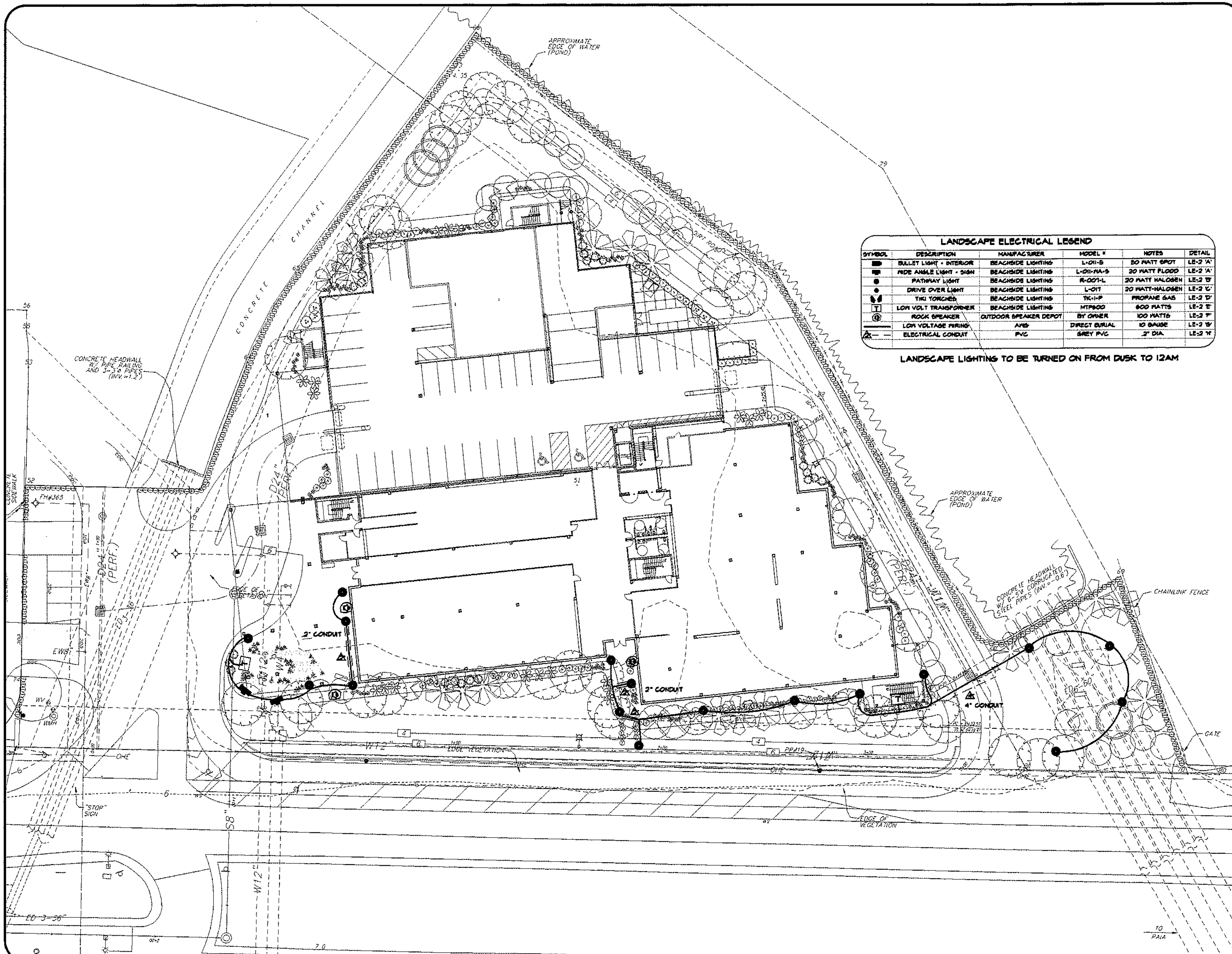

LANDSCAPE ELECTRICAL LEGEND

SYMBOL	DESCRIPTION	MANUFACTURER	MODEL #	NOTES	DETAIL
	BULLET LIGHT - INTERIOR	BEACHSIDE LIGHTING	L-011-S	50 WATT SPOT	LE-2 'A'
	WIDE ANGLE LIGHT - SIGN	BEACHSIDE LIGHTING	L-011-WA-S	20 WATT FLOOD	LE-2 'A'
●	PATHWAY LIGHT	BEACHSIDE LIGHTING	R-007-L	20 WATT HALOGEN	LE-2 'B'
●	DRIVE OVER LIGHT	BEACHSIDE LIGHTING	L-017	20 WATT-HALOGEN	LE-2 'C'
	TIKI TORCHES	BEACHSIDE LIGHTING	TK-1-P	PROPANE GAS	LE-2 'D'
T	LOW VOLT TRANSFORMER	BEACHSIDE LIGHTING	MTP600	600 WATTS	LE-2 'E'
	ROCK SPEAKER	OUTDOOR SPEAKER DEPOT	BY OWNER	100 WATTS	LE-2 'F'
	LOW VOLTAGE WIRING	AWG	DIRECT BURIAL	10 GAUGE	LE-2 'G'
	ELECTRICAL CONDUIT	PVC	GREY PVC	2" DIA.	LE-2 'H'

LANDSCAPE LIGHTING TO BE TURNED ON FROM DUSK TO 12AM

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PREPARED FOR:

MAUI MEDICAL PLAZA
151 HANA HIGHWAY
KAHULUI, MAUI, HAWAII
T.M.K. (2) 3-7-011:028

SHEET TITLE

LANDSCAPE LIGHTING PLAN

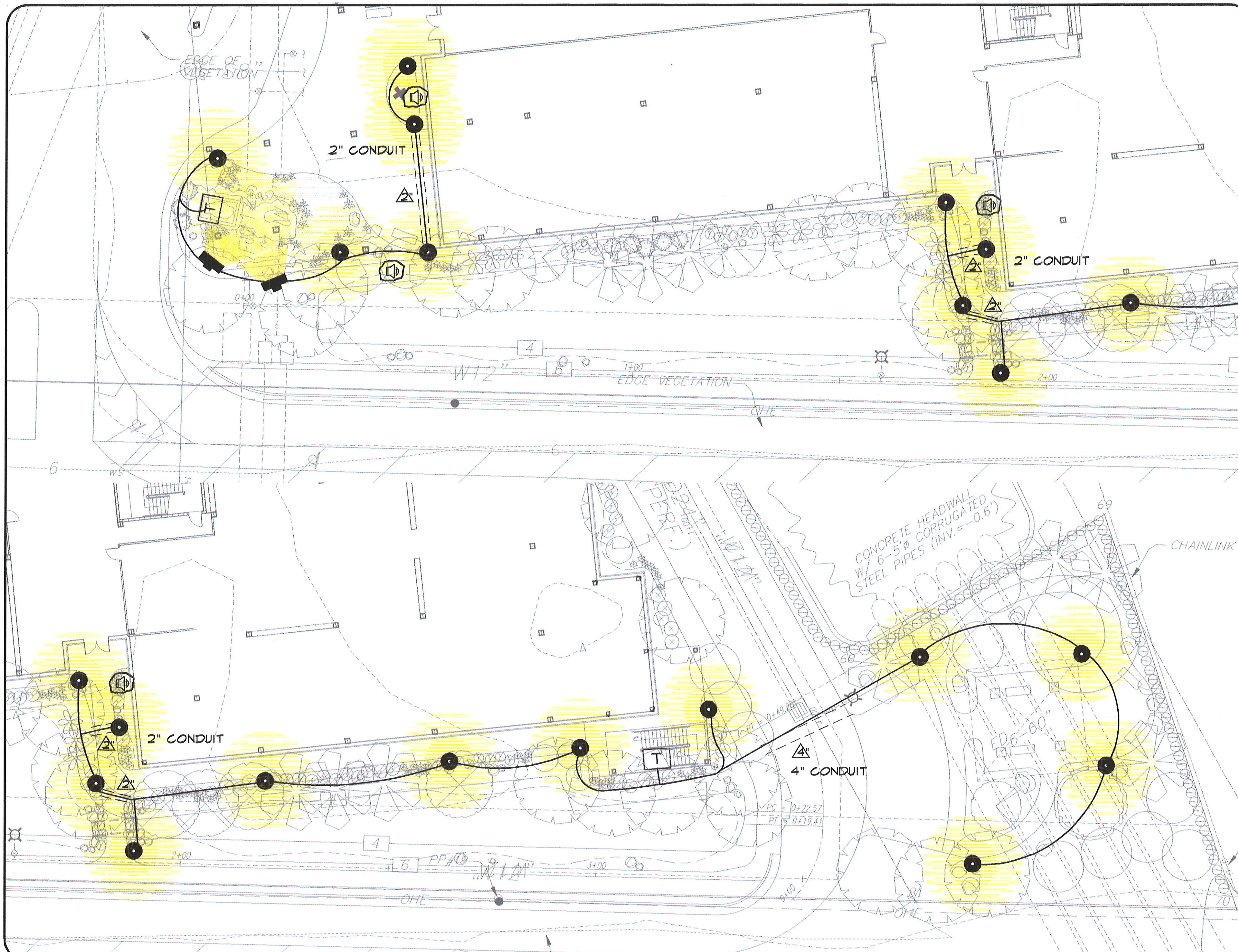
REVISIONS

NO	DESCRIPTION	DATE	BY
△			

JOB NUMBER	DATE
3945	30 SEPTEMBER 2010
DESIGNED BY	CHECKED BY
BPM	BPM

SHEET SCALE
1"=20'-0"

LE-1



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THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION AND CONSTRUCTION OF THIS PROJECT WILL BE UNDER MY OBSERVATION. OBSERVATION OF CONSTRUCTION AS DEFINED IN SECTION 16-115-2, OF THE HAWAII ADMINISTRATIVE RULES, DEPARTMENT OF COMMERCE AND CONSUMER AFFAIRS, STATE OF HAWAII, RELATING TO ENGINEERS, ARCHITECTS, LAND SURVEYORS, AND LANDSCAPE ARCHITECTS.

SIGNATURE

PREPARED FOR:

MAUI
MEDICAL
PLAZA
151 HANA HIGHWAY
KAHULUI, MAUI, HAWAII
T.M.K. (2) 3-7-011:028

SHEET TITLE

LANDSCAPE
LIGHTING
PLAN

REVISIONS

NO	DESCRIPTION	DATE	BY

JOB NUMBER	DATE
3945	30 SEPTEMBER 2010
DESIGNED BY	CHECKED BY
BPM	BPM

SHEET SCALE
1"=10'-0"

LE-2

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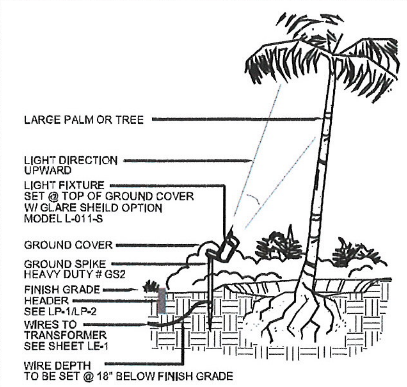
A — INTERIOR SPOT LIGHT



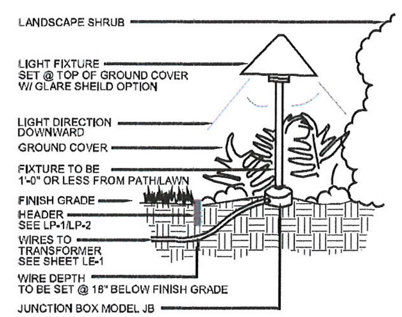
NOTES: FOR WIDE ANGLE USE WIDE FLOOD LAMP MODEL # FMV.

BULLET DIRECTIONAL

MODEL	WATT	LAMP
L-011-S	50	EXT
	35	FMV
	20	BAB
OPTION	-	BGS1

SYMBOL — FILE: LGHT-101

B — PATHLIGHT



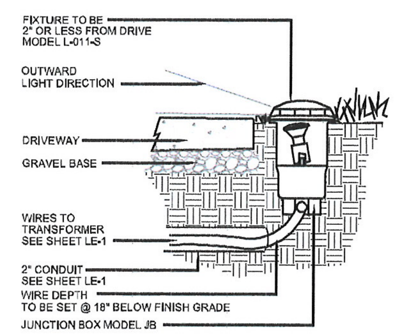
NOTES: USE UNFINISHED TOP FOR NATURAL PATINA

ACCENT PATHLIGHT

MODEL	WATT	LAMP
R-005	20	20H
	35	35H
	50	50H
OPTION	-	GS2B

SYMBOL — FILE: LGHT-102

C — DRIVE OVER LT.



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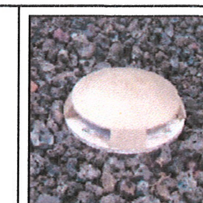
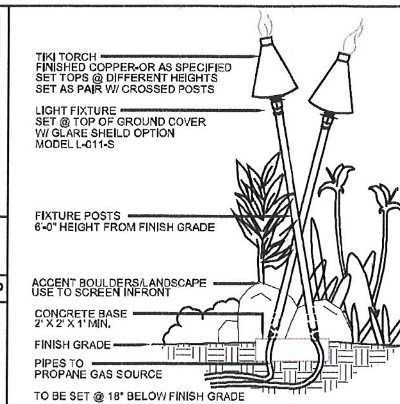


DRIVEWAY PATHLIGHT

MODEL	WATT	LAMP
R-007-L	20	ESX
	35	FMT
	50	EXT
OPTION	-	-

SYMBOL — FILE: LGHT-103

D — TIKI TORCHES

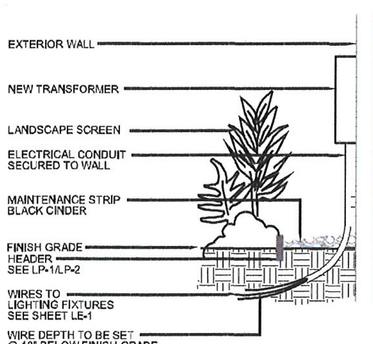


ACCENT TIKI TORCH

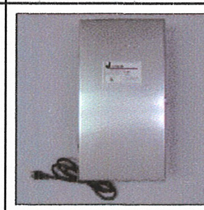
MODEL	-
TK-P-1	-
	-
	-
OPTION	-

SYMBOL — FILE: LGHT-104

E — TRANSFORMER



NOTES: TO BE INSTALLED BY CERTIFIED ELECTRICIAN

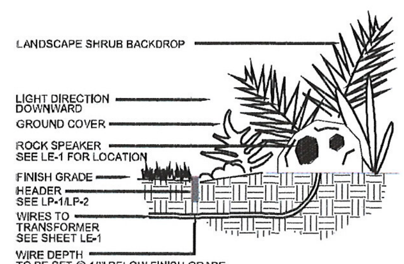


LOW VOLT POWER BOX

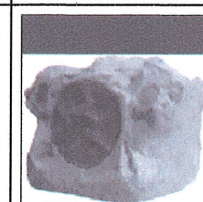
MODEL	WATT	-
MTP	300	-
MTP	600	-
MTP	1200	-
OPTION	-	-

SYMBOL T — FILE: LGHT-105

F — ROCK SPEAKER



NOTES:

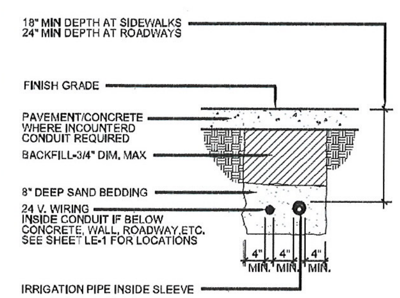


OUTDOOR SPEAKER

MODEL	WATT	LAMP
R-007-L	20	20H
	35	35H
	50	50H
OPTION	-	GS2B

SYMBOL — FILE: LGHT-106

G — TRENCHING



NOTES: IF PAVEMENT IS EXISTING, SAWCUT TO ACCOMODATE TRENCH, BACKFILL AND RESTORE PAVEMENT TO ORIGINAL CONDITION

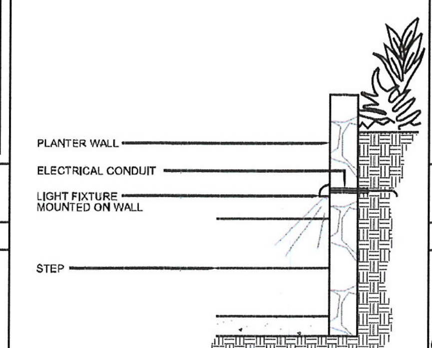
NO PICTURE

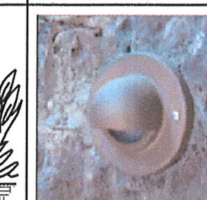
ELECTRICAL TRENCH

-	-	-
-	-	-
	-	-
	-	-
-	-	-

SYMBOL — FILE: LGHT-107

H — STEPLIGHT





STEP LIGHTING

MODEL	WATT	LAMP
L-012	10	10X
	15	15X
	10	10H
OPTION	-	-

SYMBOL — FILE: LGHT-108

GENERAL LIGHTING NOTES

1. Contractor shall verify all light quanities and dimensions prior to construction.
2. Contractor shall be responsible for locating and protecting all existing utilities.
3. Notify and meet with the Landscape Architect prior to light installation for verification and interpretation of plans.

MAXWELL DESIGN GROUP
LANDSCAPE ARCHITECTURE
PLANNING
2670 Wai Wai Place
Kihei, Maui, HI 96753
Office: 808-891-0629
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www.landscapearchitect.net

BRYAN P. MAXWELL — LICENSED PROFESSIONAL LANDSCAPE ARCHITECT No. LA 8901 — HAWAII, U.S.A.

SIGNATURE

PREPARED FOR:

MAUI MEDICAL PLAZA
151 HANA HIGHWAY
KAHULUI, MAUI, HAWAII
T.M.K. (2) 3-7-011:028

SHEET TITLE: LANDSCAPE LIGHTING DETAILS

REVISIONS NO	DESCRIPTION	DATE	BY
△			

JOB NUMBER	DATE
3945	30 SEPTEMBER 2010
DESIGNED BY BPM	CHECKED BY BPM

SHEET SCALE AS SHOWN

LE-3

APPENDIX F.

Archaeological Assessment Survey

AN ARCHAEOLOGICAL ASSESSMENT SURVEY FOR LOT 8, KANAHA INDUSTRIAL SUBDIVISION II, LOCATED ON A C. 2.5 ACRE PORTION OF LAND IN WAILUKU *AHUPUA'A*, WAILUKU DISTRICT, MAUI ISLAND

(TMK: ([2] 3-7-11: 028)

Prepared on behalf of:

Mr. Benjamin Brown, Principal
Kanaha Professional Plaza, LLC
Wailuku, Maui

Prepared by:

Xamanek Researches, LLC
Pukalani, Maui
Erik M. Fredericksen

8 May 2007
(Revised 14 June 2008)

ABSTRACT

Xamanek Researches, LLC conducted an archaeological assessment survey of Lot 8, Kanaha Industrial Subdivision II, a c. 2.5 acre portion of land in Kahului, Wailuku Commons, Maui during December of 2006 (TMK [2] 3-7-11: 028). The study area is located on a portion of land that is adjacent to Kanaha Pond in Wailuku *Ahupua'a*, Wailuku District, Maui. The subject parcel is a portion of a large central Maui land grant—Grant 3343 to Claus Spreckels. This survey was conducted on behalf of Mr. Benjamin Brown, Principal, Kanaha Professional Plaza, LLC. Project plans call for the construction of a c. six story medical facility that will be leased to medical professionals, along with other on-site improvements, including a parking structure.

This archaeological study utilized a 100% pedestrian surface survey, 10 backhoe trenches, 2 shovel test units, and monitored results of soil testing that occurred on the parcel to assess subsurface conditions. Mechanically excavated soil was spot-checked with 1/8th inch wire mesh. All manually excavated soil was screened with 1/8th inch hardware cloth. All backhoe trenches were terminated in the water table and none of them exceeded 1 m in depth. There were no significant material culture remains located during the walk-over or subsurface testing. No further archaeological work is recommended for this parcel of land in Kahului, Maui at this time. However, precautionary monitoring is recommended, depending upon final construction plans.

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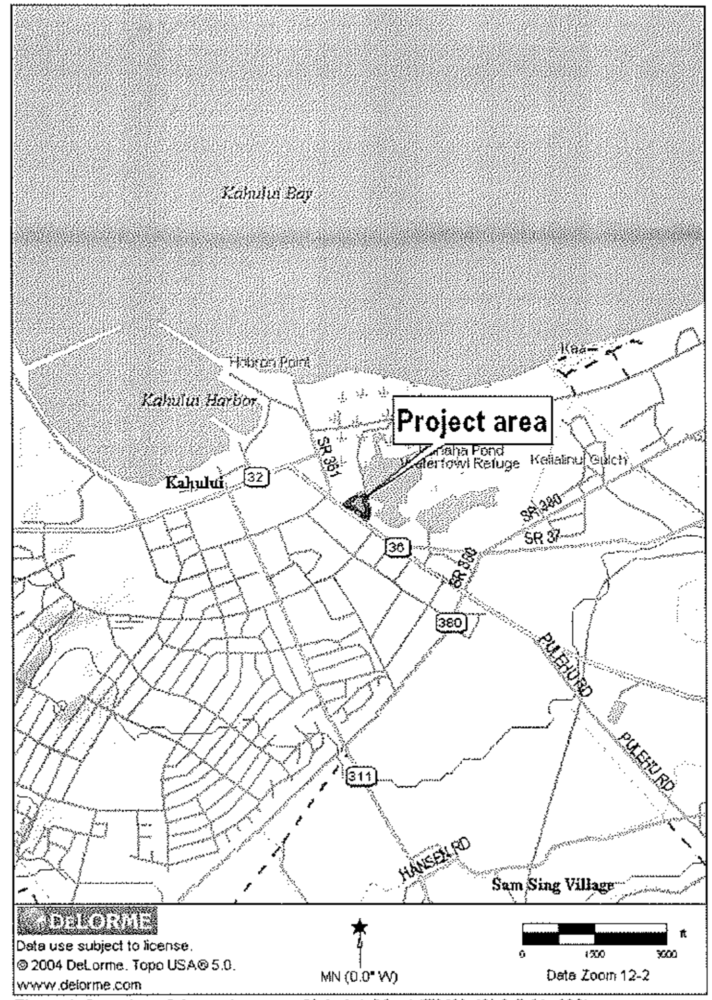

Figure 1: Location of the project area, Kahului, Maui (TMK: [2] 3-7-11: 028).

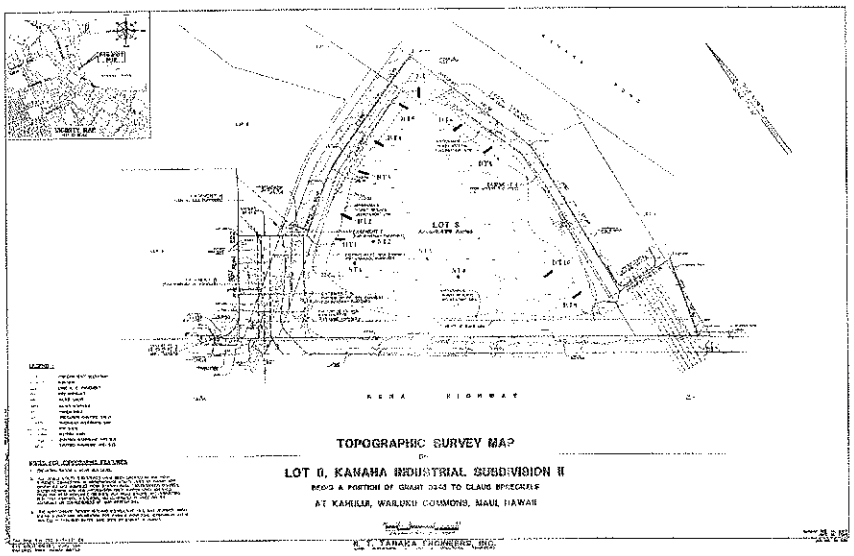

Figure 2: Topographic map of Lot 8, Kanaha Industrial Subdivision II, including locations of BT 1 – BT 10, and ST 1 – ST 4.

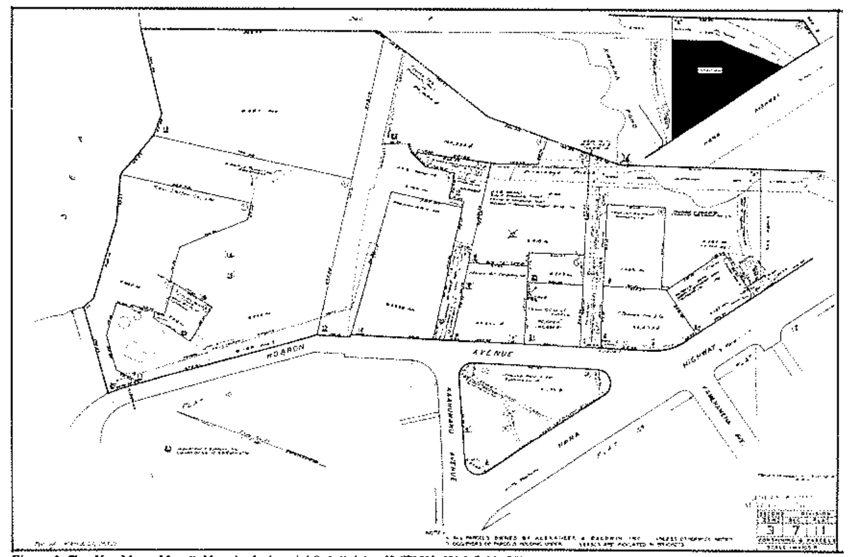

Figure 3: Tax Key Map of Lot 8, Kanaha Industrial Subdivision II (TMK: [2] 3-7-11: 28).

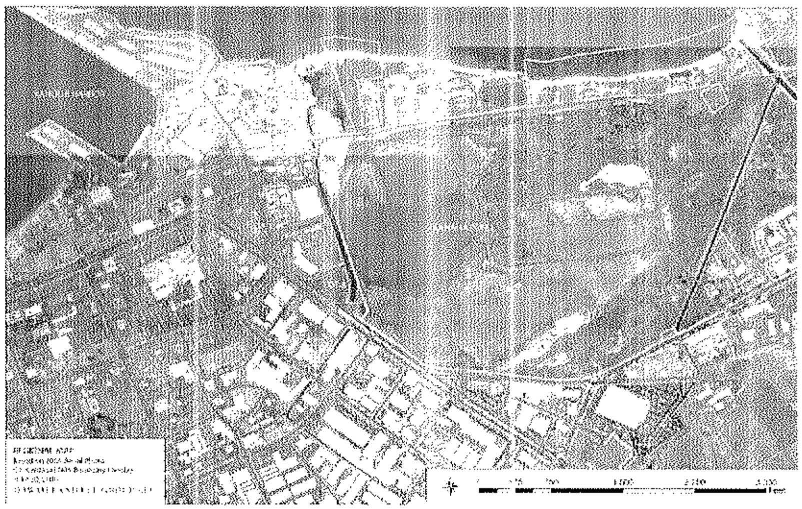

Figure 4: Overall plan view of project area (Lot 8) in relationship to Kanaha Pond and the general Kahului area. Note WWII era modifications to Kanaha Pond in upper center right of aerial photograph, along with 1970s flood control drainage canal to the right of Lot 8, and additional canal at right in photograph.

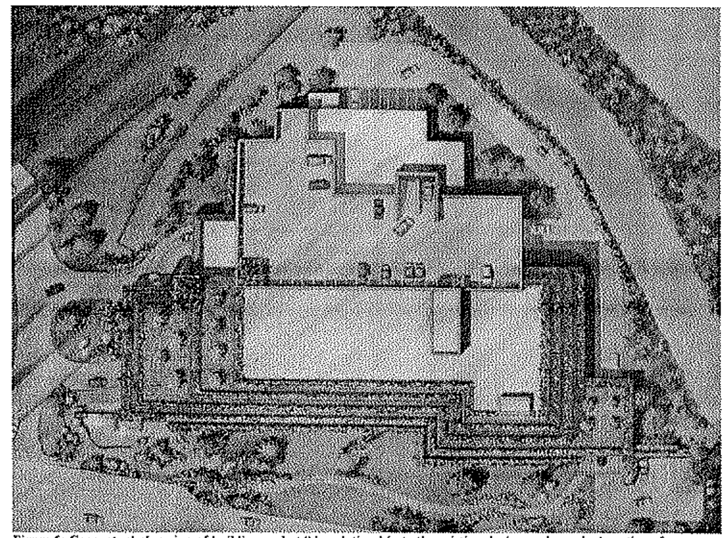

Figure 5: Conceptual plan view of building on Lot 8 in relationship to the existing drainage channel. A section of Kanaha Pond is visible in the upper right of this figure, and Hana Highway is at the bottom of the figure.

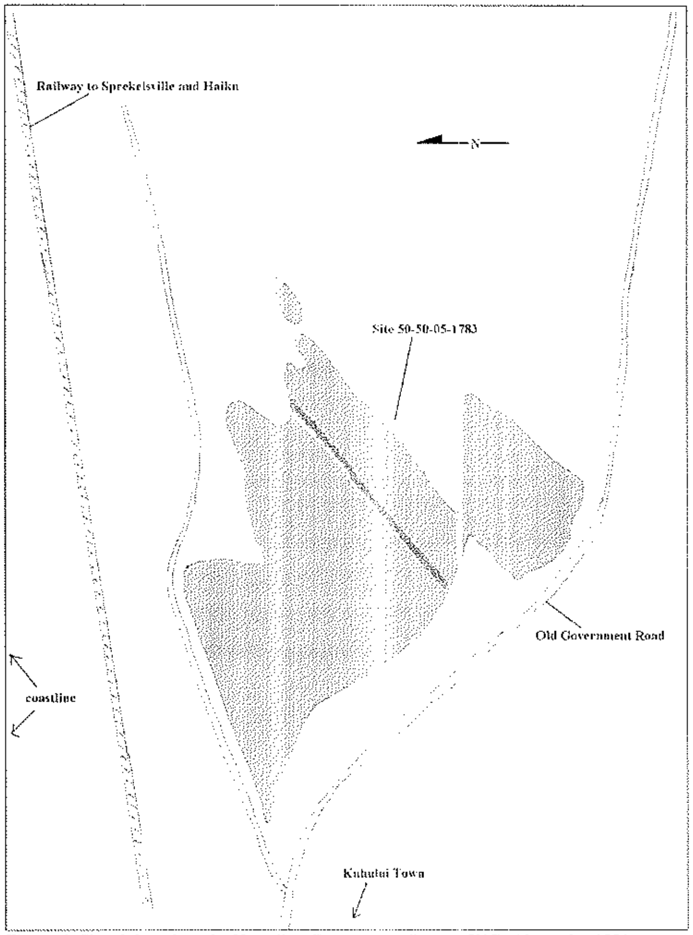

Figure 6: Sketch based on the Hawaiian Government Survey, W.D. Alexander 1881 map (map provided by Mr. Les Kuloloio), emphasizing the rock wall that separates Kanaha Pond from Mau'oni Pond at center right in the sketch.

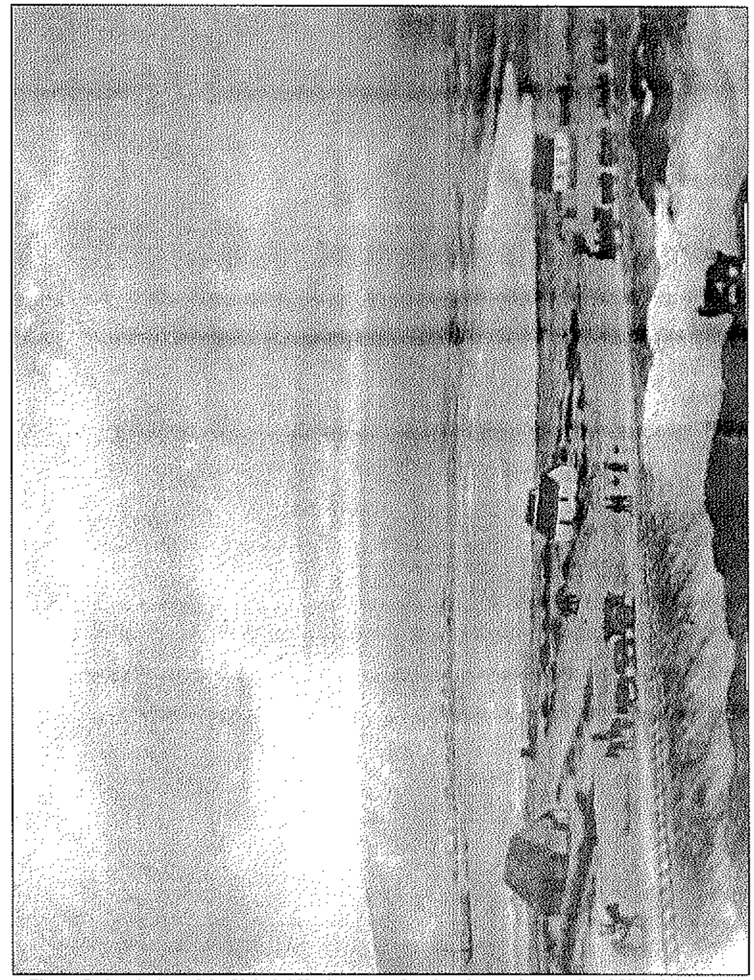

Figure 7: A painting of the Kahului Harbor area showing the newly completed Kahului Railroad as well as old houses possibly associated with Land Commission Awards in the general area (i.e. near Keopuolani Park).

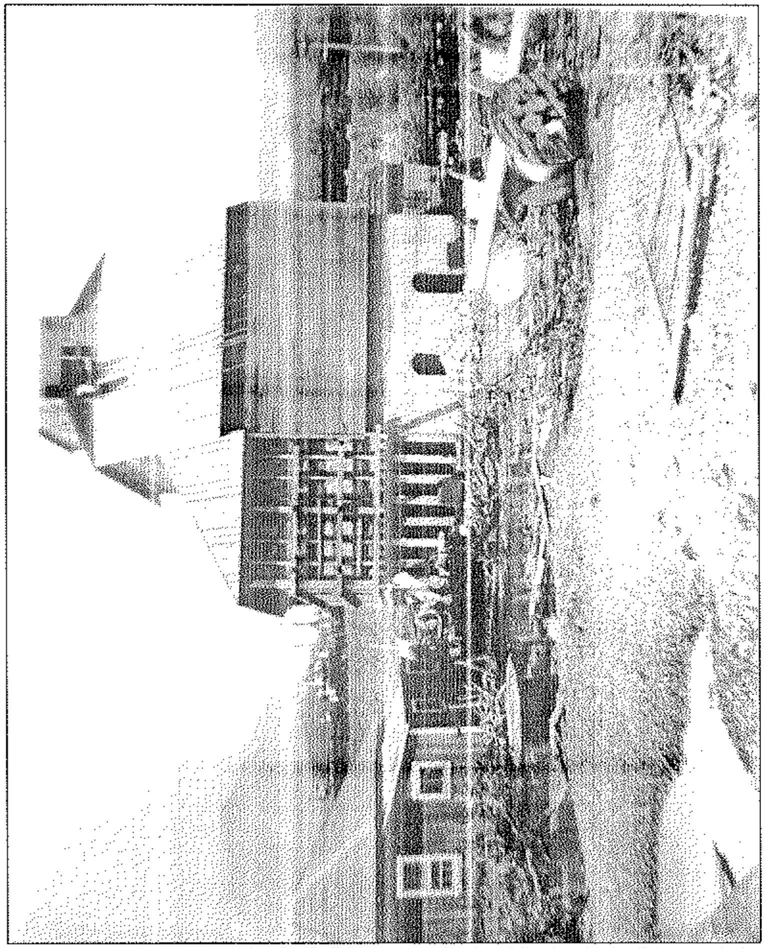

Figure 8: The Makaweli Rock Crusher building—shown in 1941, following the April 1 tsunami of that year.

INTRODUCTION

Xamanek Researches, LLC was contacted by a representative of Kanaha Professional Plaza, LLC in the summer of 2006 about conducting an inventory survey on a parcel of land in Kahului, Maui. Project plans called for the development of a multi-story medical building that would be leased to medical professionals (see Figure 5). The proposed project area consisted of Lot 8, Kanaha Industrial Subdivision II, a c. 2.5 acre portion of land in Kahului, Wailuku Commons, Maui (TMK [2] 3-7-11: 028). The study area is located in Wailuku *Ahupua'a*, Wailuku District, Maui. The c. 2.5 acre parcel is a portion of a large central Maui land grant—Grant 3343 to Claus Spreckels. The State Historic Preservation Division (SHPD) was contacted and subsequently indicated that an archaeological inventory/assessment survey was needed for this project, because of its location. We submitted a proposal and we were subsequently contracted to carry out the inventory/assessment survey on behalf of Mr. Benjamin Brown, Principal, Kanaha Professional Plaza, LLC.

We were given the notice to proceed in the fall of 2006 and fieldwork was carried out in late December of the same year. The following report presents the results of this survey, which under the revised SHPD rules is an archaeological assessment.

STUDY AREA

As previously noted, the project area consists of Lot 8, Kanaha Industrial Subdivision II, which is located in Kahului, Maui. The c. 2.5 acre parcel is bordered along its eastern side by a c. 50 ft (15 m) wide drainage canal/levee (Lot 7), which separates the study area from the Kanaha Pond Wildlife Sanctuary. A portion of the Lot 8 northern boundary is defined by a 20 ft (6 m) wide drainage canal/levee, while a portion of a previously developed parcel bounds the lot on its northwestern side. Finally, Hana Highway borders the property along its southern side.

The c. 2.5 acre parcel is essentially level. As noted above, it is located near, but separate from, a large wetland area. Project elevations range from c. 3 ft AMSL in the central portion of the parcel to c. 5 ft AMSL along the levees and to a bit over 6 ft AMSL along portions of Hana

Highway. The project area is located within a larger parcel of land in Kahului, Wailuku Commons, Maui (TMK [2] 3-7-11: 028). The project area lies an estimated 1 km inland from the Kahului coastline.

This windward portion of Maui is typical of much of the low lying near coastal inland Kahului region, with soil components consisting of Jaucus Sand, Saline, 0-12% (JcC) (Foote et al., 1972). This soil type is encountered near the ocean where ground water is near the surface and where salts have accumulated over time. These soils are subject to inundation after periods of heavy precipitation. Annual precipitation in this windward area ranges from c. 20-30 inches, with the majority of rainfall occurring between November and March (Juvic and Juvic, 1998).

A recent biological resources survey of Lot 8 was carried out by Robert Hobdy in 2006. In his report, Hobdy notes that the parcel is heavily overgrown. Noted species include the non-native shrub sourbush (Plucea indica), seashore saltgrass (Distichlis spicata), and a few scattered trees such as *kiawe* (Prosopis pallida), and date palm (Phoenix x dactylifera).

BACKGROUND RESEARCH

Precontact Period

The *ahupua'a* of Wailuku is a large land unit stretching around Kahului Bay from Paukukalo to Kapukaulua. It includes Iao Valley and the northern half of the Kahului Isthmus. This single land division comprises nearly half of the District of Wailuku, and is noted as a place where chiefs were buried and wars were fought. The word itself can be translated as "water of destruction" (Pukui, et. al., 1974, p. 225), and this name is in reference to the battles that took place in the area.

Iao Valley and the two associated dune formations on the north and south sides of the river, constituted the core area of Wailuku. This was the religious and political center of Maui, which culminated during the time of Pi'ilani (c. 1600 AD). In the late precontact period, warfare increased as the chiefs from Maui, Oahu and Hawaii struggled for political and military dominance. High Chief Pi'ilani succeeded in unifying the districts of Maui by warfare, but after his death, his sons fought with one another--each hoping to succeed their father as high chief. Eventually Kiha-a-Pi'ilani became victorious, but each following generation of chiefs had to struggle through warfare to secure their positions of political domination (Speakman, 1978, pp. 9-13).

During the reign of the last powerful paramount chief or king, Kahekili (who ruled from 1765 to 1790), Wailuku again became the site of intense warfare. Wailuku was considered to be

the capital of Maui, as Kahekili's royal residence, Kalanihale, was located in there, surrounded by his retinue.[1] In the mid-1770s, Kalanihale was marched upon by a Big Island chief named Kalani'opu'u and his *alapa* (the name given to his warriors). News of his coming preceded him, and Kahekili hid his warriors in the sand dunes above Haleki'i *heiau* to surprise the invading troops. A fierce battle ensued, and Kalani'opu'u's army was pushed to the sea and slaughtered (Speakman, pp. 16-17).

By 1786, Kahekili controlled Maui, Molokai, Lanai, and Oahu. This undisputed political control lasted for only 4 years, however. In 1790, Kamehameha the First invaded Kahekili's territory—an action that ended in the battle of Kepaniwai[2] and the defeat of the Maui ruler. The word Kahului can be translated as "the winning", and the Bay takes this name because Kamehameha gathered his warriors there prior to fighting the battle in Iao Valley (Pukui, et. al., 1974).

Kanaha Pond and Mau'oni Pond

These two ponds have been designated SIHP No. 50-50-05-1783. While Mau'oni Pond is shown on the 1881 Alexander map in this report, a later 1922 USGS map does not show this pond, indicating that it was apparently filled at some point during the c. 40 year period between these two maps. Modern maps only depict the c. 37 acre Kanaha Pond, which is just to the east of the Lot 8 project area. To date, there have not been any archaeological investigations conducted on either of these ponds. These ponds were built in a natural wetland that was located in this area.

Kanaha Pond and Mau'oni Pond have been mentioned by Samuel Kamakau (1961). He related that Maui high chief Kiha-a-Pi'ilani was involved in the initial construction of a rock wall that divided these two ponds. Fornander (in Walker, 1931) has suggested that Kiha-a-Pi'ilani lived in the mid-1500s, which potentially dates modification to this area to the mid-16th century. The two ponds are also associated with an early 18th century Oahu high chief, Ka-pi'i-oho-o-ka-lani who ordered construction at the ponds, naming them for his son, Kanaha-o-ka-lani, and his daughter, Kahama-lui-hi'i-ke-ao-ihi-lani[3] (from notes by Catherine Summers, quoted in Kikuchi, 1973).

The 1881 Alexander map contained in this report depicts the wall that divided these two ponds (see Figure 6). A narrow extension of the pond on its northwestern corner was said to have connected to the ocean near an old landing to the west of the present Pier 1 in Kahului Harbor. The pond area was again impacted by human activity in c. 1910 when Kahului Harbor was first dredged.

The dredging of the harbor generated substantial quantities of coral and sand. Much of this material was spread out along the shoreline from near the intersection of Ka'ahumanu Avenue and

[1] The location is said to be located just north of the intersection of High Street and Main Street leading into Iao Valley in Wailuku town.
[2] Kepaniwai means literally "water dam" in reference to Iao Stream, because the stream was choked with human bodies after the slaughter there (Pukui, et. al., 1974, p. 109).
[3] Kahama-lui-hi'i-ke-ao-ihi-lani was also known by the name Mau'oni.

Kahului Beach Road and eastward toward Hobron Point. In addition, we have located fill associated with this time period near Maui Community College, the hospital, under sections of various roads, including Mahalani Street, Lower Main Street, and even in some unpaved access roads in the Central Maui area. The deposition of this fill in some near shore areas added several feet to the former ground surface (Foote et al., 1972).

Robert Hobdy (2006) carried out a Biological Resources survey of the subject parcel in 2006. In his study he notes that Lot 8 does not appear to have been filled or included within the permanently inundated portion of Kanaha Pond since 1881. The subject parcel does however contain some wetland (Ibid.).

The next era of impact to the study area occurred in the late 1970s when the U.S. Army Corps of Engineers approved a flood control project.[4] This project created a network of drainage canals that served to channel groundwater out of the developing Kahului Industrial Area and to the ocean. Some of this drainage network was constructed alongside Lot 8, further separating the subject parcel from Kahana Pond. The construction of the drainage canals adjacent to the study area created levees/berms that are still present today (see Figure 4). In addition, an access road to service the drainage canal on the northern side of the parcel is built on a berm that is composed of dredged material associated with the above flood control project.

Early Post-Contact Period

The reign of Kamehameha was intertwined with the increasing presence of foreigners (*haoles*) in the Hawaiian Islands. The arrival of Captain Cook offshore at Kahului Bay in 1778 began the steady flow of outside influences that would forever alter the indigenous population and environment. One of the first of these influences came with missionaries, whose charge it was to save heathen souls. The first missionaries arrived in Wailuku in 1832, and the traditional religion began to wane under their influence. Rev. Jonathan Green established a girls' seminary (Central Female Boarding School) in 1836, where young Hawaiian women were taught the language, customs and religion of the foreigners.

Another influence to bring change to the Hawaiians was foreign commercialism, and it came initially in the form of sugar production. The first sugarcane crops grown in the *ahupua'a* were harvested and processed in 1828. Kamehameha III, with the help of two Chinese technicians, established a water-powered mill in Wailuku. This was known as Hungtai Sugar Works, and its location was fairly close to the later location of the Wailuku Sugar Mill, which was established in 1862. Hungtai Sugar Works continued to operate until the opening of the new mill.

The population of the *ahupua'a* of Wailuku was listed in the 1831-32 census as 2,256, with most of it being in the northern portion, presumably in Iao Valley (Cordy, 1978, p. 59).

In Central Maui, on the southern and eastern side of the Iao Valley dunes (Pu'uone Dunes), an early commercial activity took the form of cattle ranching. This sizable area was used for pasturage. By as early as 1845, large herds of cattle were roaming the Kahului Isthmus (cattle had

[4] Another Army Corps of Engineers flood control project also impacted Iao Stream and its flood plain in the late 1970s.

been introduced on the Big Island by Vancouver in 1793). The Maui cattle were under royal *kapu*, so were not to be molested. They were so destructive to the environment that Native Hawaiian landowners protested, but to no avail (Barrere, 1975, p. 52). In addition to the commercial raising of cattle, there were also other commercial efforts, one being a brief attempt at the production of cotton in the 1830s. This endeavor met with little commercial success however[5], and further adversely impacted the landscape.

Post-1850s Period

After the Mahele in 1848, much of the *ahupua'a* of Wailuku was designated as Crown Land, to be used in support of the royal "state and dignity". In 1872, Kamehameha V died, and his sister Princess Ruth Ke'elikolani inherited the land. She was designated as the owner of the *Ka'a* lands of Wailuku, the southern portion of the *ahupua'a*. The *ili* of *Owa* comprised of 743.40 acres, (LCA 420) was granted to Kuihelani, a steward to Kamehameha I. The much smaller northern section (the *ili* of *Kalua*-LCA 7713, Apana 23--391 acres) was awarded to Princess Ruth's half-sister, Victoria Kamamalu. In 1882, Princess Ruth sold one-half of the Crown Lands of Hawaii to sugar producer, Claus Spreckels, in order to settle her debts with him. Spreckels already held a lease for 16,000 acres of Wailuku *ahupua'a*, dating from 1878. Worried about what Spreckels might do with half of the Crown Lands, King Kalakaua gave him Land Grant 3343, a 24,000 acre portion of the southeastern section of Wailuku ahupua'*a*, in return for the surrender of his claim (Adler, 1966, pp. 262-263).

The Reciprocity Treaty of 1876 with the United States gave a boost to the sugar industry by increasing the prices of sugar. The dry eastern part of the *ahupua'a* became attractive as potential sugar land—if only water could be brought to it. In 1880, Spreckels began construction of what was called "Spreckels' Ditch", located *makai* of the Hamakua Ditch, which had been built earlier by Alexander and Baldwin to water their Maui Agricultural Company's fields in and around Pa'ia. The "Spreckels' Ditch" brought Haleakala water farther west onto the arid Kahului isthmus. The ditch was 30 miles long, delivered about 60 million gallons of water a day, and cost $500,000 to construct.

Spreckels also built another ditch, the Waihe'e ditch in 1882, which tapped the water resources from the West Maui Mountains, thus bringing water to both sides of the Wailuku Commons isthmus area (Adler, 1966, pp. 48-49). These endeavors enabled him, in 1882, to found Hawaiian Commercial and Sugar Company. He continued involvement in that company until 1898, when control was wrested from his hands. The parent company still bears the name of Alexander and Baldwin, the principal participants in the transfer of corporate control. The

[5] The Anglican Church felt that "the Hawaiian people, freed from their service to and dependence on the chiefs should be self-supporting and thought that the encouragement of the manufacture of cloth from the superior cotton which grew luxuriantly in the islands would be a means to that end. They therefore suggested that a manufacturer be sent with sufficient machinery to get the project started. They felt that the people would continue to work with the encouragement and cooperation of the chiefs." (Lemmon et. al., 1973, p. 2.B.3). To this end they sent Miss Lydia Brown in 1835 with " 'a quantity of domestic spinning apparatus' (presumably spinning wheels and a loom)" (Ibid.), and "charged with the responsibility of teaching the Hawaiian girls the arts of carding, spinning, weaving and knitting locally grown cotton and wool." (Ibid.) As each class grew proficient enough to teach others, a new class was formed (Ibid., 2.B.4).

production of sugar cane continues to be an activity in the isthmus area to this day, although some portions operated by C. Brewer and Company have shifted to pineapple production.

The environmental conditions during precontact times in lower Iao Valley, which lies well to the WNW of the project area, were ideal for agricultural production necessary to support a large population. The wide valley floor, rich alluvial soils, and a constant water supply from Iao Stream in combination provided Native Hawaiians with an abundance of food. These combined with the access to the Kahului Harbor area, rich in marine resources, made this general area the prime precontact location on West Maui for a political and religious center. The lower portion of Iao Valley contained some of the most productive taro land on the island, and the abundance of Land Commission Awards in the lower valley attest to this. There are 66 LCA's, primarily taro patch *kuleana*, and 39 *po'alima* located between the old Wailuku Mill site and Paukukalo, on the southern side of Iao stream. In addition, Kamehameha IV granted 13 awards directly to individual chiefs.

The above land use pattern is in contrast to the area south and east of Lower Iao Valley, in which the study parcel is located. Here there were only two LCAs awarded—one to Victoria Kamamalu (7713), and one to Kuihelani (420). The largest land partition of Central Maui area is Grant 3343 to Claus Spreckels. The subject parcel is a portion of the large Grant 3343 to Spreckels.

Lower Main Street was built along the route of an old government road, which very likely followed the course of traditional transportation routes from the ocean to the inland portions of Iao Valley. Many of the LCAs in this area have borders aligned with the road, indicating it was an important transportation corridor at the time the *kuleana* were granted. This corridor follows the natural boundary between the sand dune and the alluvial deposits of the valley. The Kahului Railroad paralleled Lower Main Street, and was one of the earliest known commercial projects that impacted the dune itself.

The route of the railroad ran from Kahului Harbor to Wailuku Sugar Mill (see Figure 7). The remnants of this old railroad bed can still be noted in a few places along Lower Main, and along Kahului Beach Road. The most striking architectural remnants of the railway system located along Kahului Beach Road are the 5 concrete pillars and arches, the most visible *makai* one impressed with the date "1921". In the past, a large wooden frame building rested on these pillars, serving as the housing for the Makaweli Rock Crusher apparatus (see Figure 8). It was constructed so the train carrying rock from the quarry could off-load from the track-bed into the crusher. The concrete pilings elevated the crusher adequately above ground so trucks could be driven in and filled with crushed rock. This series of pillars (that was the footings for the Makaweli Rock Crusher Mill) still stands near the intersection of Kanaloa Avenue and Kahului Beach Road.

Railroad construction was begun in the late 1870s (Figure 7)[6] and continued for nearly 2 decades, as routes were added and service expanded. The Maui News contains articles dealing with activities in the general vicinity of the project area. One dated February 8, 1902, describes a problem and potential solution resulting from the railroad:

[6] This painting by Rev. Bailey shows several structures, which may be houses associated with two LCAs near the intersection of Kanaloa Avenue and Kahului Beach Road to the northwest of the project area

"Superintendent R.W. Fuller of the Kahului Railroad Company is preparing to make some important changes in the line of railroad track between Kahului and Wailuku.
At present the sharp turn and the railroad crossing at the beach is extremely dangerous on account of the sand dunes that shut out the approaching trains from the view of those approaching the crossing with teams, especially the wind is blowing a gale.

The track will be moved some hundreds of feet south of its present location, so that the point where it crosses the road as well as the approaching trains themselves can be seen for quite a distance. On crossing the road, the track will skirt the pasture at greater distance from the public road."

On June 8, 1907, another reference describes plans improving the land for further residential use in the future:

"The Kahului Railroad Company is filling in the lowlands, in and about Kahului and will in time raise the level of the entire town site, when the work is completed and proper drains provided, the town should be free of mosquitos and the place a most desirable locality in which to live."

The Kahului Railroad continued operations until after World War II. Then demands slowly began to change, and segments of the system were phased out over the next two decades. An article contained in an article of **The Maui News** on 15 October 1957 bore the headline "Iron Horses Bow Out As Wailuku Sugar Company Discontinues Use of Railroad". The railroad continued to serve other areas until 1966, when it ceased operation.

PREVIOUS ARCHAEOLOGICAL WORK

Iao Valley/Pu'uone Dunes Area

The earliest archaeological work in the Wailuku area was part of the island-wide survey done by Winslow Walker in 1931. He reported that there were a number of *heiau* in the general area of Wailuku. Two of these religious structures lie on the northern side of Iao Stream atop the large dune formation there—Pihana and Haleki'i *heiau*. Both *heiau* have been restored and are designated as the Halekii-Pihana Heiau State Monument, which is under the supervision of the Division of State Parks (DLNR). Walker also reported that there were a number of other *heiau* in this area of Wailuku, which were said to have been consecrated by Liholiho during his visit to

Maui for that purpose in 1801 (Walker, 1931, pp. 146-147). At the time of his survey, none of these reported *heiau* (named Keahuku, Olokua, Olopio, Malena, Pohakuokahi, Lelemako, Kawelowelo, Kaulupala, Palamaihiki, and Oloolokalani) could be found (Ibid., p. 148).

A personal communication (1992) from Mr. Charles Keau, a well-respected authority on history and prehistory of Maui, provided more information about some of these *heiau*, which Walker could not find. By Mr. Keau's account, there were three *heiau* located in the Lower Main Street corridor from Kahului Harbor to the intersection of Lower Main and Mill Streets. One was situated across the street from the Maui Soda Company. Another was located on parcel 83 (TMK: 3-4-39) between the Maui Electric Power Station and the County of Maui Wailuku Government cemetery. A third may have been located near the Home Maid Bakery. During the construction of the parking lot next to the bakery, Mr. Keau reported that Wesley Wong, a well-known local antiquity collector, found five adzes of "Tahitian" style. He did not specify when this was, but thought there might still be portions of the *heiau* there as well as some burials. Recent archaeological work has corroborated at least the latter part of this prediction.

Nisei Veterans Memorial Center and Kanaloa Avenue Projects

The closest archaeological findings of note to the northwest of the present project area, occur near the intersection of Kanaloa Avenue and Kahului Beach Road. Both projects areas contain extensive precontact habitation areas with associated human burials. Each of these is briefly discussed below.

Nisei Veterans Memorial Center Project

The Nisei Memorial project has been underway since c. 1992, as this site has proven to be one of the more significant sites studied on the northern Maui coastline.

In February of 1992, Xamanek Researches initiated an inventory survey on this c. 2-acre parcel of land near the intersection of Lower Main and Wai'ehu Beach Road (Fredericksen and Fredericksen, December 1992). The most notable feature surface feature located at this time consisted of a portion of the former Kahului Railroad bed that ran the length of the property (Site 3112). Another historic site (Site 3119A) was a refuse disposal area about 20 cm. below the existing surface. The predominant historic items were composed of bottles and ceramics dating from the late 1800s, about the time the railroad was built and in use. An exploratory excavation that cut through the historic site, located a subsurface precontact site that was initially designated as Site 3119B. Later data recovery work at this site caused a revision in the site numbering system. All precontact components of the site were subsequently designated as Site 3120, while the historic components bear the Site 3119 designation.

Site 3120 became extremely interesting when a very early radiocarbon date of AD 233-410 was obtained. However, later data recovery work did not produce material of a comparable date. The deposits from which it came, turned out to have been previously disturbed by excavations done during the construction of the railroad bed, and the original source was not located.

In another area of Site 3120, test excavations produced a number of artifacts, including coral files, bone picks, an unfinished fishhook, and worked bone, along with large quantities of food midden. Data recovery research has shown Site 3120 to be a large coastal habitation site, which contains a cluster of burials. The latter remain *in situ* and will be preserved as a permanent burial/grave site. Several fire pit features were recovered and a series of 12 radiocarbon dates were obtained. They range from the very early date mentioned above (AD 233-410) to AD 1200-1740, with the majority of the precontact dates falling in a range of AD 1400 to 1700 (Fredericksen, et al., 1998).

Archaeological monitoring followed the completion of data recovery work, and a total of 38 additional burials (designated Site 4668) were located in the southwestern corner of the 2-acre parcel near the crest of the dune.[7] A radiocarbon date from charcoal recovered from a large double posthole beneath one of the burials returned a conventional radiocarbon age of 620 +/- 50, and a calibrated date range of AD 1285-1420. This extended monitoring program is nearing completion at the writing of this report. To date four *in situ* burials as well as finds of unarticulated human remains have been located at the Nisei Veterans Memorial project during the last phase of the monitoring program.

Xamanek Researches surveyed the adjacent property to the south (TMK: 3-8-07: 38) in November of 1992. Fourteen backhoe test trenches were excavated, along with 3 manual test units, in the dune areas, and relatively undisturbed portions of the parcel. The *makai* portion of the property had been impacted by the installation of a sewer line, the mid-portion by the construction of the former Kahului Railroad bed (Site 3112) and a rock crusher mill (Site 3145) [see Photographs 1 and 2]. The only cultural materials recovered were historic items, most likely associated with the railroad construction (Fredericksen and Fredericksen, November 1992).[8]

Kanaloa Avenue AIS

Four sites were identified during a March 2005 archaeological inventory survey for the Kanaloa Avenue Improvements project (Fredericksen, March 2005).[9] Xamanek Researches[10] conducted fieldwork for this earlier survey over an extended period of time beginning in 2002 and ending in early 2005. The first of the identified sites is Site 5660, which is interpreted as a possible precontact habitation area remnant. This site was deemed significant for its information content under Criterion "d" of Federal and State historic preservation guidelines. This site is located in the COM right-of-way along Kanaloa Avenue. Site 5496, a precontact habitation area with an associated waterworn basalt pavement (Feature 1), is also deemed significant under Criterion "d" for its information content. This latter site is also considered to be culturally significant under Criterion "e" because of its association with the Site 5495 human remains. This site and Site 5495 are located in Keopuolani Park within c. 250 m southeast of the current project area. This County of Maui Park was initially known as Maui Central Park (see discussion on

[7] This portion of the property had previously been covered with bulldozed trees and construction related debris from the adjacent Sand Hills residential development.
[8] A recent find of an articulated human burial was made at an abandoned campsite on a portion of this parcel in November 2006.
[9] Kanaloa Avenue lies c. 1 lot to the south of the Nisei Veterans Memorial parcel.
[10] All of the fieldwork for this inventory survey was carried out before Xamanek Researches was converted to a Hawai'i-based Limited Liability Company in February 2005.

Central Maui Area below). The four finds of Site 5495 human remains, designated Finds 3-6 (Features A-D), are interpreted as Native Hawaiian remains that are over 50 years old. These human remains qualify for significance under Criterion "d" as well as Criterion "e" because of their cultural importance to Native Hawaiians. Sites 5471 and 5472 were tentatively interpreted as a Native Hawaiian burial and previously disturbed human remains, respectively. Both of these finds are significant under Criterion "e" as well, and were found in the COM right-of-way of Kanaloa Avenue.

Central Maui Area

The central area of Maui, south of Ka'ahumanu Avenue, is noted for many burials in the Pu'uone Sand Dune formation, which stretches across the isthmus. There have been a number of studies documenting these finds (Fredericksen et al., 1997; 1998; Panteleo and Sinoto, 1996; Rotonno-Hazuka, 1994).

However, in the central area to the north of Ka'ahumanu Avenue, very few sites other than scattered burials have been found. Xamanek Researches conducted studies at Maui Community College, Maui Central Parkway (Fredericksen and Fredericksen, December 1992; Fredericksen, et. al., 1994), and at the Keiki Zoo Maui (Fredericksen and Fredericksen, September 1995)—all with negative results. It is interesting to note that we did locate quantities of dredged material that originated from Kahului Harbor during our subsurface testing on the college parcel.

Archaeological Consultants of Hawaii conducted a survey for the Maui Arts and Cultural Center, again without significant findings (Kennedy, 1990). Cultural Surveys Hawaii, Inc conducted an inventory survey for the 110-acre Maui Central Park area (now Keopuolani Park). A large intact dune was contained in the bulk of the park. There were no indigenous cultural sites located during the Cultural Surveys Hawaii inventory survey. However, scattered human remains (Site 50-50-04-4211) were previously identified on the surface near the Maui Arts and Cultural Center, during an earlier botanical survey conducted by Xamanek Researches in 1996. Subsequent archaeological work at the inventory level indicated that no additional human remains were present, and Site 4211 was evaluated as no longer significant (Heidel, Pyle and Hammatt, January 1997). Other historic sites noted in the Maui Central Park inventory survey included Site 4232, a former WW II military facility, and Site 3112, the Kahului Railroad Berm.[11] Both sites were partially preserved through incorporation into the landscaping of the Park (Ibid.).

It was previously thought that the paucity of archaeological findings in this area indicated that the extensive military activity associated with World War II had altered the Central Maui landscape, thereby potentially obliterating most archaeological sites.

Airport Area Archaeological Work

While a comprehensive inventory survey of the Kahului Airport to the southeast of the project area has not been undertaken to date, previous archaeological work in this area has

[11] The Kanaloa Avenue construction-monitoring project located a previously unidentified precontact habitation area (Site 5496) along with three *in situ* human burials and the remains of two previously disturbed individuals (Site 5495). Both of these sites lie in the northeastern portion of Keopuolani Park (Fredericksen, 2005).

uncovered significant sites. The earliest work was associated with the construction monitoring carried out in conjunction with the installation of the sewer line for the Paia Sewerage System from Spreckelsville to Ku'au. Clark and Toenjes (1987) of the B.P. Bishop Museum recorded a total of six sites that were encountered between 30 and 160 cmbs. Subsurface features included various pits and charcoal concentrations. In addition, indigenous food midden and artifacts were recovered. Charcoal recovered from Site 50-50-04-1777, part of which was identified *makai* of Kahului Airport, yielded a radiocarbon date range of A.D. 1380-1700.

Two sites have been identified on the airport property that will require additional work. These cultural resources include Site 50-50-05-1798, which is composed of an unknown number of human burials, a reburial area[12], and a subsurface terrace wall with associated pond field deposits. There is a Programmatic Agreement, signed in 1997, that covers this area, which lies to the north of the runway. To date, it remains unclear what work has been carried out in this area. The second site, Site 1799 is located to the north of Site 1798 and consists of a c. 4 m long rock alignment and a possible coral pavement of unknown function. The SHPD has previously indicated that this site has not been adequately assessed.

Site 50-50-05-2849 is made up of an extensive subsurface cultural deposit that was identified during archaeological testing carried out by IARII in c. 1990-1991 (Welch, 1991). This site qualifies for significance under Criterion "d" because of its information content. The SHPD has recommended that data recovery work be undertaken on this cultural deposit.

Site 50-50-05-4197 consists of related features of the former WWII Naval Air Station (NASKA). The SHPD has indicated that additional work at the inventory level is needed for this complex before additional evaluations/recommendations can be made.

Settlement Patterns and Expected Findings

The lower Iao Valley portion of Wailuku *ahupua'a* was a central political and religious area of West Maui, because of its fertile taro lands and close proximity to the sea. Given these conditions, a large population could be supported, and wherever large population clusters are found, the social framework of chiefly importance and religious expression is also present. This is attested to by the existence of the two *heiau* (Haleki'i and Pihana) atop the northern dune system, and others reported by Walker (1931) and Keau (1992, oral communication) within the Iao Stream corridor. The middle and upper reaches of Iao Valley were also rich in *lo'i* and *'auwai* which produced additional food stuffs to support political and religious activities. The Upper Iao Valley had been traditionally known as a very significant sacred place in the history of Maui (Donham, MCCRC minutes, June 1, 1995). Coastal sites, such as Site 3120 at the Nisei Veterans Memorial Center, have been occupied since the 1200s (and possibly much earlier), and no doubt provided the area's population with marine resources. There seems to be a pattern in Iao Valley, whereby sites closer to the ocean have earlier dates than the ones farther inland, suggesting that settlement occurred first along the sea shore and gradually moved inland as the population numbers increased.

[12] Mr. Charles Kauluwehi Maxwell Sr., current Chair, Maui/Lana'i Islands Burial Council (MLIBC), assisted in the reburial of human remains that were disturbed by airport construction activities c. 20+ years ago (personal communication with Mr. Maxwell, 2005).

An intensification of usage appears to have occurred during the 16th century, and seems to have peaked around the time of Pi'ilani, ca. 1600 AD (Donham, MCCRC minutes, June 1, 1995). All radiocarbon dates, which have been recovered from the sites along this corridor fall into this temporal framework.

The study area lies next to Kanaha Pond, and is a part of the island that has been adversely affected by the presence of the military during World War II. A large Marine base existed in the area that is now Keopuolani Park, which lies to the northwest of Lot 8. In addition, there are several military related buildings as well as remnants of the NASKA facility that are located to the ENE of the project area. Finally, it is important to note that portions of Kanaha Pond have been altered by WWII activities (see Figure 4). The general area was formerly used for pasturage prior to WWII. As a consequence of the considerable amount of land alteration associated with these events, most surface traces of precontact activity, if it existed, has been most likely destroyed. Remnants of habitation sites—some with associated burials—have been found in the near shore area, and there is a possibility that similar subsurface features are present on some of the lands that are near Kanaha Pond.

TABLE 1

Selected Archaeological Studies Carried out in Lower Iao Valley, and Central Maui Area.

AUTHORS	LOCATION	FINDINGS
Burgett and Spear, 1995	TMK: 3-8-37: 48, Lower Main St., Home Maid Bakery. Sites 3924 and 3925	Habitation sites; human burials. Dated c. AD 1430 to 1671.
Connolly, 1973	TMK: 3-8-36: 94, Lower Main St., Site 1171	Habitation site; burials discovered 1994 eroding from dune face
Donham, 1994	TMK 3-8-37: 49, Lower Main St., Home Maid Bakery, Site 3556	Inadvertent burial discovery, both historic and precontact burials
Fredericksen, W. and Fredericksen, D. December 1992a	TMK 3-8-07: 40 and 43; Maui Community College Parking Lot Extension.	Historic sites from WWII. No indigenous materials. Kahului Harbor dredged material.
Ibid., September 1995	TMK: 3-8-07: por. 1, Keiki Zoo Maui	No findings of significance.
Ibid., February 1996	TMK 3-8-07: 104, Maui Scrap Metal Company, Waikapu Borrow Site, Site 3525	Remains of at least 22 individuals recovered from mined sand.

Table 1 cont.

Fredericksen D. and Fredericksen, W., December 1992b Fredericksen, et. al., November 1998	Inventory Survey - TMK: 3-8-07: 123, at Lower Main and Wai'ehu Road, Nisei Veterans Memorial Center. Data Recovery Report	Historic site, Kahului Railroad (Site 3112); large precontact habitation site, with continuous occupation from c. 1200 AD to c. 1740 (Site 3120); numerous burials to be preserved *in situ*.
Fredericksen, et. al., July 1995; Fredericksen, E. and Fredericksen, D. September 1996	Inventory Survey and Data Recovery: TMK: 3-4-39: por. 81, 82, 83 at Lower Main and Mill Streets, Site 4127	Habitation site; dated c. AD 1450 to 1675.
Fredericksen, E., W., and D., September 1994	TMK: 3-8-07: por. 125; Maui Central Park, 10 acres along Kahului Beach Road	No significant findings.
Ibid., January 1997	TMK: 3-4-07: por. 121, Maui Lani Parkway corridor	No precontact finds in corridor—human remains (Site 4368) on Golf Course Hole #10—monitoring recommended.
Ibid., May 1997	TMK: 3-8-47: por. 1, 2, 3, 4, 17, 18, 30, and 32, 3-9-07: por 121 Mahalani Street Extension	No significant findings—limited monitoring recommended.
Fredericksen, E., February 1997 (post-field summary)	TMK: 3-4-07: por. 121, Lot 11-A, Maui Lani Project—20.7 acres	One indigenous *in situ* burial (Site50-50-04-4401)-Monitoring recommended.
Heidel, Pyle and Hammatt, 1997	TMK: 3-8-07: 1 and 3-7-01: 2; Maui Central Park	Historic sites: 4232-WW II military camp; 3112-Kahului Rail-road Berm; 4211-scattered human remains.
Kennedy, 1992	TMK: 3-8-07; Maui Arts and Cultural Center	No findings.
Pantaleo, J. and A. Sinoto, January 1996	TMK: 3-8-07: 2, 110; Phase 1 and Phase 1A, Maui Lani Partners Development, Wailuku.	No habitation sites. Human burials in several locations. Monitoring recommended. Additional burials during monitoring.
Rotunno and Cleghorn, 1990 Rotunno-Hazuka, et. al. May 1994a	TMK: 3-8-07: 2, 110: Maui Lani Development Property.	No precontact sites other than burials (Site 2797).
Spear, 1995	TMK: 3-8-37: 48; Lower Main St., Site 4066.	Human burials and habitation layers.

ARCHAEOLOGICAL FIELD METHODS

Fieldwork was conducted in two phases. An initial inspection of the parcel was carried out in early December of 2006. This preliminary work was undertaken in order to obtain a general understanding of the project area. This inspection revealed that portions of the project area had been previously impacted by activities associated with the placement of a flood control canal that lies between Lot 8 and Kanaha Pond (Figure 4, Photograph 2), and the installation of an access road for this drainage feature. In addition, some previous grubbing appeared to have taken place on the parcel. Finally, the project area appeared to have been utilized as an informal dumping area for some time.

Inventory/assessment level fieldwork was subsequently undertaken during December 2006. Archaeological survey members consisted of supervisory archaeologist Jonas Madeus, and Marco Molina. Erik Fredericksen was the project director for this archaeological assessment survey.

The pedestrian inspection utilized surface sweeps that were spaced c. 5 meters apart and were roughly oriented N-S. Surface visibility ranged from poor to good, depending upon ground cover and refuse.

The evaluation phase of this survey utilized 10 backhoe trenches that were up to 5 meters in length by c. 0.5 to 0.9 m in depth. Mechanically excavated back dirt was visually inspected and spot checked with 1/8th inch screen. In addition, four manual shovel test units were excavated by stratigraphic layer in the interior of the parcel, in order to obtain additional information. All soil excavated from these units was sifted through 1 8 inch mesh hardware cloth. Standard recordation methods were followed in the field and all mapping was done with metric survey tapes and hand held compasses. Photographs were taken in a digital format.

ARCHAEOLOGICAL FINDINGS

As previously noted, 10 backhoe trenches were used to sample the study area. Subsurface results are discussed below. Refer to Table 2 below for backhoe test results.

Backhoe Trenches

A total of 10 backhoe trenches were utilized to assess subsurface conditions on the project area. None of these backhoe trenches exceeded 1 meter in depth, due to very rocky subsurface conditions. There was no evidence of a subsurface cultural deposit located during testing in the study area. Portions of the project area appear to have been impacted by previous grading activities associated with the development of the existing access road. There were up to 3 common soil layers encountered during subsurface testing on the parcel (see Appendix B).

These strata consisted of Layer I—white (10 YR 8/1) silty sandy clay; Layer II—brown (10 YR 5/3) medium grained sand; and Layer III—dark grey (10 YR 4/1) sand. There were no significant material culture remains noted during backhoe testing. The groundwater table was encountered between 40 and 70 cmbs. Layers I and II are interpreted as fill, as are some portions of Layers III and IV.

TABLE 2
SUMMARY OF BACKHOE TEST RESULTS
LOT 8, KANAHA INDUSTRIAL SUBDIVISION II PROJECT

BT#	Length X depth[13]	Stratigraphy	cmbs[14]	Remarks[15]
1	3 x 0.7	Layer I: 10 YR 8/1	0-22	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present.
		Layer II: 10 YR 4/1	22-70	Layer II: dark grey, medium, granular sand, wet, semi-compact to loose consistency
2	3 x 0.45	Layer I: 10 YR 8/1	0-17	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present
		Layer II: 10 YR 5/3	17-25	Layer II: brown, fine to medium grained sandy clay
		Layer III: 10 YR 4/1	25-45	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency
3	3 x 0.60	Layer I: 10 YR 8/1	0-10	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present
		Layer II: 10 YR 5/3	10-21	Layer II: brown, fine to medium grained sandy clay
		Layer III: 10 YR 4/1	21-60	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency
4	3 x 0.40	Layer I: 10 YR 8/1	0-9	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present
		Layer II: 10 YR 5/3	9-15	Layer II: brown, fine to medium grained sandy clay
		Layer III: 10 YR 4/1	15-42	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency
5	3 x 0.55	Layer I: 10 YR 8/1	0-12	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present.
		Layer II: 10 YR 5/3	12-25	Layer II: brown, fine to medium grained sandy clay
		Layer III: 10 YR 4/1	25-55	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency
6	3 x 0.70	Layer I: 10 YR 6/3	0-25	Layer I: previously disturbed
		Layer II: 10 YR 8/1	25-37	Layer II: white, fine silty sandy clay, semi-compact (Layer I elsewhere)
		Layer III: 10 YR 5/3	15-42	Layer III: brown, fine to medium grained sandy clay (Layer II elsewhere)
		Layer IV: 10 YR 4/1	42-70	Layer IV: dark grey, medium, granular sand, wet, semi-compact to loose consistency (Layer III elsewhere)

[13] In meters
[14] cmbs = Centimeters below surface
[15] There were no significant material culture remains located during backhoe testing on the project area.

Table 2 cont.

7	3 x 0.70	Layer I: 10 YR 6/3	+65	Layer I: previously disturbed – berm
		Layer II: 10 YR 8/1	0-10	Layer II: white, fine silty sandy clay, semi-compact (Layer I elsewhere)
		Layer III: 10 YR 5/3	10-21	Layer III: brown, fine to medium grained sandy clay (Layer II elsewhere)
		Layer IV: 10 YR 4/1	21-70	Layer IV: dark grey, medium, granular sand, wet, semi-compact to loose consistency (Layer III elsewhere)
8	3 x 0.85	Layer I: 10 YR 6/3	0-40	Layer I: previously disturbed – fill/berm
		Layer II: 10 YR 8/1	40-45	Layer II: white, fine silty sandy clay, semi-compact (Layer I elsewhere)
		Layer III: 10 YR 5/3	45-50	Layer III: brown, fine to medium grained sandy clay (Layer II elsewhere)
		Layer IV: 10 YR 4/1	50-85	Layer IV: dark grey, medium, granular sand, wet, semi-compact to loose consistency (Layer III elsewhere)
9	3 x 0.90	Layer I: 10 YR 8/1	0-16	Layer I: white, fine silty sandy clay, semi-compact, no cultural material present.
		Layer II: 10 YR 6/2	16-30	Layer II: brownish gray, compact medium grained sandy clay, very compact
		Layer III: 10 YR 4/1	30-90	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency
10	3 x 0.70	Layer I: 10 YR 6/3	0-43	Layer I: previously disturbed
		Layer II: 10 YR 8/1	28-30	Layer II: white, fine silty sandy clay, semi-compact, no cultural material present
		Layer III: 10 YR 4/1	43-70	Layer III: dark grey, medium, granular sand, wet, semi-compact to loose consistency

Shovel Test Units (Figures 9-10)

There were four manually excavated 50 by 50 cm shovel test units excavated after the backhoe trenches were completed. These units were utilized to obtain a more controlled assessment of subsurface conditions on the study area. There were no significant cultural materials located during the testing process in STs 1-4. A total of 3 layers were identified during testing.

Layer I (0-10 cmbs) was composed of the common, compact, white (10 YR 8/1) silty sandy clay. Layer II (c. 10-20 cmbs) was made up of brown (10 YR 5/3) medium grained sand. Both strata appeared to have been previously disturbed and are interpreted as fill. Layer III (c. 20-35 cmbs) consisted of dark grey (10 YR 4/1) sand. Some of this stratum also appeared to have been previously disturbed. The groundwater table was encountered between 35 and 50 cmbs in all four units.

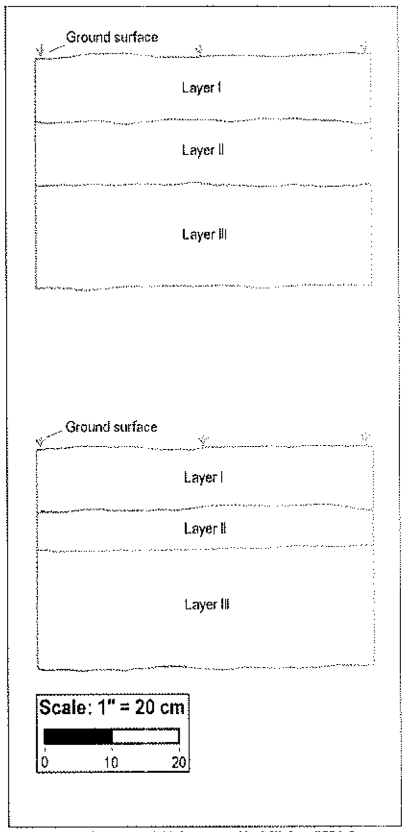

Figure 9: ST 1 - SW face wall, ST 2 - SW face wall.

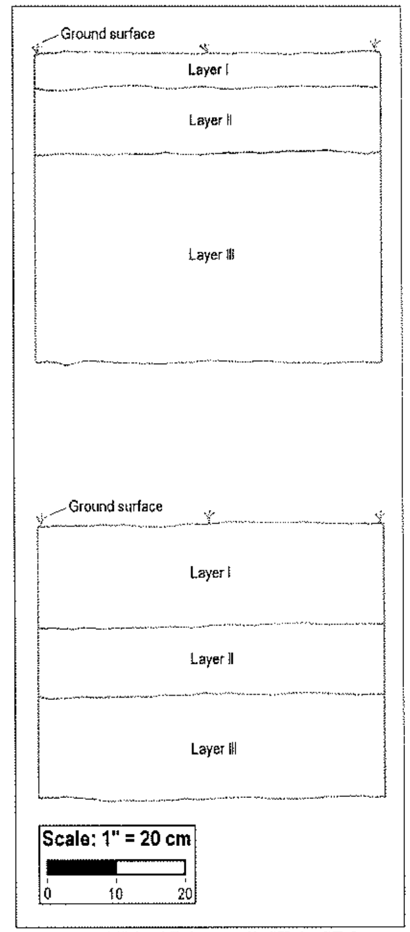

Figure 10: ST 3 - SE face wall, ST 4 - SE face wall.

Soil Testing at Lot 8

Per previous discussions with Dr. Melissa Kirkendall, SHPD Maui staff archaeologist, Xamanek Researches, LLC monitored soil testing activities that were carried out on the project area. There were no significant cultural materials noted during the inspection of the recovered soil core samples. GEOLABS, Inc staff was cooperative and allowed our monitor to view and photograph the core samples that were recovered during testing (see Photographs 19-26).

SUMMARY AND CONCLUSIONS

As previously discussed, a total of 10 backhoe trenches, 4 manually excavated shovel test units, and monitored soil sampling results were used to sample subsurface conditions on the study area. Test results suggest that portions of the project area have been impacted by previous earth moving activities associated with the construction of an existing drainage control canal, an access road, and previous fill activities. As noted above, there was no evidence of a cultural deposit or significant material culture remains located during this assessment survey.

Site Significance Evaluations

The following significance evaluations are based on the Rules Governing Procedures for Historic Preservation Review (DLNR 1996; Chapter 275). According to these rules, a site must possess integrity of location, design, setting, materials, workmanship, feeling and association and shall meet one or more of the following criteria:

Criterion "a"—Be associated with events that have made an important contribution to the broad patterns of our history;

Criterion "b"—Be associated with the lives of persons important in our past;

Criterion "c"—Embody the distinctive characteristics of a type, period, or method of construction; represent the work of a master; or possess high artistic value;

Criterion "d"—Have yielded, or is likely to yield, important information for research on prehistory or history;

Criterion "e"—Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts.

As mentioned earlier in this report, we did not locate significant surface material culture remains during our walkover survey or a subsurface cultural deposit during testing of the study area. Consequently, there can be no site significance assessments made at this time.

Site Mitigation Recommendations

Given the lack of cultural resources, no further archaeological work is recommended for the project area at this point in time, other than precautionary monitoring during construction.

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September 1996 Archaeological Data Recovery Report on Site 50-50-04-4127, Lower Main and Mill Streets, Wailuku *ahupua'a*, Wailuku District, Maui Island (TMK: 3-4-39: 81 & 82), prepared for County of Maui Department of Public Works, by Xamanek Researches, Pukalani, HI.

November 1995 Interim Data Recovery Report for the Nisei Veterans Memorial Center Site (Site 50-50-04-3120), Wailuku *Ahupua'a*, Wailuku District, Maui Island. Prepared for Earl Kono, AIA Nisei Veterans Memorial Center, by Xamanek Researches, Pukalani, Hawaii.

September 1998 Archaeological Data Recovery Report for Site 50-50-04-3120, Nisei Veterans Memorial Center, TMK 3-8-07: 123, Wailuku *Ahupua'a*, Wailuku District, Maui Island. Prepared for Earl Kono, AIA, Nisei Veterans Memorial Center, prepared by Xamanek Researches, Pukalani, Hawaii.

Fredericksen, Demaris L. and Erik M.
September 1997 Archaeological Inventory Survey for Proposed Maui Texaco Service Station Located at Lower Main and Mill Streets, Wailuku *Ahupua'a*, Wailuku District, Island of Maui (TMK: 3-4-39: 82), prepared for Charal, LLC, Honolulu, by Xamanek Researches, Pukalani, Hawaii.

December 2000 Archaeological Inventory Survey for the Wai'ehu Kou Sewer Line Corridor, Wai'ehu *Ahupua'a*, Wailuku District, Maui Island (TMK: 3-2-13), prepared for Department of Hawaii Home Lands, by Xamanek Researches, Pukalani, Hawaii.

September 2002 An Archaeological Inventory Survey of a Parcel of Land in Wailuku *Ahupua'a*, Wailuku District, Maui Island (TMK: 3-4-39: 76), prepared for Victor Campos, Wailuku, by Xamanek Researches, Pukalani, HI.

Fredericksen, Erik M., and Demaris L.
September1998 An Archaeological Mitigation Report for Lower Main and Mill Streets Public Utilities Improvement Project, Wailuku *Ahupua'a*, Wailuku District, Maui Island (TMK: 3-9-39: por. 81, 82, 83), prepared for MECO, by Xamanek Researches, Pukalani, HI.

June 1999 An Archaeological Inventory Survey of a Drainage and Diversion Easement Corridor for the Department of Hawaiian Home Lands, Wai'ehu Kou 2 Residential Development, Wai'ehu *Ahupua'a*, Wailuku District, Maui Island, (TMK: 3-2-13: por. 1 and 9), prepared for Ms. Mei Lee Wong, Project Manager, Maui School Development Partnership, prepared by Xamanek Researches, Pukalani, Hawaii.

Dec.1999 An Archaeological Inventory Survey of a c. ½-acre Parcel on Lower Main Street, Wailuku *ahupua'a*, Wailuku District, Maui Island (TMK: 3-8-36: 94), prepared for Ms. Shuw Luan Chang, by Xamanek Researches, Pukalani.

January 2002 Archaeological Monitoring Report for the Paukukalo 8-inch Waterline Replacement –Phase I Project, Wailuku, *Ahupua'a*, Wailuku District, Maui (TMK 3-4-29) [Job No. 98-17], prepared for Mr. Robert Chin, Diversified Machinery, Inc., by Xamanek Researches, Pukalani, HI

Fredericksen, Erik
August 2000 Archaeological Mitigation Plan for Human Remains Located in Site 50-50-04-3120 and Site 4668—the Nisei Veterans Memorial Center Project, Wailuku *Ahupua'a*, Wailuku District, Island of Maui (TMK: 3-8-07.123 and Por. of 38).
Prepared on behalf of the Nisei Veterans Memorial Center, Wailuku. Prepared by Xamanek Researches, Pukalani, Maui.

June 2002 Archaeological Monitoring Plan for the Paukukalo 8-inch Waterline Replacement—Phase II Project along Lilihua Street, Wailuku *Ahupua'a*, Wailuku District, Maui. (TMK-3-4-27, 28, 29) [Job No. 98-17], prepared for the County of Maui Board of Water Supply, by Xamanek Researches, Pukalani.

Fredericksen, Walter and Demaris Fredericksen
November 1992 An Archaeological Inventory Survey for Owa Subdivision, A & B Properties, Inc. (TMK: 3-8-07: 38), Wailuku Ahupua'a, Wailuku District, Maui, prepared for Hideo Kawahara, A & B Properties, by Xamanek Researches, Pukalani, HI.

Handy, E.S.C., and E.G. Handy
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Juvic, Sonia P., and James O. Juvic
1998 Atlas of Hawaii, 3rd Edition, University of Hawaii Press, Honolulu.

Kamakau, Samuel M
1991 Ka Po'e Kahiko: The People of Old. Bernice P. Bishop Museum Special Publication 51. Bishop Museum Press, Honolulu

1992 Ruling Chiefs of Hawaii—Revised Edition, Kamehameha Schools Press, Honolulu, Hawaii.

Naone, Lyons Kapi'iho III
1996 *Haleki'i and Pihana Heiau*, Maui Historical Society Journal, Spring 1996, Wailuku, Maui

Pukui, M.K., S.H. Elbert and E.T. Mookini
1976 Place Names of Hawaii, University of Hawaii Press, Honolulu.

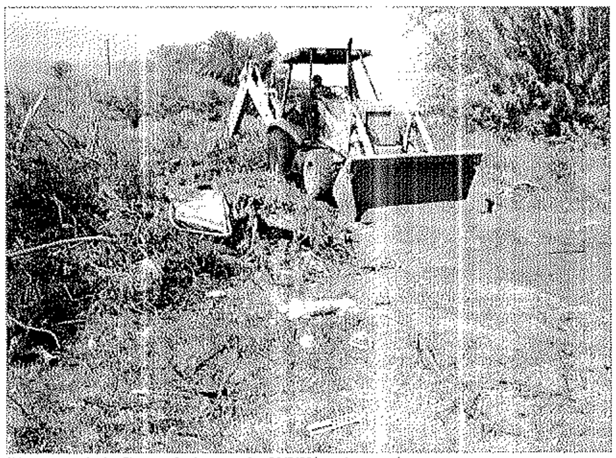
Speakman, Cummins E.
1978 Mowee: An Informal History of the Hawaiian Island, Peabody Museum of Salem, Salem, Mass.

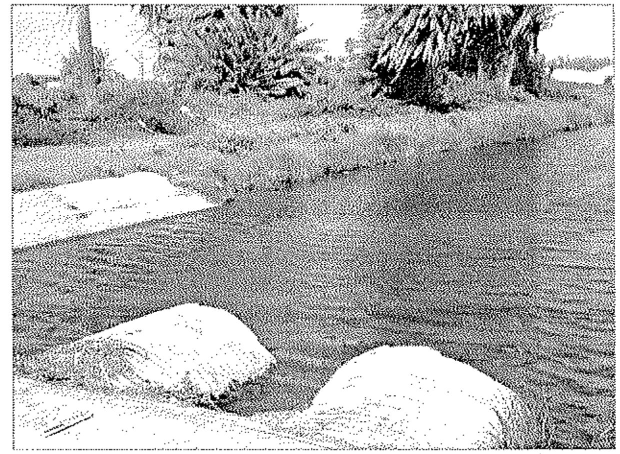
Spear, Robert L.
1995 Report on Monitoring of Curbing, Burial Crypt and Side-walk excavations at Site 50-50-04-4066, Wailuku, Maui, TMK: 3-8-37: 48, prepared for SHPD by Scientific Consultant Services, Honolulu

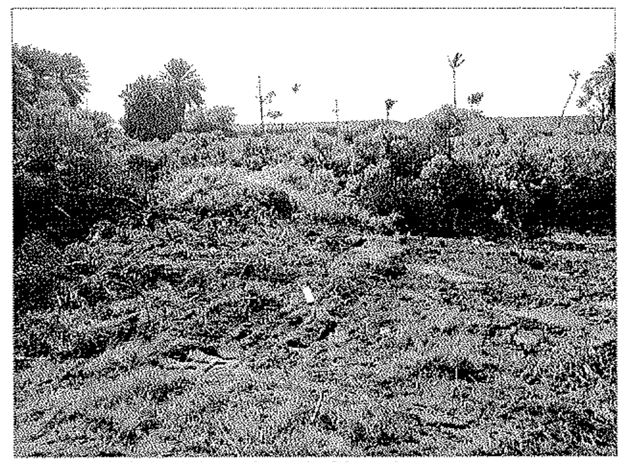
Winieski, John and Hammett Hallett
November 1999 Archaeological Monitoring Plan for a proposed waterline replacement project In Paukukalo, Wailuku *Ahupua'a* on Kainalu, Kaiko'o and Ukali Streets, and Lipo, Lilihua, and Kanai Places, Island of Maui (TMK 3-4-27, 28, 29). Prepared for Warren S. Unemori Engineering, Inc. Prepared by Cultural Surveys Hawai'i, Oahu.

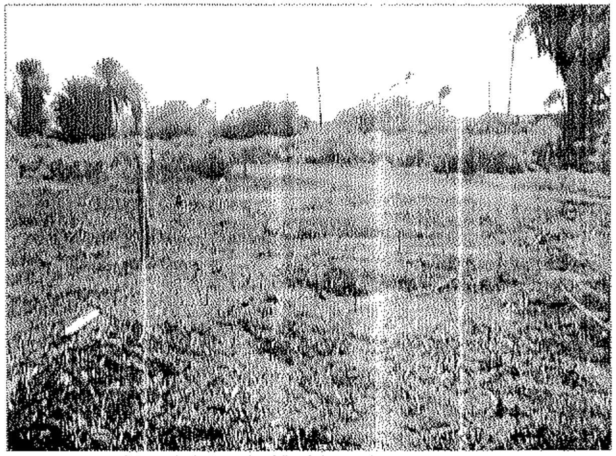
Walker, Winslow
1931 Archaeology of Maui, MS on file at Maui Historic Society, Wailuku, Maui.

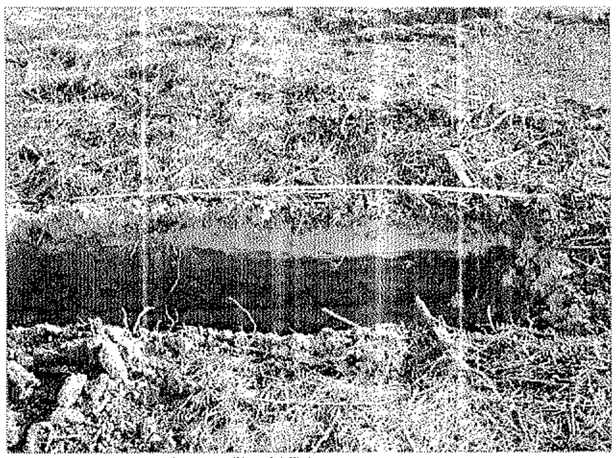
APPENDIX A:
Lot 8, Kanaha Industrial Subdivision II
Project Photographs

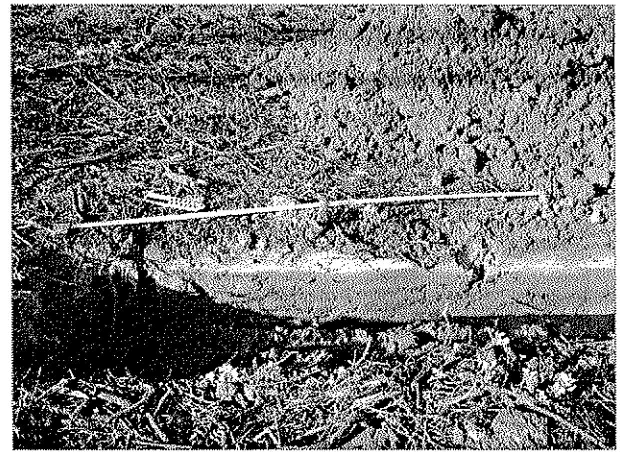

Photograph 1: General view to the WNW, prior testing.

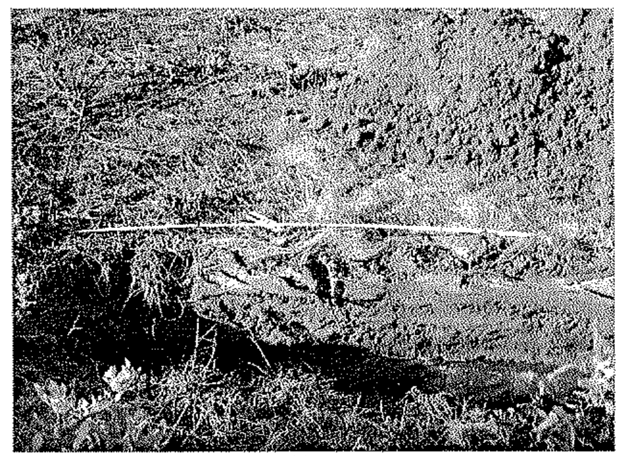

Photograph 2: General view to the NW of the flood control canal - project area lies at the left. Note: Kanaha Pond lies to the right, but is not visible in this photograph.


Photograph 3: General view to the south of the project area.


Photograph 4: General view to the SE of the project area.

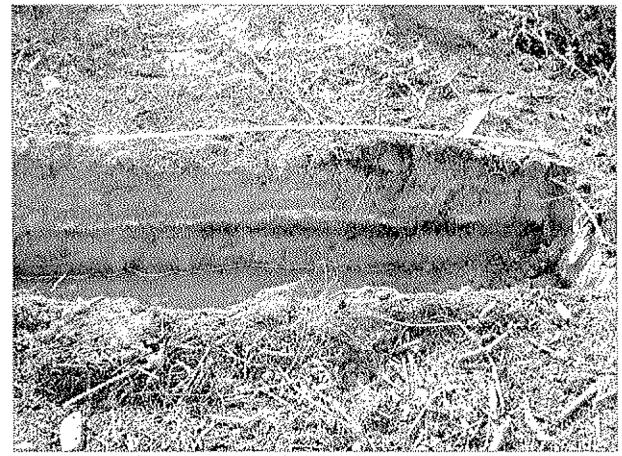

Photograph 5: North face profile of BT 1.

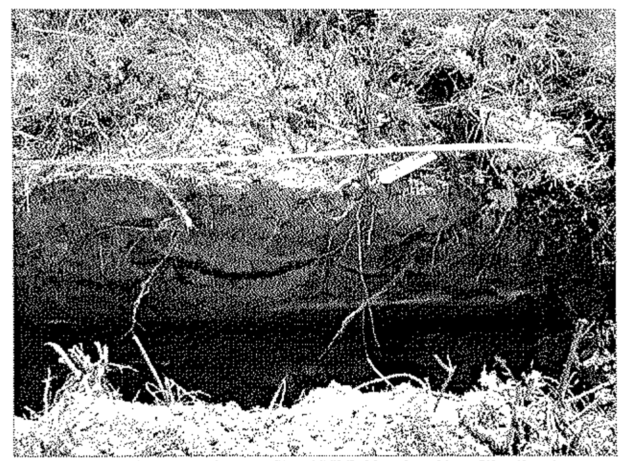

Photograph 6: West face profile of BT 2.

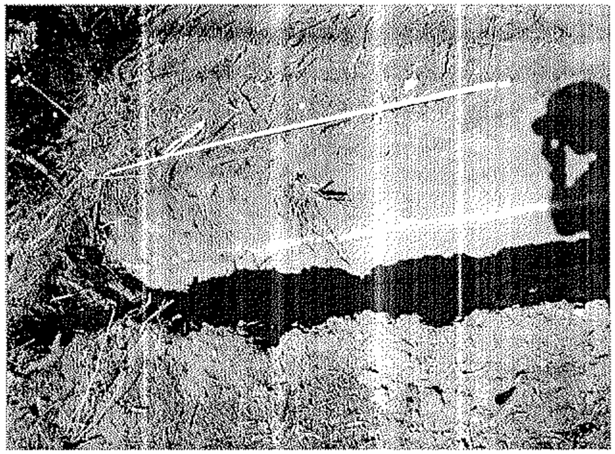

Photograph 7: West face profile of BT 3.


Photograph 8: East face profile of BT 4.

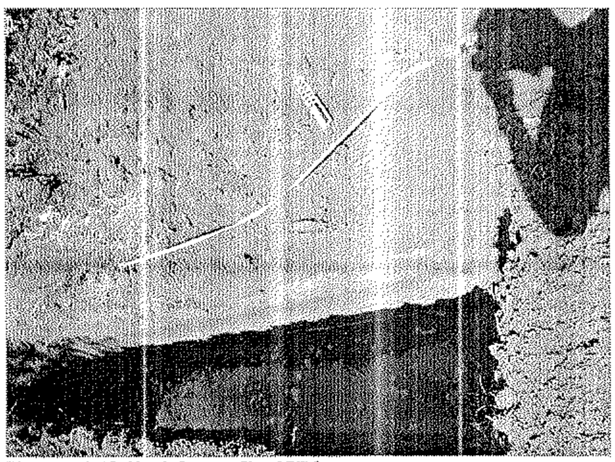

Photograph 9: East face profile of BT 5.


Photograph 10: South face profile of BT 6.

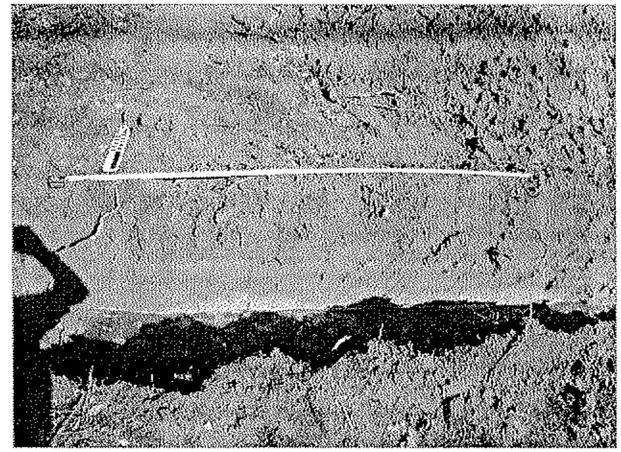

Photograph 11: Southeast face profile of BT 7, Kanaha. Note fill collapsing out of the profile.



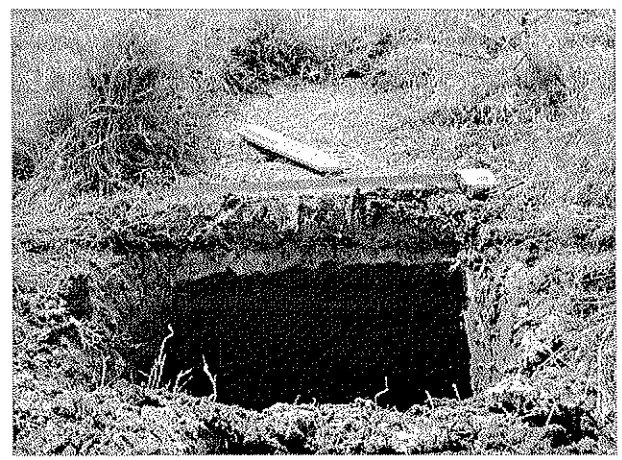
Photograph 12: Northwest face profile of BT 8.



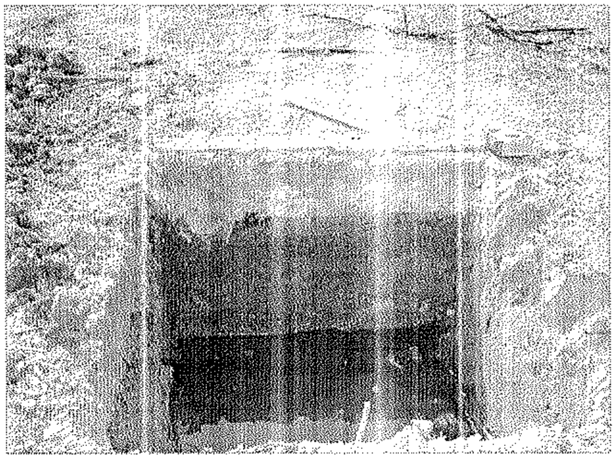
Photograph 13: North face profile of BT 9.



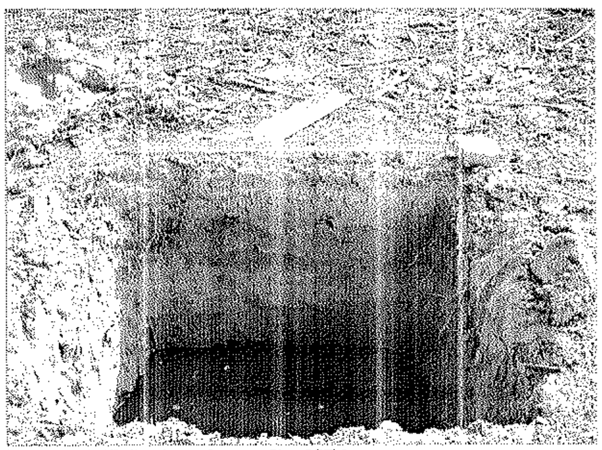
Photograph 14: North face profile of BT 10.



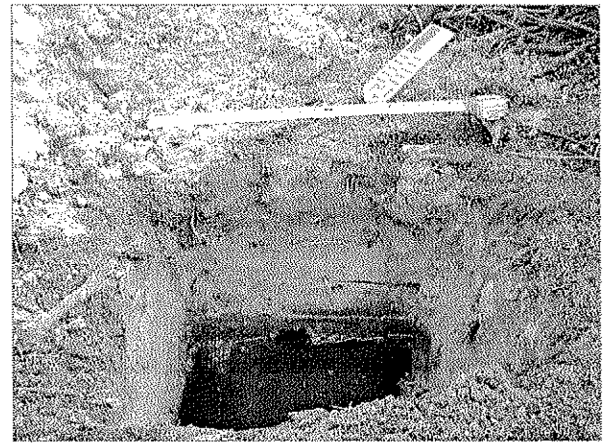
Photograph 15: Southwest face profile of ST 1.



Photograph 16: Southwest face profile of ST 2.

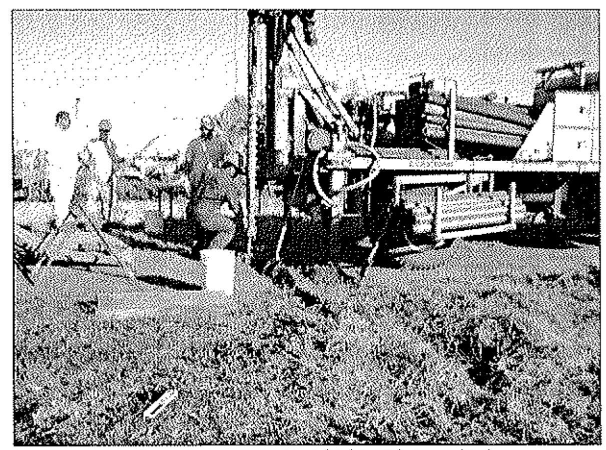


Photograph 17: Southeast face profile of ST 3.



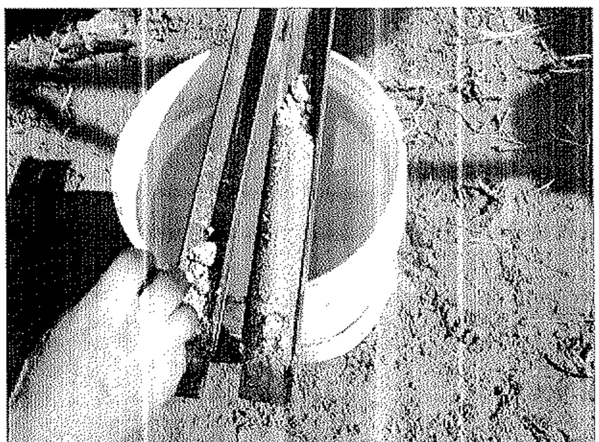
Photograph 18: Southeast face profile of ST 4.

Soil Testing – Kanaha Lot 8 Industrial Subdivision II



Photograph 19: General view to the N of GEOLABS, Inc drill rig.

Photograph 20: General view to the E of Core 1 test location.



Photograph 21: General view of Core Sample 2, sand (6.5 - 8 ftbs [16]).

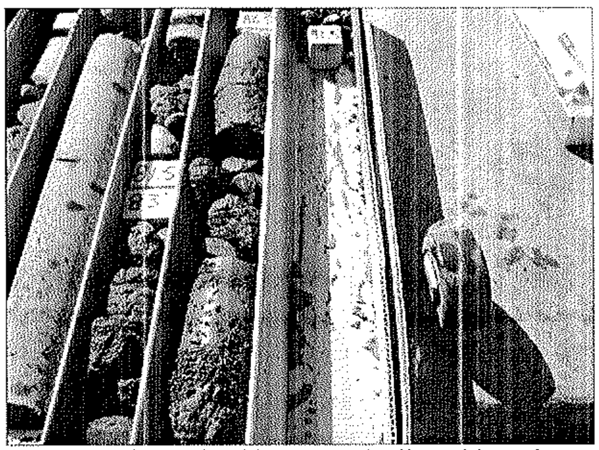
[16] Measurements are in feet below surface (c. 200–250 cmbs). Note: it was not possible to photograph Core Sample 1.

Photograph 22: General view of Core Sample 3, sand (11.5 - 13 ftbs [17]).

Photograph 23: General view of Core Sample 4, sand (16.5 - 18 ftbs [18]).

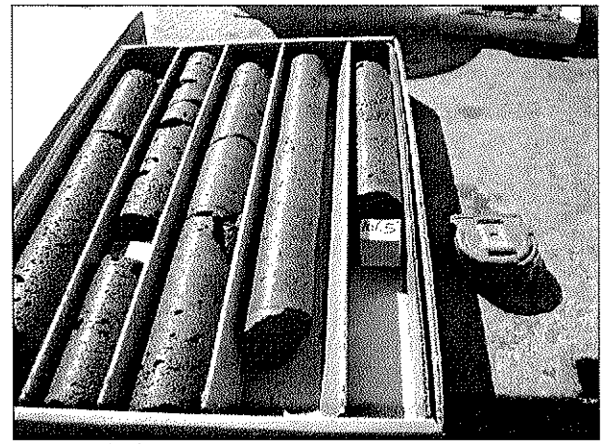
[17] Measurements are in feet below surface (c. 350–400 cmbs).
[18] Measurements are in feet below surface (c. 500–550 cmbs)

Photograph 24: General view of Core Sample 8, possible alluvial deposit (36.5 - 38 ftbs[19]).



Photograph 25: General view of deep core samples. Note rock in samples at left.

[19] Measurements are in feet below surface (c. 1100–1170 cmbs).



Photograph 26: General view of deepest core samples - all rock.

APPENDIX B:
Lot 8 Kanaha Industrial Subdivision II
Project Backhoe Trench profiles

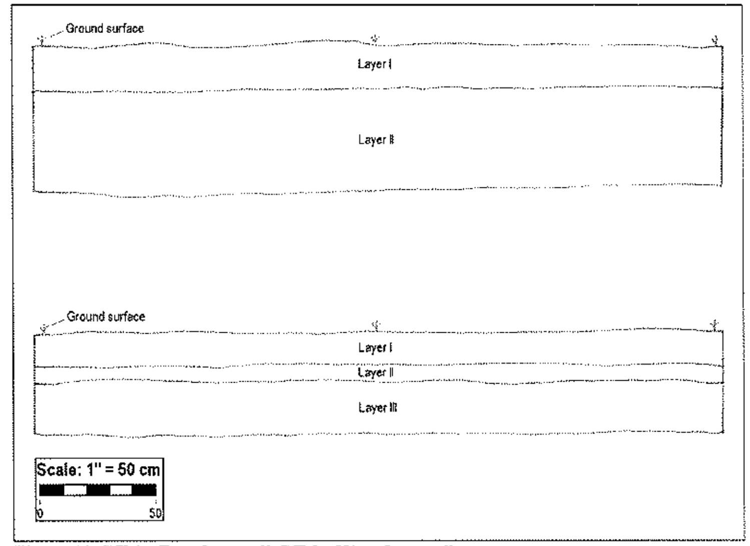


Figure 11: BT 1 - East face wall, BT 2 - West face wall.

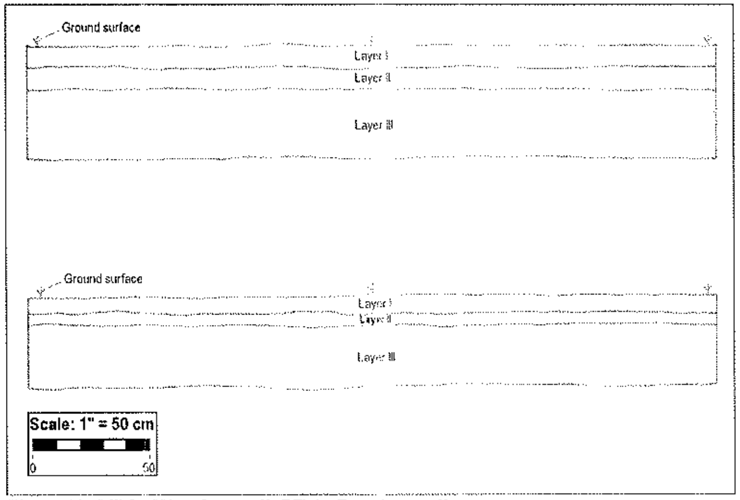


Figure 12: BT 3 - West face wall, BT 4 - East face wall.

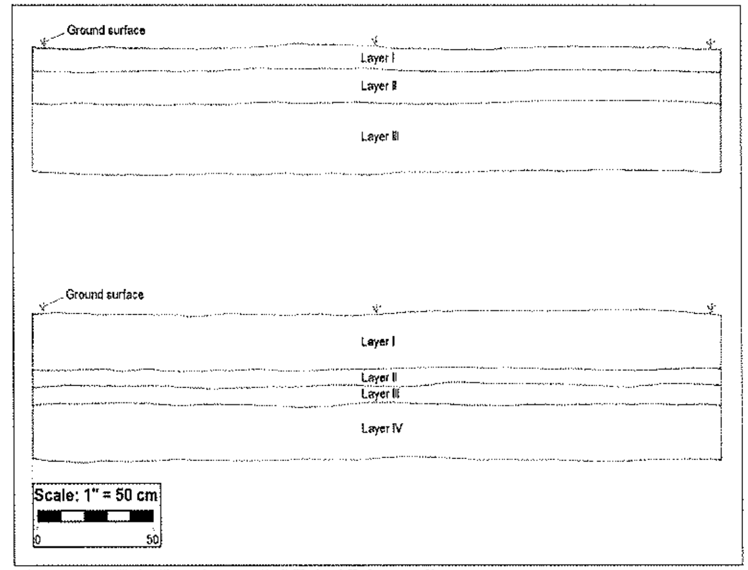


Figure 13: BT 5 - East face wall, BT 6 - SE face wall.

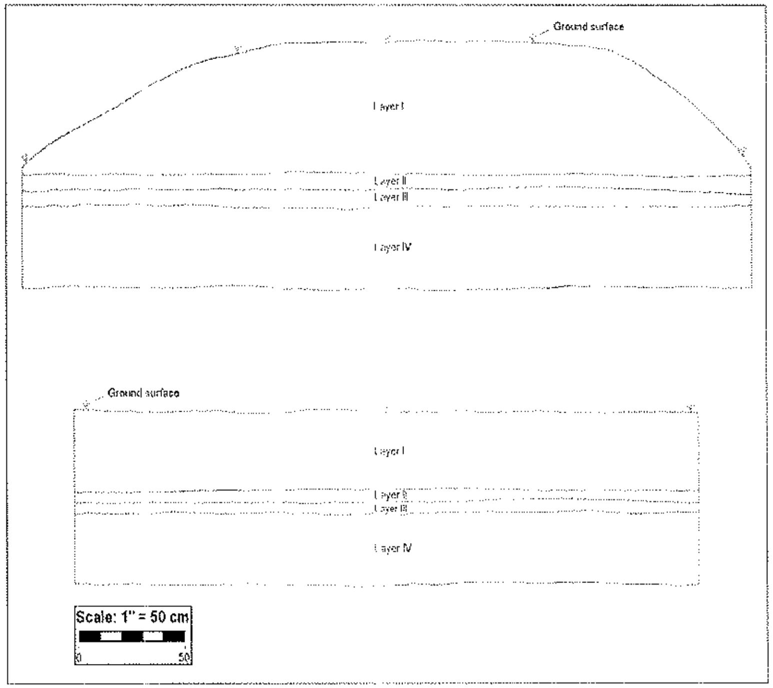


Figure 14: BT 7 - SE face wall, BT 8, including cross section of berm - NW face wall.

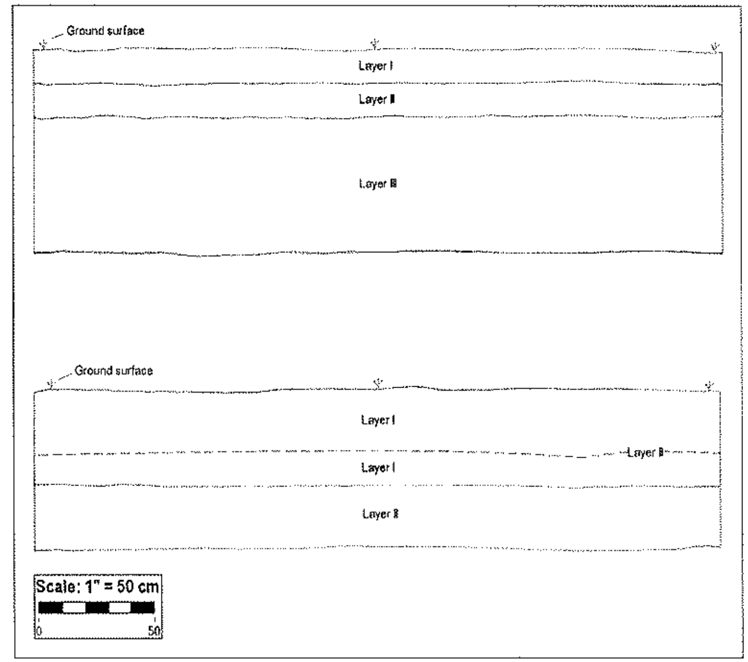


Figure 15: BT 9 - North face wall, BT 10 - North face wall.

APPENDIX F-1.

Letter from Department of Land and Natural Resources, State Historic Preservation Division Accepting Archaeological Assessment Survey

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
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

July 13, 2008

Erik M. Fredericksen, M.A.
Xamanek Researches, LLC
P.O. Box 880131
Pukalani, Hawai'i 96768

LOG NO: 2008.2437
DOC NO: 0807PC02
Archaeology

Dear Erik:

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Archaeological Assessment Survey for Lot 8, Kanaha Industrial Subdivision II, Located on a c. 2.5 Acre Portion of Land in Wailuku Ahupua'a, Wailuku District, Maui Island
TMK: (2) 3-7-011:028

Thank you for the opportunity to review this revised report, which our staff received on July 3, 2008 (Fredericksen 2008): *An Archaeological Assessment Survey for Lot 8, Kanaha Industrial Subdivision II*...Xamanek Researches, LLC.

The report was first reviewed by SHPD staff on May 4 of 2008, resulting in a series of requested revisions (SHPD LOG NO: 2007.1605; DOC NO: 0805PC05). The most recent version of the report was reviewed in hardcopy format to confirm completion of previously requested revisions and suggestions.

The report now contains the required information as specified in HAR §13-276-5 regarding the documentation of inventory level fieldwork resulting in an absence of culturally significant finds, and is acceptable.

Should you have any questions or comments regarding this letter, please contact Patty Conte (Patty.J.Conte@hawaii.gov).

Aloha,

Nancy McMahon, Deputy SHPO/State Archaeologist
State Historic Preservation Division

c: Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793

APPENDIX F-2.

Archaeological Monitoring Plan

AN ARCHAEOLOGICAL MONITORING PLAN FOR LOT 8, KANAHA INDUSTRIAL SUBDIVISION II, A 2.499 ACRE PORTION OF LAND IN WAILUKU *AHUPUA`A*, WAILUKU DISTRICT, MAUI ISLAND

(TMK: ([2] 3-7-11: 028)

Prepared on behalf of:

Mr. Benjamin Brown, Principal
Kanaha Professional Plaza, LLC
Kahului, Maui

Prepared by:

Xamanek Researches, LLC
Pukalani, Maui
Erik M. Fredericksen

06 August 2008 (FINAL)

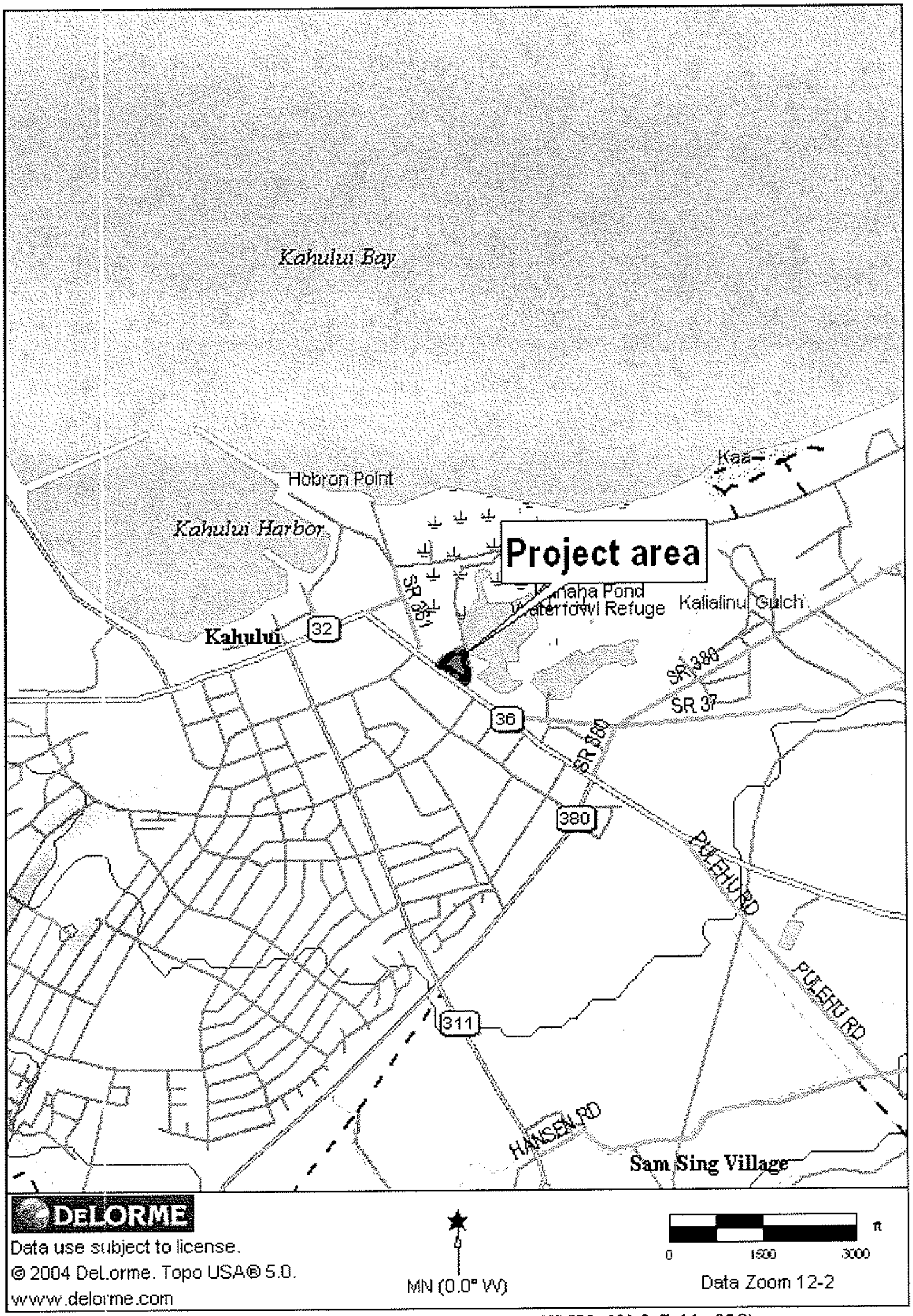


Figure 1: Location of the project area, Kahului, Maui (TMK: [2] 3-7-11: 028).

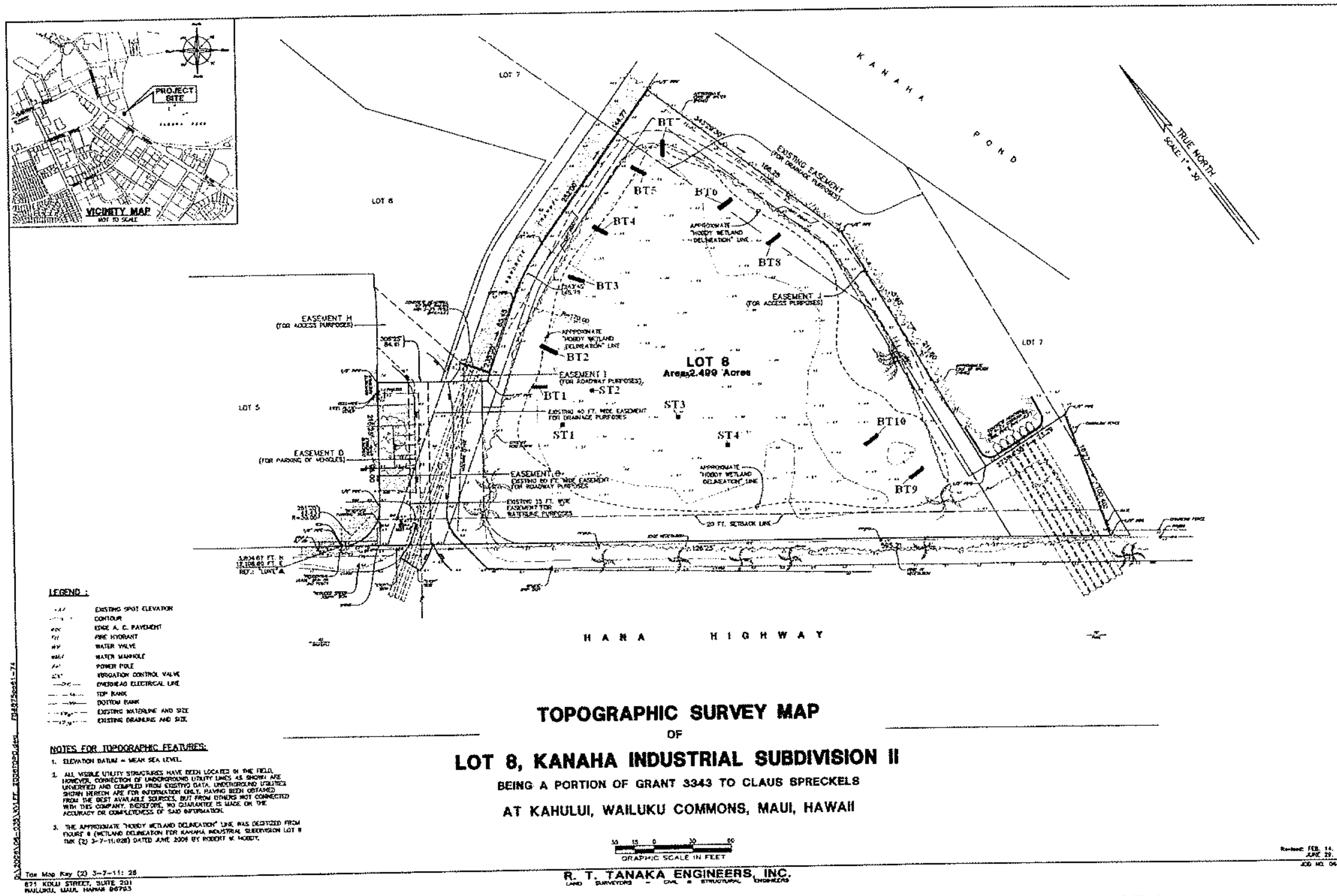


Figure 2: Topographic map of Lot 8, Kanaha Industrial Subdivision II, including locations of BT 1 – BT 10, and ST 1 – ST 4.
Note: Lot 7 is located between the project area and Kanaha Pond.

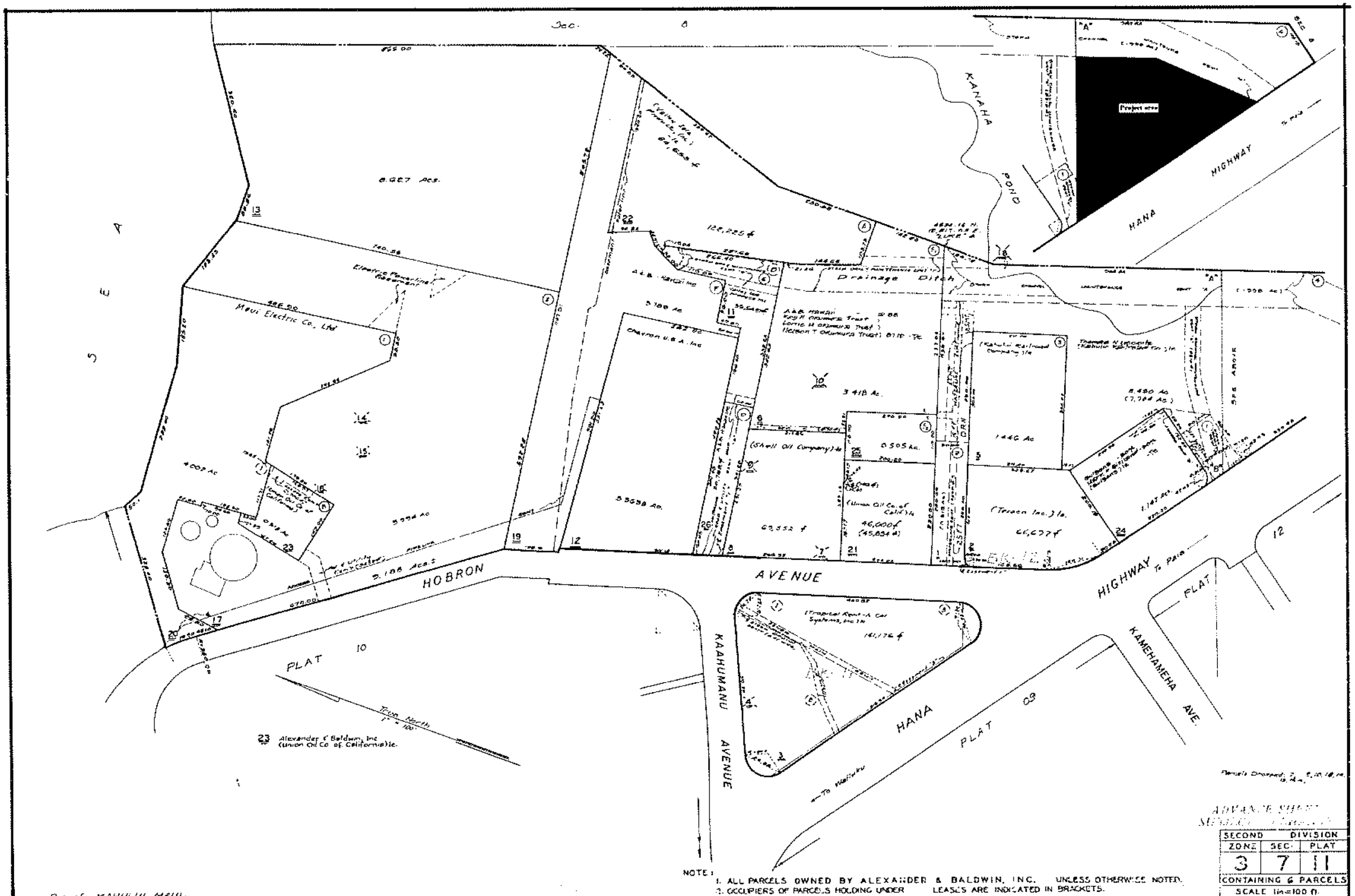


Figure 3: Tax Key Map of Lot 8, Kanaha Industrial Subdivision II (TMK: [2] 3-7-11: 28).

Figure 4: Overall plan view of project area (Lot 8) in relationship to the adjacent Lot 7, Kanaha Pond and the general Kahului area. Note WWII era modifications to Kanaha Pond in upper center right of aerial photograph, along with 1970s flood control drainage canal, which is on Lot 7 to the right of Lot 8.

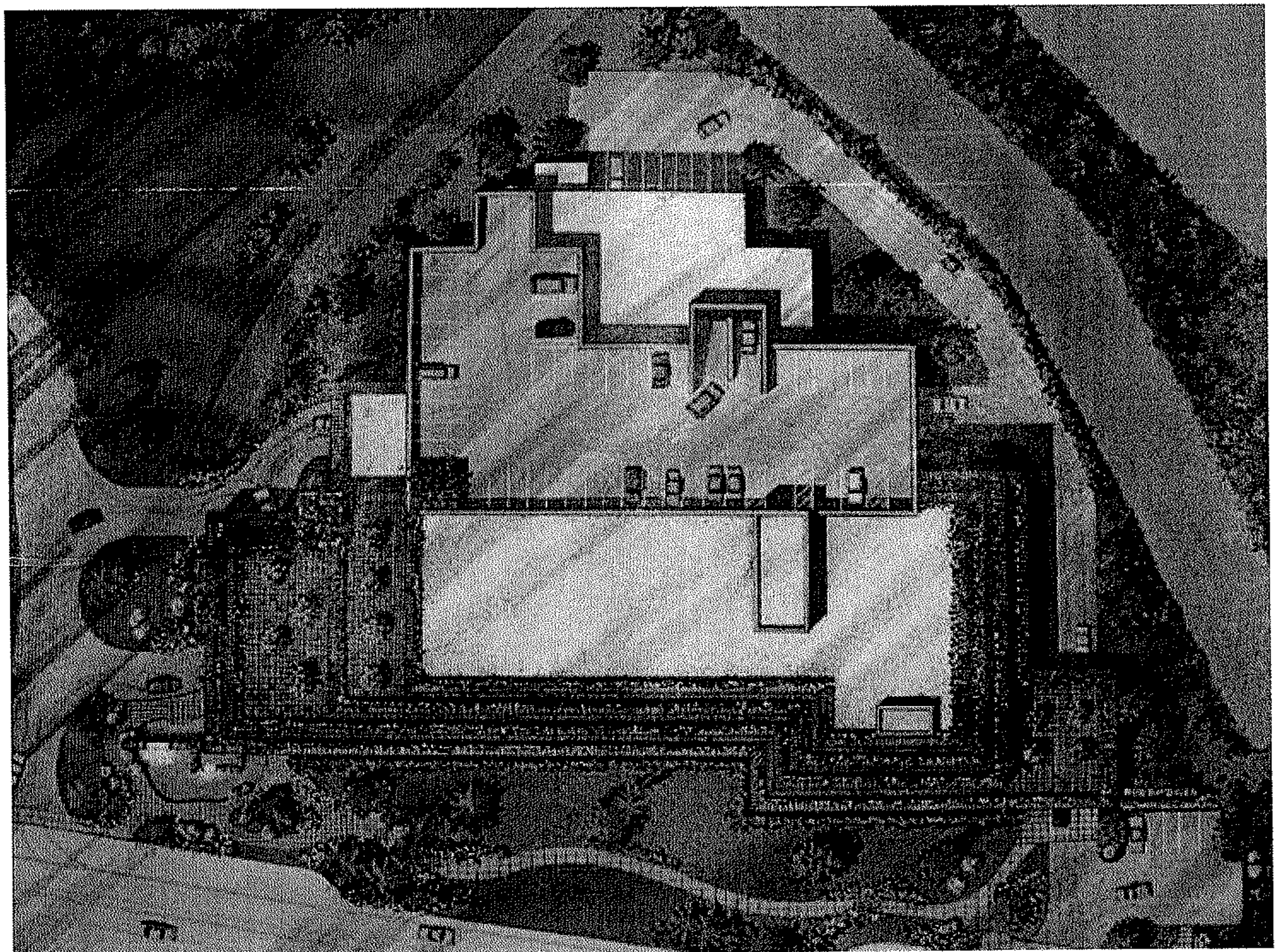


Figure 5: Conceptual plan view of building on Lot 8 in relationship to the existing drainage channel. A section of the adjacent Lot 7 drainage canal, and a portion of Kanaha Pond are visible in the upper right of this figure, and Hana Highway is at the bottom of the figure.

INTRODUCTION

Xamanek Researches, LLC previously conducted an archaeological assessment survey of Lot 8, Kanaha Industrial Subdivision II, a c. 2.5 acre portion of land in Kahului, Wailuku Commons, Maui during December of 2006 (TMK [2] 3-7-11: 028). The study area consists of a portion of land (known as Lot 8) that is separated from Kanaha Pond by Lot 7, which contains a drainage canal. The property is located in Wailuku *Ahupua`a*, Wailuku District, Maui. The subject parcel is a portion of a large central Maui land grant—Grant 3343 to Claus Spreckels. The earlier assessment survey was conducted on behalf of Mr. Benjamin Brown, Principal, Kanaha Professional Plaza, LLC. Project plans call for the construction of a multi-story medical facility that will be leased to medical professionals, along with other on-site improvements, including a parking structure.

There were no significant material culture remains located during the walk-over or subsurface testing of Lot 8. No further archaeological work was recommended for this parcel of land in Kahului, Maui at this time. However, precautionary monitoring was stipulated. given the location of the proposed project area (SHPD DOC NO: 0807PC02). At the writing of this archaeological monitoring plan, the proposed facility is known as the Maui Medical Plaza.

STUDY AREA

As previously noted, the project area consists of Lot 8, Kanaha Industrial Subdivision II, which is located in Kahului, Maui. The c. 2.5 acre parcel is bordered along its eastern side by a c. 50 ft (15 m) wide drainage canal/levee (Lot 7), which separates the study area from the Kanaha Pond Wildlife Sanctuary. A portion of the Lot 8 northern boundary is defined by a 20 ft (6 m) wide drainage canal/levee, while a portion of a previously developed parcel bounds the lot on its northwestern side. Finally, Hana Highway borders the property along its southern side.

The c. 2.5 acre parcel is essentially level. Project elevations range from c. 3 ft AMSL in the central portion of the parcel to c. 5 ft AMSL along the levees and to a bit over 6 ft AMSL along portions of Hana Highway. The project area is located within a larger parcel of land in Kahului, Wailuku Commons, Maui (TMK [2] 3-7-11: 028). The project area lies an estimated 0.7 km from the Kahului coastline.

This windward portion of Maui is typical of much of the low lying near coastal inland Kahului region, with soil components consisting of Jaucas Sand, Saline, 0-12% (JcC) (Foote et al., 1972). This soil type is encountered near the ocean where ground water is near the surface and where salts have accumulated over time. These soils are subject to inundation after periods of heavy precipitation. Annual precipitation in this windward area ranges from c. 20-30 inches, with the majority of rainfall occurring between November and March (Juvic and Juvic, 1998).

A biological resources survey of Lot 8 was carried out by Mr. Robert Hobdy in 2006. In his report, Hobdy notes that the parcel is heavily overgrown. Noted species include the non-native shrub sourbush (Plucea indica), seashore saltgrass (Distichlis spicata), and a few scattered trees such as *kiawe* (Prosopis pallida), and date palm (Phoenix x dactylifera).

ARCHAEOLOGICAL MONITORING PLAN

Scope of monitoring

The scope of this monitoring plan includes having an archaeological monitor present during all subsurface earthmoving activities scheduled for the Maui Medical Plaza in Kahului. Actual on-site time and specific actions to be followed in the event of inadvertent discoveries will be discussed and agreed upon by the general contractor and the archaeological consultant at a pre-construction meeting held for this purpose. Additional meetings may be called, if either the monitoring archaeologist or contractor believes that other relevant information should be disseminated. The following monitoring plan covers this current project area as well as any off-site improvements for the medical facility (TMK [2] 3-7-11: 028).

Monitoring methodology

Given the location of the proposed medical facility, there is a possibility that significant material culture remains may be inadvertently disturbed during earthmoving activities in this portion of Kahului, Maui. Possible cultural materials could include subsurface habitation deposits (such as Site 4753 to the northwest near Kahului Harbor), human burials and/or human skeletal remains (such as Site 5496 also near the harbor).

Close cooperation between the monitoring archaeologist and construction personnel is important to a successful monitoring program. The monitoring program will follow the 12 conditions listed below:

1) The contractor shall be responsible for ensuring that the archaeological consultant is aware of all pertinent construction schedules and that the monitor is present for <u>all</u> subsurface excavation activities on this near coastal parcel.

2) Both the archaeological consultant and the contractor are responsible for ensuring that on-site work is halted in an area of significant findings and to protect any such find from any further damage (i.e., construction fencing, protective covering, etc.). The State Historic Preservation Division will recommend appropriate mitigation actions. The SHPD Burial Sites Program, the SHPD Maui office, and the Maui/Lana`i Islands Burial Council (MLIBC) will be consulted in the event that human remains are found. (Change work order)

3) In the event of the discovery of human remains, work shall cease in the immediate find area. The monitoring archaeologist will be responsible for notifying the SHPD Maui office and the Historic Preservation Division Burial Sites Program, which, in consultation with the Maui/Lana`i Islands Burial Council, will determine the appropriate mitigation measures. This notification will include accurate information regarding the context and composition of the find. (Change work order)

4) The archaeological consultant will work in compliance with Hawai`i Revised Statutes Chapter 6E (procedures Relating to Inadvertent Discoveries).

5) The monitoring archaeologist will have the authority to closedown construction activities in areas where potentially significant discoveries have been made until they have been properly evaluated. Normally, construction activities may continue in unaffected portions of the project area. (Change work order)

6) Field procedures to be followed for documentation of discovered cultural features or human skeletal remains: a) standard field methods including recordation of profiles showing stratigraphy, cultural layers, etc.; b) mapping and photographing of finds other than human remains; c) and excavation of cultural materials and/or exposed features.

7) The SHPD Maui office shall be notified and consulted with regarding treatment of identified features such as cultural layers, artifact or midden concentrations, structural remains, etc., considered to be of significance under S13-279-2 (definitions).

8) The contractor should take into account the necessity for machine excavation at a speed slow enough to allow for reasonable visual inspection of the work. The monitoring archaeologist must make a "best effort" to search for significant material culture remains (i.e. artifacts, features, midden, skeletal remains, etc.). Machine excavation speed will need to be slowed in an area where significant material culture remains have been identified. (Change work order)

9) Significant archaeological discoveries, if they occur, shall be protected and identified by construction "caution" tape, fencing, or other reasonable means, until the SHPD Maui office and the archaeological consultant decide appropriate mitigation actions. All recovered material culture remains—with the possible exception of charcoal samples for radiometric analysis—will remain on Maui. Standard laboratory methods shall be utilized by the consulting archaeologist in the event that cultural materials are recovered during monitoring and/or mitigation work. Cultural materials will be curated by archaeological consultant. (Change work order)

10) One monitor in most instances will carry out the necessary fieldwork. Tasks will include observation of grubbing and earth-moving activities. However, the SHPD and the MLIBC require that one archaeological monitor be assigned to each piece of major earthmoving equipment in sand dune areas or other culturally sensitive locations. (Change work order)

11) In the event of night work, the general contractor shall supply adequate lighting for the onsite monitor.

12) Chapter 6E-11 (a) specifies the following "It shall be unlawful for any person or corporate, to take, appropriate, excavate, injure, destroy, or alter any historic property or aviation artifact located on the private lands of any owner thereof without the owner's written permission being first obtained. It shall be unlawful for any person, natural or corporate, to take, appropriate, excavate, injure, destroy, or alter any historic property located upon lands owned or controlled by the State or any of its political subdivisions, except as permitted by the department."

Field methods utilized shall include photographic recordation (where appropriate), artifact excavation (recovery and recordation), profile documentation of cultural layers and stratigraphy, excavation and recordation of exposed features, and mapping of all pertinent features on an appropriate site map. A daily log (field notes) of activities and findings will also be kept. Gathered information shall be utilized in the preparation of the monitoring report to be submitted to the SHPD.

In the event human skeletal remains are inadvertently disturbed, the SHPD Maui office, the SHPD Burial Sites Program and the Maui/Lana`i Islands Burial Council shall be notified, and appropriate mitigation actions determined (photographs of human skeletal remains will not be taken).

A supervisory archaeologist may periodically visit the monitoring site as often as is necessitated by the nature of the construction activities and archaeological findings. If significant discoveries are made, appropriate mitigation measures will be discussed with the SHPD Maui office.

The archaeological consultant shall curate all cultural materials recovered from this monitoring project on Maui, with the exception of radio carbon samples that will need to be sent off-island for analysis. When analysis is completed, recovered material culture remains will be turned over to the appropriate parties. Long-term curation arrangements of such materials will be approved by the SHPD.

A draft monitoring report detailing the results of the monitoring program will be prepared. This draft report shall be submitted to the State Historic Preservation Division within 180 days of the completion of fieldwork, for comment and approval. Approved changes and corrections will result in the final monitoring report for the proposed Maui Medical Plaza on TMK [2] 3-7-11: 028.

APPENDIX F-3.

Letter from Department of Land and Natural Resources, State Historic Preservation Division Accepting Archaeological Monitoring Plan

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

[redacted]
LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
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

September 6, 2008

Erik M. Fredericksen, M.A.
Xamanek Researches, LLC
P.O. Box 880131
Pukalani, Hawai'i 96768

LOG NO: 2008.3536
DOC NO: 0809PC08
Archaeology

Dear Erik:

SUBJECT: Chapter 6E-42 Historic Preservation Review –
Archaeological Monitoring Plan for On- and Off-Site Improvements Related to Lot 8, Kanaha Industrial Subdivision II, Located on a c. 2.5 Acre Portion of Land in Wailuku Ahupua'a, Wailuku District, Maui Island
TMK: (2) 3-7-011:028

Thank you for the opportunity to review this plan, which our staff received on August 8, 2008 (Fredericksen 2008): *An Archaeological Monitoring Plan for Lot 8, Kanaha Industrial Subdivision II*...Xamanek Researches, LLC.

Precautionary archaeological monitoring was recommended by your firm upon completion of an archaeological inventory survey (assessment), for which a final report was accepted in July of this year (SHPD LOG NO: 2008.2437; DOC NO: 0807PC02). While no significant cultural resources were identified during the survey, such resources may be impacted during ground altering disturbance associated with the proposed project.

As specified in the monitoring plan, there will be one archaeological monitor on site during all ground altering disturbance and for excavation within sandy substrates or culturally sensitive areas, there will be one archaeologist per piece of heavy equipment in use, as per the recommendation of the Maui/Lana'i Islands Burial Council (MLIBC). A coordination meeting with the construction crew and all other pertinent parties to explain monitoring procedures and that the monitoring archaeologist has the authority to halt work in the vicinity of a culturally significant find will be undertaken, and should anything of cultural significance be identified, the SHPD will be consulted for mitigation recommendations. The plan further states that in the event human remains are inadvertently exposed, both the SHPD and MLIBC will be notified and appropriate burial protocol followed. A report detailing the findings of the monitoring will be prepared and submitted to our office for review within 180 days after the completion of the project.

The plan contains the required information as specified in HAR §13-279-4(a) regarding the contents of monitoring plans in general and is acceptable.

Should you have any questions or comments regarding this letter, please contact Patty Conte (Patty.J.Conte@hawaii.gov).

Aloha,

Nancy McMahon, Archaeologist and Historic Preservation Manager
State Historic Preservation Division

c: Jeff Hunt, Director, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793
Lance Nakamura, Engineer, DPWEM, 250 S. High Street, Wailuku, Hawai'i 96793
Maui CRC, Dept. of Planning, 250 S. High Street, Wailuku, Hawai'i 96793

APPENDIX F-4.

No Effect Determination Letter from Department of Land and Natural Resources, State Historic Preservation Division

10/4/2010

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

December 3, 2010

Jim Buika, Coastal Resource Planner
County of Maui Department of Planning
Via fax to: (808) 270-7634

LOG NO: 2010.2754
DOC NO: 1012MD15
Archaeology

Dear Mr. Buika:

**SUBJECT: Chapter 6E-42 Historic Preservation Review –
Special Use Permit and Environmental Assessment (SM1 2010/0006 and EA 0002)
Wailuku Ahupuaʻa, Wailuku District, Island of Maui
TMK: (2) 3-7-011:028**

Thank you for the opportunity to comment on the aforementioned project, which we received on July 27, 2010. We apologize for the delay in our reply.

These permits are for the proposed Maui Medical Plaza Project to be located in Kahalui. An archaeological inventory survey (assessment) has been conducted on this parcel (Fredericksen 2008) and was accepted by SHPD (*Log No. 2008.2437, Doc No. 0807PC02*). Additionally, the Department of the Army issued Standard Permit POH-2006-531 to fill the wetland portion of this parcel (*Log No. 2008.5284, Doc No. 0901PC06*), located adjacent to the Kanaha Fishpond (SIHP 50-50-051783).

Although no historic properties were found during the archaeological assessment, SHPD agreed with the recommendations that all future ground-altering construction be subject to archaeological monitoring as this parcel is within two historic districts: the Kahului Historic District (SIHP 50-50-04-1607) and the Kahului Harbor Historic District (SIHP 50-50-04-2953). An archaeological monitoring plan for this project was submitted to and accepted by SHPD in 2008 (Fredericksen 2008, *Log No. 2008.3536, Doc No. 0809PC08*).

Therefore we believe that the proposed project will have **no effect on historic properties** because appropriate mitigation in the form of precautionary archaeological monitoring during ground-altering disturbance has been put in place, and which are expected to be followed by the project developer. If you have questions about this letter please contact me at (808) 243-5169 or via email to: morgan.e.davis@hawaii.gov.

Aloha,

Morgan E. Davis
Lead Archaeologist, Maui Island Section
State Historic Preservation Division

'10 DEC -8 A10:18
DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Cc:
County of Maui, DPW-DSA via fax to: (808) 270-7972
Maui CRC, Department of Planning, 250 S. High Street, Wailuku, Hawaii 96793

APPENDIX G.

Cultural Impact Assessment Report

Maui Medical Plaza at Kanahā

Cultural Impact Assessment

for

Kanahā Lot 8 Project
Kanahā, Kahului, Maui

by

Jill Engledow
Historical Consultant
Wailuku, Maui
March 2008

Prepared for
Maui Medical Plaza
350 Hukilike Street, Suite D
Kahului, Maui, HI 96732

Cultural Impact Assessment
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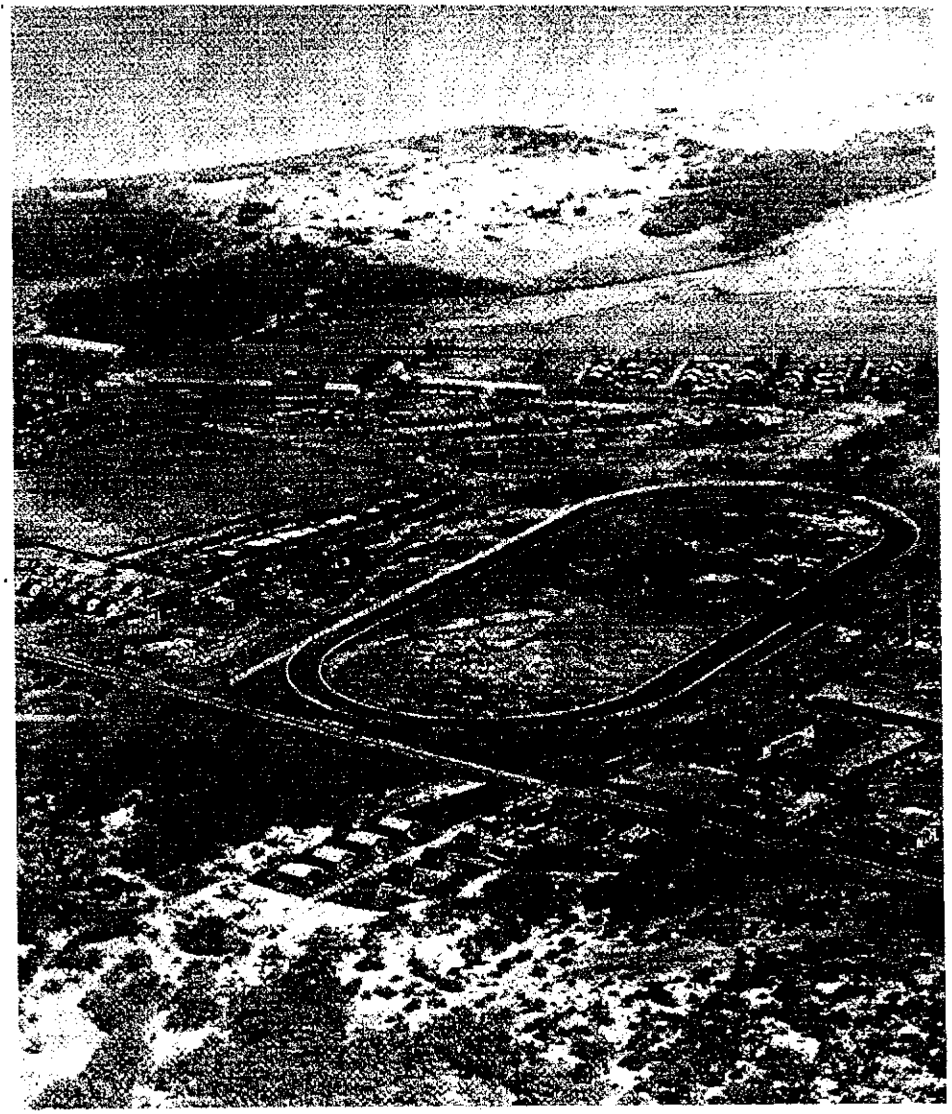

Kahului circa 1926, in a photo reproduced in Alexander & Baldwin Inc.'s *Ninety Years a Corporation, 1900-1990.* Note Kanahā Pond at top right.

2005 aerial photo of area around subject property, which is indicated by an arrow

Maui Medical Plaza at Kanahā

Cultural Impact Assessment

I. Introduction

At the request of Maui Medical Plaza at Kanahā, researcher and writer Jill Engledow prepared this Cultural Impact Assessment of the property known as Kanahā Industrial Subdivision Lot 8, TMK (2 3-7-11:028). This 2.5-acre undeveloped property is bounded on the east by a 50-foot-wide drainage canal and levee that separates it from the Kanahā Pond Wildlife Sanctuary. It is bounded on the north by a 20-foot-wide drainage canal and levee, on the northwest by retail and light industrial businesses and on the southwest by Hana Highway.

The proposed action that requires this Cultural Impact Assessment is an application for a Special Management Area Permit.

II. Report Methodology/Resource Materials Reviewed

Sources sited in archival research are listed in the attached bibliography. Additional searches included the Internet and the indexes of a variety of books on Hawaiian culture and history which were searched for the word *Kanahā*. Maui Historical Society and the Alexander & Baldwin Sugar Museum were contacted for information or pictures. Significant input came from previous reports on the archaeological, architectural and cultural land uses in the area from Kahului Harbor to Kahului Airport, and from the *Biological Resources Survey* and *Wetland Determination* conducted for this project by environmental consultant Robert W. Hobdy and the *Archaeological Survey Assessment* by Xamanek Researches. Engledow also conducted interviews with residents who remember uses in the area over the past 50 years. The nearby Kanahā Pond Wildlife Sanctuary was designated in 1952, and has not been available for traditional fishing uses since then, so it is unlikely that many contemporary Mauians ever participated in such uses. Several who did recall traditional uses, however, were interviewed for *An Evaluation of Traditional and Customary Land Uses in the Kahului Airport Area*, a report produced in 1999 which included interviews with several kūpuna who have since passed on, and their memories are referenced in this assessment.

III. Study Area Description

The property is on the low-lying coastal plain where Maui's commercial center, Kahului, is located. It is an undeveloped lot between buildings that house retail and light industrial businesses and a drainage canal that separates the property from Kanahā Pond. It has been densely overgrown with shrubs, primarily Indian fleabane *(Pulchea indica)*. Of the 32 plant species recorded during a botanical survey, only five were indigenous to Hawai'i

as well as to other areas, and all are of common occurrence. (Hobdy, *Biological Resources Survey*, 3-4) "From a vegetation standpoint there is little of interest or concern regarding this property in its current state, and any proposed land-use changes are not expected to have a significant negative impact on the botanical resources in this part of Maui," Hobdy's survey report said. Until recent efforts by the developers of Maui Medical Plaza to clear the area, it was a dumping ground for trash and often a camping site for homeless individuals. Other land uses in the surrounding area include Kahului Airport to the east, harbor and shipping facilities to the west, the ocean and the Kahului Wastewater Reclamation Facility to the north, and the Hāna Highway and the town of Kahului to the south.

The drainage ditch separating the property from Kanahā Pond includes a levee made of materials dredged in the creation of the ditch, its raised level preventing the mixing of waters from the ditch with those in the pond. Vuich Environmental Consultants, in a 2006 environmental study of the property, said: "Historically, the land has had fill material placed over its surface from drainage canal improvements and drainage canal maintenance (dredging). This has raised the land level of the subject property, which, historically, was likely part of the Kanaha pond (wetland)." Vuich concluded that "This assessment has revealed no evidence of *recognized environmental conditions* in connection with the property," and said a records review did not discover any current investigation of the subject site under any programs conducted by a federal, state, or local environmental agency.

Though the subject property is near Kanahā Pond Wildlife Sanctuary, the *Biological Resources Survey* found no endangered species on or using the property, although the *ae'o*, or Hawaiian stilt, was observed flying overhead. Birds in the pond have adapted to human activities that now surround it, the drainage channel constructed to remove excess groundwater from Kahului industrial area provides a wide buffer between the subject property and the pond, and the property is not suitable as water bird habitat in its present condition, Hobdy wrote. "In light of the above discussion it is felt that, should this property be developed, it would not result in significant negative impacts to the adjacent wetland habitats and species if carefully designed and constructed." (*Biological Resources Survey*, 11-12)

Similar conclusions were reached in a 2007 archaeological study by Xamanek Researches LLC, which found no significant surface material or subsurface deposits and recommended no further archaeological work other than precautionary monitoring during construction. (Xamanek, 2007, 20-21)

IV. Study Area History

The subject property is located within the traditional ahupua'a of Wailuku in the district of Wailuku, which is part of a larger area known as Na Wai 'Eha, "The Four Waters," after the four major streams that fed the taro-growing areas of Waikapū, Wailuku, Waiehu and Waihe'e. An article in *Paradise of the Pacific* (September 1900) includes a description of this area based on that by a native Hawaiian of "considerable age."

> The district was called Nawaieha (the four streams) and was famous throughout the group, not only for the magnificence of Kahekili's court but for the vastness of its products. The shores of Kahului harbor, from Waihee point to Haiku, were surrounded with the grass huts of the fisherman and of those connected with the innumerable war canoes of the king. Myriads of cocoanut trees lined the beach from Kahakuloa to Wailuku, the trunks of many of which are found in the marshes at Wailuku at this day, the trees having been destroyed by a conquering army from Hawaii.

The marshes referred to covered much of what became Kahului town in the 20th century, when the coastal flat area was filled with materials dredged in the development of Kahului Harbor. Within these marshes, early chiefs developed two large fishponds called Kanahā and Mau'oni. Two stories are recorded about the building of the ponds.

The ponds may have been built by Kiha-a-Pi'ilani, who lived in the early 16th century and who, with his father, Pi'ilani, built the King's Highway that circles Maui. According to Kamakau (1992:42) the Hawai'i Island chief Keawe-nui-a-'Umi sailed to Wailuku and met Kiha-a-Pi'ilani, who "was building the walls of the pond of Mau'oni."

Another story was recorded by J.G. F. Stokes, as told by Puea-a-Makakaualii (Mrs. Rosalee Blaisdell). The story says that "Kapiiohookalani, king of Oahu and half of Molokai, built the banks of *kuapa* [walls] of Kanaha and Mauoni, known as the twin ponds of Kipiioho." Laborers passed stones from hand-to-hand, and there were so many of them that "at times the men had only one *nehu* [anchovy] each for a meal and had to fill up with seaweed and salt. . ." Kapiiohookalani was killed by Alapainui of Hawai'i before the ponds were finished, leaving a daughter, Kahamaluihiikeaoihilani, and a son, Kanahaokalani. The princess later traveled on Maui, searching for her young brother, and learned that Maui chief Kamehamehanui was going to proclaim a kapu on the *kuapa* of the twin ponds. She appeared at the event, "stripped off her pa'u and stepped upon the center kuapa of the ponds. Around her waist was flying the *pola* of a white malo called the 'malokea,' a special malo worn by the high priest of the blood royal." Though the crowd who had come to watch the ceremony shouted that the kapu had been broken, normally an occasion for severe punishment, the king recognized the princess, welcomed her and let her name the ponds. The princess "named the pond makai, Kanaha, in honor of her brother Kanahaokalani, and the mauka pond Mauoni," the name she had used in her incognito travels. (Sterling, 1998: 87-88)

Both Kanahā and Mau'oni ponds were *loko wai*, "an inland freshwater fish pond which is usually either a natural lake or swamp, which can contain ditches connected to a river, stream, or the sea and which can contain sluice gates"; Kanahā's shape had been altered by man. (Kikuchi 1973: 228-229)

Wailuku was the site of several battles among the chiefs of Maui, Hawai'i and O'ahu during the 1700s. Around 1781, Maui forces defeated the invading Hawai'i Island chief Kalani'opu'u, and Kalani'opu'u and his chiefess Kalola sent the sacred chief Kiwala'o to

seek peace with Kalola's brother, Kahekili, the paramount chief of Maui. Protected by the kapu that required the Maui soldiers to prostrate themselves before him, Kiwala'o was able to approach the Maui chief at his headquarters in Wailuku. Kahekili responded positively, and told his followers, "Take the fish of Kanaha and Mau'oni and the vegetable food of Nawaieha down to Kiheipuko'a," where Kalaniopu'u and Kalola were waiting. (Kamakau, 1992:88-89)

A decade later, Kahekili's army was defeated in 'Īao Valley by another Big Island chief, who became Kamehameha I. At the time of the Great Māhele, the ali'i nui Victoria Kamāmalu was granted most of the lands in the area. In 1882, Claus Spreckels acquired fee simple title from his friend King Kalākaua to all of the Wailuku ahupua'a through Grant 3343. (Welch, Morgan, Magnuson and Prasad 2004: 8-9) In 1898, Spreckels' Hawaiian Commercial & Sugar Company was taken over by the Alexander & Baldwin group, and in 1899 A&B acquired Maui Railroad & Steamship Co. a separate Spreckels corporation that controlled much of the land around Kahului and the harbor itself, including the fishponds. (Alexander and Baldwin,1990:10, 32) Mrs. Blaisdell (interviewed in 1923) said, "The chiefess Kaipuula and her son Pumaia were the custodians of the fishponds from the time of K. I & III. . . Today it is neglected." (Sterling, 1998: 87-88)

Freshwater streams fed the ponds, where mullet were found into the early 1900s. In 1924, the *Maui News* reported that "Fine catches of large mullet are being made in Kanaha ponds since the pumping in of material dredged from the harbor bottom began. It appears that the seawater which goes with the filling material attracts the mullet to the vicinity of the pipe outlet and there they are gathered into nets, put into gunny sacks and taken away." (*Maui News*, Sept. 10, 1924)

Meanwhile, Kahului had begun to develop along the shore to the west of the ponds, and the dredging of Kahului Harbor, expanded several times during the first three decades of the 20th century, provided fill material that made it possible for the town to spread inland on former wetlands. The exact extent of the filling is not clear, but parts of Kanahā and perhaps all of Mau'oni ponds were filled, as well as areas that later became the County Fairgrounds and race track and now are shopping, business and residential areas. In 1924, the *Maui News* reported that it was hoped that reclamation of the ponds and creation of a larger canal to carry water from the ponds to the sea would lower the water table beneath Kahului. Once the new canal was completed, it was expected that the existing canal draining the ponds would be closed up. By August 1931, several rounds of dredging had resulted in a harbor deep enough for large vessels. (*Maui News*, Feb. 5, 1924; Dec. 12, 1931)

The area around Kanahā in these prewar years were largely a "bare waste where little existed besides the prickly pear, the razor back hog and the wild indigo" (Baldwin 1915:47). Maui writer Inez Ashdown noted on photos of Hawaiian stilts in Kanahā (preserved in the Maui Historical Society archives) that "the HC&S horses used to graze here. They ate the underwater grasses with water up to their eyes. All Kahului town once was part of the swampland fishpond. . . it was from the sluice gates on the beach near the wharf to the racetrack and all across Spreckelsville beach to the Maui Country Club area." The undated notes add: "Mr. C.S. Childs and the Hui Manu saved this and made it into a bird sanctuary."

Following the attack on Pearl Harbor in December 1941, the U.S. government annexed land at Kahului for the construction of Naval Air Station Kahului, commonly called NASKA. The boundaries of NASKA extended along the stretch of Haleakalā Highway between Kahului and the Hana Highway, touching the Hana Highway at their easternmost point, and more or less followed the shoreline from Spreckelsville to a western edge just past Kanahā Pond. The subject area of this report was just outside this military-controlled property. (Yoklavich, Tomonari-Tuggle and Welch, 1997:2) Aviation facilities developed for the air station beginning in late 1942 eventually were turned over to the Territory of Hawai'i to become Kahului Airport. Remains of some of the many military buildings within the NASKA area still exist, including concrete ammunition storage structures in the Kanahā Pond area on areas that were filled and segmented by the military. (Yoklavich, Tomonari-Tuggle and Welch, 1997:12-14)

In 1951, the Territorial Board of Agriculture designated Kanahā Pond a Waterfowl Sanctuary. In 1962, the state Department of Land and Natural Resources was given a permit to manage 143 acres as a Wildlife Sanctuary by the Hawai'i Department of Transportation Airports Division, with Federal Aviation Administration approval. In 1971, the National Park Service designated Kanahā as a National Natural Landmark. In 1973, HDOT/Airports transferred management of the area to DLNR. More area was added to DLNR management in 1994; there are now 235 acres under management. "Kanaha Pond Wildlife Sanctuary (KPWS) is not only a primary wetland which is managed as habitat for Hawaii's three endangered water birds, the Hawaiian Stilt, Hawaiian Coot and Hawaiian Duck, but it is also site of intense ongoing ecosystem restoration. Its location, description and its history provide a background for the current largely volunteer driven projects which are converting the alien plant dominated landscape back to the original plant communities," wildlife biologist Fern Duvall said at a 2002 workshop on wetland management in the Hawaiian Islands. (Duvall, 2002)

Meanwhile, the development of Kahului continued, with parcels between the subject property and the harbor now developed for uses that range from retail to light industrial.

V. Oral Interviews

Methodology, Procedures, and Interviewee Biographical/Organizational Information

Contacts with a number of individuals who might have some knowledge of cultural uses in the immediate vicinity of the subject property yielded relatively little information, probably because much of this area has been set aside as a wildlife sanctuary during the lifetime of most living informants, while the rest has been in the process of urban development for decades. In addition to personal contact with individuals listed below, letters briefly outlining the development plans along with an aerial photo of the project site were sent to organizations whose jurisdiction includes knowledge of the area, asking

for input on this report. Letters were sent to Thelma Shimaoka, coordinator of the Maui branch of the Office of Hawaiian Affairs, Samuel Kalalau, chairman of the Maui County Cultural Resources Commission, and the Central Maui Hawaiian Civic Club.

Earlier studies assessing cultural impacts on traditional uses at Kahului Harbor included valuable information collected from informants who are no longer alive or are not well enough to be interviewed. *An Evaluation of Traditional and Customary Land Uses in the Kahului Airport Area* (Prasad, Tomonari-Tuggle and Welch, 1999) draws on information from a number of interviewees, in particular Charlie Keau (then aged 72), Aaron Brown (then 81), and Rene Sylva (then aged 70+). These three and others interviewed for the airport report indicated that "several types of subsistence activities related to fishing took place along the shores of Kahului, and the ponds, and nearby areas. Among these are:

1. Fishing in Kanahā Pond;
2. Shellfish gathering;
3. *Limu* gathering;
4. Turtle hunting;
5. *Hukilau,* along the coast from Kū'au to Lower Pā'ia;
6. Gathering salt from salt pans."

Keau told interviewers that Kanahā Pond and the reef area of Kahului were widely used for fishing and gathering shellfish. He remembered that Mau'oni Pond extended all the way to the old County Fairgrounds area, and that the ponds sometimes smelled from the *limu.* Aaron Brown, a fisherman for most of his life, said Piers 1 and 2 in Kahului were popular for fishing, diving and swimming in water that was very clean before the town developed. "Aaron had fished in Kanahā Pond. Along with his brothers and neighbors, he used to catch *'o'opu* and *āholehole* from the ponds; but there was also sometimes *pāpio* in the pond. They used old pipes to bring up the fish since there wasn't any need for nets. The water in the pond was very clean and the fish were visible. Depending on the season, there could be an abundance of fish in Kanahā. Aaron also recalls picking *limu* along the shoreline, and gathering salt inland of Kanahā Pond." Keau and Brown said they thought it likely taro farming had taken place alongside the ponds, although they had not actually witnessed taro growing in Kahului. Keau remembered that old-timers used to launch their canoes from "Kalo Grounds," now the location of the Maui Beach Hotel. (Prasad, Tomonari-Tuggle and Welch, 1999: 16-18)

The airport report said that while few traditional plant species are now found in the area, and there appears to be no mention of gathering from around the project area in written accounts, Rene Sylva, an expert on native Hawaiian plants, was "certain that many other species of traditional plants were found in the area but that some either have become extinct or have been displaced by plants as such as *haole koa* and *kiawe* that now surround Kanahā Pond." (ibid.: 19)

Habitation in the area was primarily related to fishing. Along with Raw Fish Camp in Wailuku (built for employees of Kahului Railroad, which was headquartered at the harbor), Hawaiian families inhabited houses along Kahului waterfront and the site of the county Wastewater Treatment Plant adjacent to Kanaha Pond. (ibid.: 20)

Contemporary informants contacted by Engledow for this report included a telephone interview with Wes Wong, a retired state forester and Wailuku resident. Wong said his grandfather, Wong Nung, moved to Maui from Kailua, O'ahu, in 1908, and obtained a government lease on the entire Kanahā Pond, where he raised ducks. Water circulated naturally between the pond and the ocean, so that fish came in and spawned and Mr. Wong was able to catch them. He held the lease until about 1916, so Wes Wong's father grew up around that area. Wes Wong say he never heard stories of native plant gathering, but *makaloa*, a sedge used for making fine mats in ancient times, grows in the pond. He said he does not know of any traditional gathering or uses of the pond today.

Another informant, attorney Guy Haywood, moved to Hawai'i in 1946 as a one-year-old. His father, a physician, worked at the Pu'unēnē and Pā'ia hospitals and helped start the Maui Clinic. Haywood recalls that the family lived in a two-story house near the present site of the Maui Beach Hotel, where there were about six houses occupied mostly by railroad supervisors, and that there were another 10 or 15 houses closer to the harbor. Later, the family moved to a house at the junction of Ka'ahumanu and Hobron avenues. When the family lived in their first house on the beach, the kids had "about a half-mile range," went fishing off the pier and could dive from the pier or the breakwater. By the time they moved to the second house, access to the pier at the beach area was getting more restricted. "We didn't go into the pond or that area," Haywood recalls. The triangle where their house was situated had two or three houses, and "everything else was kiawe trees. People didn't go in there [to Kanahā], because that wasn't the way to the beach," and there was no public access to Kanahā Pond. He said there are still concrete military bunkers in the pond where the county was storing materials when Haywood was County Corporation Counsel in the early 1990s. (Haywood, personal communication)

Lani Medieros, now on staff at Maui Historical Society, lived on Palapala Drive (between Kanahā Pond and Kahului Airport) in 1972. She said people didn't use the area around the pond at that time: "It was just weeds and grass and water."

VII. Confidential information withheld; Conflicts in information or data

No confidential information was withheld. There were no conflicts in information or data within the reports consulted for this Cultural Impact Assessment.

VIII. Affects on Plan

Because the subject property has long been surrounded by urban development on one side and a wildlife sanctuary on the other, there appear to be few if any cultural resources that might be impacted by the building of a medical office building on the site.

IX. Individuals and Groups Contacted

Efforts to contact individuals with personal knowledge of cultural beliefs and practices resulted in relatively few successful interviews. Many of those with traditional

knowledge have passed away, leaving what one informant called "the lost generation" who were raised as "modern Hawaiians."

Individuals contacted for possible contribution to this report or for referrals to others with knowledge included the following individuals. Most could add little to the information already included in the report:

Leslie Kuloloio, cultural specialist
Guy Haywood, former resident of the Kahului Harbor Area
Paul Gammie, former resident of the Kahului Harbor Area
Wes Wong, whose grandfather leased the pond in 1908
Robert Hobdy, environmental consultant
Charles Villalon, county worker with possible suggestions for other contacts (none of whom could be reached during the time this report was being prepared)
Lani Medieros, former resident of the Kanahā/airport area

Groups contacted were:

Office of Hawaiian Affairs, Maui Office
Central Maui Hawaiian Civic Club
Maui County Cultural Resources Commission

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APPENDIX H.

View Analysis
(3-D and Photographs)

Proposed Maui Medical Plaza Project

3D Animation Reference Map

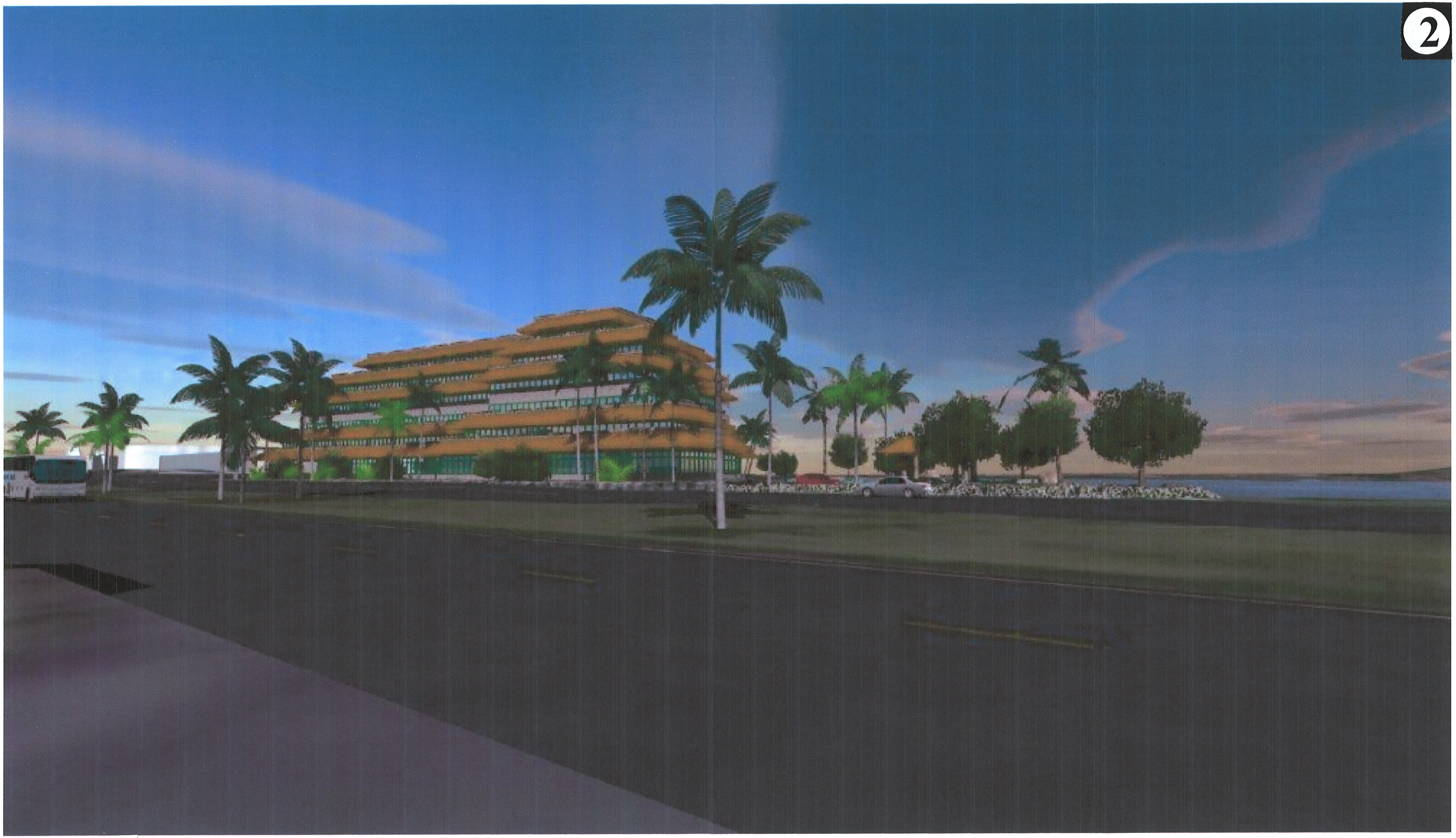
NOT TO SCALE

MUNEKIYO & HIRAGA, INC.

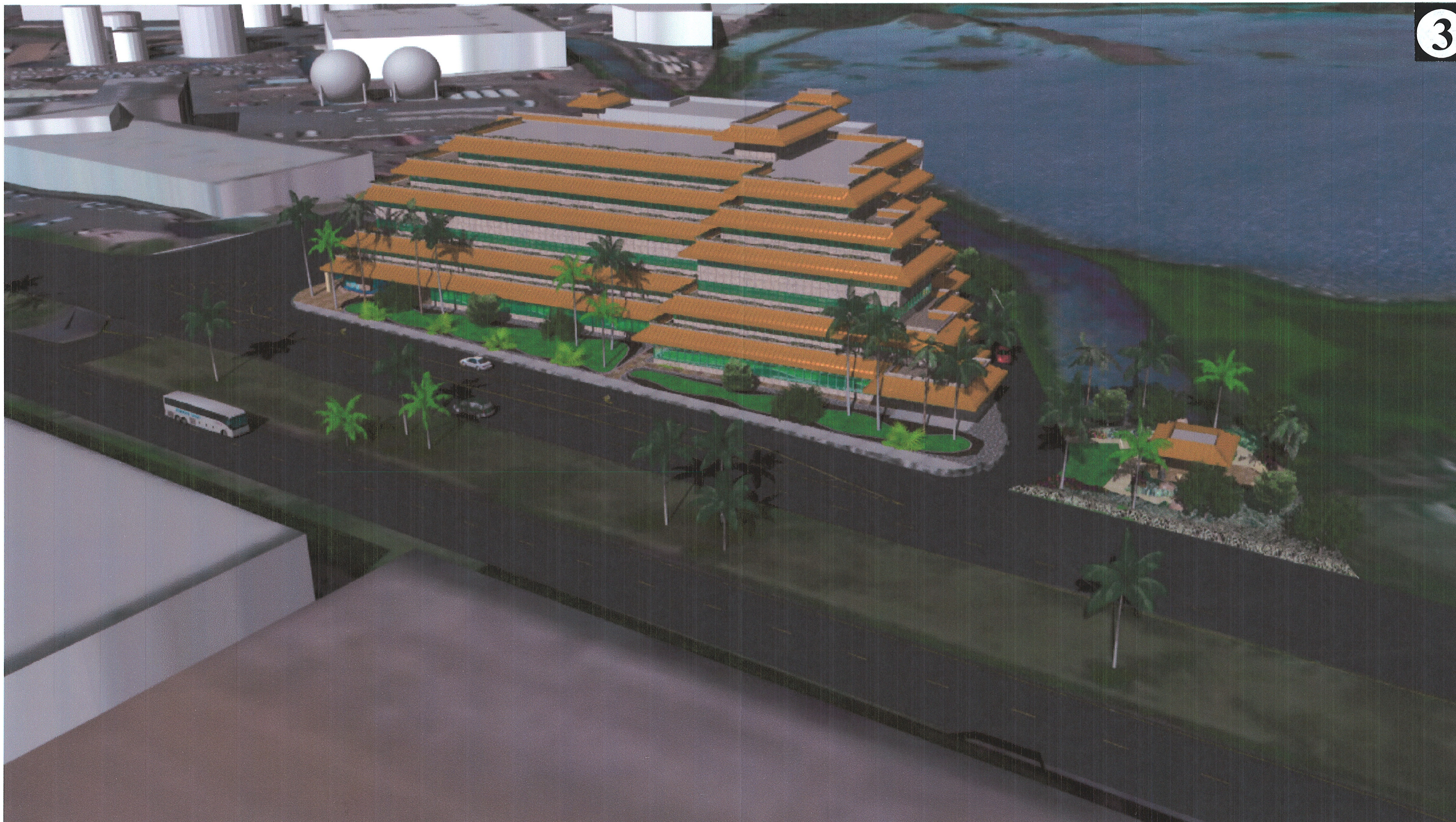
Prepared for: Kanaha Professional Plaza, LLC

MauiMedPlaza/Kanaha/3DAnimationReferenceMap

Source: THL Digital, Inc.



Source: THL Digital, Inc.



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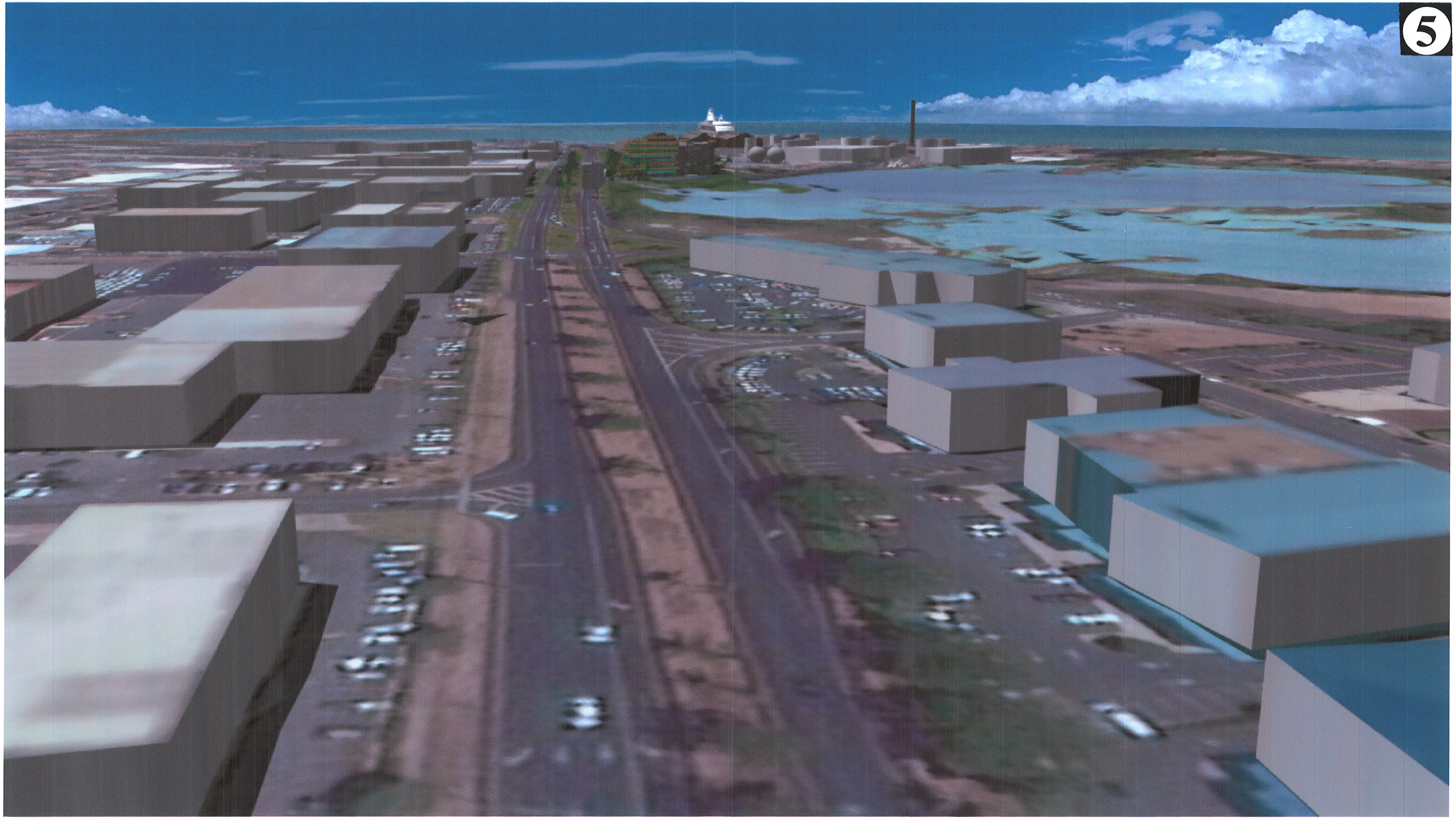
Source: THL Digital, Inc.



Source: THL Digital, Inc.

Source: THL Digital, Inc.

Source: THL Digital, Inc.

151 Hana Highway – Maui Medical Plaza development site
<u>View Study</u>

Photographs

Photographs of the view toward the Maui Medical Plaza development site from select locations at eye-level. These photographs demonstrate current conditions with the potential visual impact of the new medical office facility development in the background at 151 Hana Highway, Kahului.

Photograph #1 – SE corner of intersection near Costco

This photograph shows a view of Kahului's northwestern corner near the harbor from the sidewalk outside of Costco. Except for the view corridor down old Haleakala Hwy, the view is fully obstructed by foliage within the Kanaha Pond Wildlife Sanctuary. The Maui Medical Plaza development will not be visible from this location.

Photograph #2 – Hoohana entrance to Maui Mall

This photograph shows the view from Maui Mall north along Kamehameha Ave toward the intersection with Hana Hwy. The top floors of the Maui Medical Plaza development and the elevator service room may be visible above the tree line in the distance.

Photograph #3 – Alamaha entrance to Maui Mall

This photograph shows the view from Maui Mall northeast across Kamehameha Avenue at the intersection with 7-11. The upper floors of the Maui Medical Plaza development and the elevator service room will be visible above the automobile storage racks and the showroom of Kitagawa Motors.

Photograph #4 – Outside IHOP at Maui Mall

This photograph shows the view from the sidewalk outside IHOP at Maui Mall northeast across the parking lot toward Wendy's and Hopaco. The Maui Medical Plaza development may be visible at the center of this view through the tree line.

Photograph #5 – Outside Maui County Service Center at Maui Mall

This photograph shows the view northeast from the parking lot in front of the Maui County Service Center at Maui Mall. The upper floors of the Maui Medical Plaza development may be visible above the tree line and roofs.

Photograph #6 – Dairy Road / Hana Hwy intersection – SE corner

This photograph shows the view northwest along Hana Hwy toward Kahului Harbor. The Maui Medical Plaza will be on the north side of Hana Highway approximately .7 miles in the distance. The upper floor and elevator service room may be visible through the tree line.

Photograph #7 – Dairy Road / Hana Hwy intersection – center median

This photograph shows the view northwest along Hana Hwy toward Kahului Harbor. The Maui Medical Plaza will be located on the north side of Hana Hwy approximately .7 miles in the distance. The Maui Medical Plaza may be visible through the trees and above the rooflines from Triangle Square. It will not be visible above the tree line.

Photograph #8 Hobron Ave / Kamehameha Ave intersection

This photograph shows the view from in front of the Shell Petroleum facility southeast along Hobron Avenue across Kahului Industrial Subdivision businesses: Maui Oil, Pacific BioDiesel, and The Gas Company. The Maui Medical Plaza facility will be visible above the roofs of these developments, below the utility lines.

Photograph #9 Hana Hwy median at Kamehameha Ave intersection

This photograph shows a view east across the westbound lanes of Hana Hwy at the Kamehameha Avenue intersection. The Maui Medical Plaza development will be visible through the trees above the rooflines of the Mercedes showroom and the Maui Oil buildings.

APPENDIX H-1.

Letter from Urban Design Review Board Recommending Project Approval to the Maui Planning Commission, and Response Letter from Kanaha Professional Plaza, LLC

OCT 19 2010

CHARMAINE TAVARES
Mayor
KATHLEEN ROSS AOKI
Director
ANN T CUA
Deputy Director

COUNTY OF MAUI

DEPARTMENT OF PLANNING

October 15, 2010

Mr. Jonathan Starr, Chair
and Members of the Maui Planning Commission
250 South High Street
Wailuku, Hawaii 96793

Dear Chair Starr:

SUBJECT: URBAN DESIGN REVIEW BOARD (UDRB) COMMENTS ON THE SPECIAL MANAGEMENT AREA (SMA) USE PERMIT APPLICATION AND DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED MAUI MEDICAL PLAZA PROJECT AND RELATED IMPROVEMENTS LOCATED AT KAHULUI, ISLAND OF MAUI, HAWAI`I; TMK: (2) 3-7-011:028 (SM1 2010/0006) (EA 2010/0002)

At its regular meeting on September 7, 2010 and continued on October 5, 2010, the Urban Design Review Board (UDRB) reviewed the SMA Use Permit Application and Draft EA May 2010, referenced above. Based upon those discussions and questions to the Applicant and Applicant's representatives, the Board voted 6-2 to recommend approval of the project to the Maui Planning Commission, as presented and as based on the six-story design.

The UDRB also issued three (3) design-related recommendations, as stated below:

1. Consider options for adding third-level (third-story) shading, where there is no shading design now;

2. Study bicycle traffic options and include them in the Final EA. Continue to work with the State Department of Transportation on options that would provide for improved bicycle access to the project. Design bicycle access into traffic patterns; and

3. Recommend that the proposed bus stop not be located as part of the proposed acceleration-deceleration lane as depicted in the site plans presented. Locate the bus stop close to the project.

As noted in the main UDRB motion to recommend approval of the project plans, several UDRB members expressed some concern regarding the six-story height of the proposed project.

Please address each of the above-noted recommendations in the Final EA and SMA Use Permit hearing.

The Department of Planning notes that, for the record, Mr. Bryan Maxwell, UDRB member, recused himself from deliberating and voting on the project. Mr. Morgan Gerdal, new UDRB member, was present and voted.

Thank you for your cooperation. If additional clarification is required, please contact Coastal Resource Planner James Buika at james.buika@mauicounty.gov or at (808) 270-6271.

Sincerely,

Kathleen Ross Aoki for

LINDA OKAMOTO, Chair
Urban Design Review Board

xc: Ann T. Cua, Deputy Director
Clayton I. Yoshida, AICP, Planning Program Administrator
James A. Buika, Staff Planner
Mark Alexander Roy, Munekiyo & Hiraga, Inc.
Urban Design Review Board Members
Project File
General File

LO:JAB:sa
K:\WP_DOCS\PLANNING\SM1\2010\0006_Mauimedicalplaza\UDRB OCT 5\UDRB Recommendations MMP Vfinal 10 05 10.Doc

MAUI MEDICAL PLAZA

At Kanaha

'10 DEC 23 A11:07

December 23, 2010

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Linda Okamoto, Chair
Urban Design Review Board
c/o Department of Planning
200 South High Street
Wailuku, Hawaii 96793

SUBJECT: Special Management Area Use Permit Application and Environmental Assessment for Proposed Maui Medical Plaza Project and Related Improvements at TMK (2)3-7-011:028, Kahului, Maui, Hawaii (SM1 2010/0006) (EA 2010/0002)

Dear Ms. Okamoto:

Thank you for your letter, dated October 15, 2010, recommending approval of the subject project and providing three (3) design-related recommendations from the Urban Design Review Board (UDRB) on the Draft Environmental Assessment (EA) and Special Management Area (SMA) Use Permit Application for the subject project.

Kanaha Professional Plaza, LLC, offers the following information in response to the recommendations identified in your letter:

Comment No. 1:

Consider options for adding third-level (third-story) shading, where there is no shading design now.

Response:

We note the board's recommendation that use of shading be considered along the third story of the Maui Medical Plaza building to enhance user comfort and energy efficiency within the structure. To achieve this objective, interior blinds will be installed as part of the project to reduce the amount of solar glare and heat entering the windows along this portion of the building.

Comment No. 2:

Study bicycle traffic options and include them in the Final EA. Continue to work with the State Department of Transportation on options that would provide for improved bicycle access to the project. Design bicycle access into traffic patterns.

350 Hukilike Street, Suite D • Kahului, Maui, HI 96732 • 808.283.8811 (cell) • 866.812.8585 (toll free) • 808.876.0861 (fax) • MauiMedicalPlaza.com

Response:

Hana Highway, a State-owned and maintained regional arterial roadway, does not currently provide users with bicycle lanes along either the eastbound or westbound sections between Kaahumanu Avenue and Dairy Road. The State Department of Transportation (SDOT) is currently in the planning and design phase of widening this stretch of Hana Highway to six (6) travel lanes. It is our understanding that this corridor will be upgraded as part of the overall SDOT widening project to include bicycle facilities consistent with its 'Signed Shared Road' designation in SDOT's BikePlan Hawaii master planning document.

It is noted that the there are also a number of project-related roadway improvements being completed in conjunction with the proposed project including the addition of a third travel lane and acceleration/deceleration lane along the west bound stretch of Hana Highway in the vicinity of the subject property. These improvements, as summarized on Pages 34 to 49 of the Draft EA, have been reviewed by the SDOT and are intended to both facilitate ingress and egress to the subject property and also increase the operational efficiency of the roadway network in the immediate area until the Hana Highway widening project is completed by SDOT. A sidewalk will also be installed along the frontage of the subject property to provide a safe pedestrian access route to both the proposed facility and neighboring existing commercial and industrial uses near the Kamehameha Avenue/Hana Highway intersection. Kanaha Professional Plaza, LLC recognizes the importance of promoting the use and availability of alternative forms of transportation and, in addition to constructing a bus stop shelter along the highway fronting the project, is also proposing to include bicycle storage facilities within the parking structure of the Maui Medical Plaza.

Comment No. 3:

Recommend that the proposed bus stop not be located as part of the proposed acceleration-deceleration lane as depicted in the site plans presented. Locate the bus stop close to the project.

Response:

We note the recommendation from the board that the proposed bus stop be located outside of the acceleration/deceleration lane that will be installed by the applicant along the portion of Hana Highway fronting the property. Kanaha Professional Plaza, LLC will continue to work alongside the SDOT and the Maui County Department of Transportation to identify a location for the proposed bus stop that is (1) deemed appropriate from a regional highway planning perspective and (2) conducive to the long-term expansion plans for the Maui Bus network.

We appreciate the input provided by the UDRB. A copy of your letter will be included in the Final EA. Should you have any questions, please do not hesitate to contact our planning consultant, Mark Alexander Roy of Munekiyo & Hiraga, Inc. at 244-2015.

Very Truly Yours,

Robert T. McDaniel, Member
Kanaha Professional Plaza, LLC

RTD:
Cc: James Buika, County of Maui, Department of Planning
Mark Alexander Roy, Munekiyo & Hiraga, Inc.

APPENDIX I.

Determination of No Hazard to Air Navigation from Federal Aviation Administration

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AWP-2731-OE

Issued Date: 07/30/2009

Robert McDaniel
Maui Medical Plaza
350 Hukilike Street
Suite D
Kahului, HI 96732

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Building / Maui Medical Plaza
Location:	Kahului, HI
Latitude:	20-53-16.48N NAD 83
Longitude:	156-27-27.45W
Heights:	93 feet above ground level (AGL) 101 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking and/or lighting are accomplished on a voluntary basis, we recommend it be installed and maintained in accordance with FAA Advisory circular 70/7460-1 K Change 2.

This determination expires on 01/30/2011 unless:

(a) extended, revised or terminated by the issuing office.
(b) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE POSTMARKED OR DELIVERED TO THIS OFFICE AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE.

This determination is based, in part, on the foregoing description which includes specific coordinates , heights, frequency(ies) and power . Any changes in coordinates , heights, and frequencies or use of greater power will void this determination. Any future construction or alteration , including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Communications Commission if the structure is subject to their licensing authority.

If we can be of further assistance, please contact our office at (310) 725-6558. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AWP-2731-OE.

Signature Control No: 637154-117327128 (DNE)
LaDonna James
Technician

Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
2601 Meacham Blvd.
Fort Worth, TX 76137-0520

Aeronautical Study No.
2009-AWP-2731-OE

Issued Date: 02/14/2011

Robert McDaniel
Maui Medical Plaza
350 Hukilike Street
Suite D
Kahului, HI 96732

**** Extension ****

A Determination was issued by the Federal Aviation Administration (FAA) concerning:

Structure:	Building / Maui Medical Plaza
Location:	Kahului, HI
Latitude:	20-53-16.48N NAD 83
Longitude:	156-27-27.45W
Heights:	93 feet above ground level (AGL) 101 feet above mean sea level (AMSL)

In response to your request for an extension of the effective period of the determination, the FAA has reviewed the aeronautical study in light of current aeronautical operations in the area of the structure and finds that no significant aeronautical changes have occurred which would alter the determination issued for this structure.

Accordingly, pursuant to the authority delegated to me, the effective period of the determination issued under the above cited aeronautical study number is hereby extended and will expire on 08/14/2012 unless otherwise extended, revised, or terminated by this office.

This extension issued in accordance with 49 U.S.C., Section 44718 and, if applicable, Title 14 of the Code of Federal Regulations, part 77, concerns the effect of the structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (310) 725-6558. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2009-AWP-2731-OE.

Signature Control No: 637154-137302373 (EXT)
LaDonna James
Technician

APPENDIX J.

Traffic Impact Analysis Report

Maui Medical Plaza at Kanaha

Kahului, Island of Maui, Hawai'i

Traffic Impact Analysis Report

TMK (2) 3-7-011: 028

<u>FIRST REVISION</u>

January 2010

WARREN M. YAMAMOTO
LICENSED
PROFESSIONAL
ENGINEER
NO. 3893-C
HAWAII, U.S.A.

Expiration Date:
April 30, 2010

This work was prepared by me or under my direct supervision.

Signature
AECOM

27 JAN 2010
Date

Traffic Impact Analysis Report
First Revision

for

Maui Medical Plaza at Kanaha
Kahului, Island of Maui, Hawai'i

Tax Map Key Number *(2)3-7-011: 028*

JANUARY 2010

Prepared for:

Maui Medical Plaza at Kanaha
350 Hukiliki Street, Suite 3D
Kahului, HI 96732

Prepared by:

AECOM
Davies Pacific Center, 841 Bishop Street
Suite 1900, Honolulu, Hawai'i 96813

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TRAFFIC IMPACT ANALYSIS REPORT
for the
MAUI MEDICAL PLAZA AT KANAHA
First Revision

A medical office plaza is being planned for Kahului, Maui, Hawai'i. The traffic impact analysis report dated December 2009 identified the traffic impacts of the proposed project and recommended traffic mitigating measures. This revised report responds to comments made by the State of Hawai'i Department of Transportation (HDOT).

PROJECT DESCRIPTION

The Maui Medical Plaza at Kanaha, a professional medical plaza, is being proposed in Kahului, Maui, Hawai'i. The proposed project is intended to provide a contemporary medical facility where local health care professionals can administer improved medical services to members of the community. The medical plaza would include a six-story structure of 131,500 square feet (sf), of which 100,000 sf would be leasable space for medical doctors and technicians. This space can expect to accommodate up to 200 medical professionals and staff. The proposed project is expected to be fully occupied by 2013.

The proposed project site is situated makai of Hana Highway, approximately between the Kamehameha Avenue/Hobron Avenue and the Wakea Avenue intersections as shown on **Figure 1**. The project site is on a 2.5 acre parcel identified as TMK: (2)3-7-011: 028. The project site is bounded by long established commercial and industrial properties on its northwest boundary and by a drainage canal network owned by Mike Kitagawa on its northeast boundary. The Kanaha Pond Wildlife Sanctuary lies beyond the drainage canal networks.

The site plan and internal roadway network for the proposed project are shown on **Figure 2**. The main medical plaza building would be at the front of the property facing the Hana Highway. A six-story parking garage to match the height of the main building would be located adjacent to and behind the main building. The parking structure would be approximately 121,800 sf and would provide approximately 360 off-street parking stalls. The proposed footprint of all proposed structures is approximately 240,000 sf. Related improvements include site grading and landscaping and the installation of underground utilities.

Two roadways would provide access to Hana Highway. The northwest roadway would be built over the existing alignment of Kanaha Place that currently serves the commercial complex northwest of the project site. The new roadway design would have the same permitted traffic movements currently permitted on Kanaha Place:

- Inbound right turns from Hana Highway,
- Inbound left turns from the median break of Hana Highway, and
- Outbound right turns onto Hana Highway.

Traffic islands would delineate these movements at the Hana Highway intersection. This roadway would provide access to the existing commercial complex and the new parking garage. All of the traffic entering the project site would have to use this access roadway. Lane striping would prohibit vehicles leaving this roadway from entering the left turn lane on Hana Highway into Kamehameha Avenue due to the proximity of these two roadway elements.

A new second roadway would be built along the southeast boundary of the property to serve as a right turn out only exit driveway. This would create a clockwise traffic pattern within the project site. Based on the project design, management expects about 70% of the outbound traffic to use this exit roadway.

Several improvements would be made to Hana Highway to accommodate the above traffic movements. The northwest bound approach of Hana Highway would be widened from two to four lanes to provide a third through lane and an acceleration/deceleration lane. The third through lane would be designed to accommodate the future widening of Hana Highway and would provide an additional lane for traffic exiting the project site to merge onto Hana Highway. The acceleration/deceleration lane would be a continuous lane beginning at the new exit driveway and terminating at the northwest access roadway. A shuttle bus stop would also be located in the acceleration/deceleration lane to encourage transit access to the project. This design would minimize the reconstruction activity fronting the project site when Hana Highway is widened. A left turn lane in the median of Hana Highway would accommodate the left turn movements from southeast bound Hana Highway into the project site. U-turns would not be permitted at this median opening. A landscaped median with a four foot high hedge would be installed to form a physical barrier to prevent pedestrians from jaywalking across Hana Highway.

Other off-site improvements include converting the single right turn lane on the Kamehameha Avenue approach to double right turn lanes to accommodate the very high number of turns currently being made. Also, a left turn storage lane would be added to the existing U-turn median opening on Hana Highway on the Wailuku side of the Hobron Avenue/Kamehameha Highway intersection.

The intersections analyzed in this study include Hana Highway and Dairy Road, Hana Highway and Wakea Avenue, Hana Highway and Kamehameha Avenue/Hobron Avenue, Ka'ahumanu Avenue and Wharf Street/Maui Mall driveway, Ka'ahumanu Avenue and Pu'unene Avenue, Kamehameha Avenue and Pu'unene Avenue, and the two project access roadways. These study intersections are identified on **Figure 1** in relation to the proposed project site.

EXISTING CONDITIONS

A survey of the existing roadway and traffic conditions was made in April and May 2009.

Existing Roadways

Three highways under the jurisdiction of the State of Hawai'i Department of Transportation (HDOT) serve the project site. Kamehameha Avenue is a local road in the study area.

Hana Highway is a four-lane highway (Route 36) providing access between Paia and Kahului. Most of the intersections on the highway are channelized with separate turning lanes. The posted speed limit is 45 miles per hour (mph) east of the project site and changes to 30 mph at the project site. The Hana Highway alignment becomes Ka'ahumanu Avenue at the Hobron Triangle where the roadway turns from a northwest to southeast alignment to an east to west alignment.

There are two intersections on Hana Highway in the study area controlled by traffic signals. The traffic signal at the Dairy Road intersection operates on an eight-phase timing plan. The traffic signal at the Hobron Avenue/Kamehameha Avenue intersection operates with a split-phase for the two side streets. The southeast bound approach of Hana Highway does not permit left turns into Hobron Avenue. Left turn movements can be made at an uncontrolled median break south of the intersection. Left turns can be made into Kanaha Place or U-turns onto northwest bound Hana Highway or Hobron Avenue.

The Wakea Avenue intersection at Hana Highway is currently unsignalized. The Wakea Avenue eastbound approach is currently operating as separate left and right turn lanes, although it is not wide enough to be striped as such. Inbound left turns from Hana Highway and outbound left turns from Wakea Avenue are made through the median and are stop sign controlled within the median. Traffic signals have been proposed at this intersection; however, there is no definite schedule for their installation. Hence, two sets of forecasts were made assuming the current unsignalized condition and with the future traffic signals.

The Statewide Transportation Improvement Program (STIP) for FY 2008 thru 2013 lists the widening of Hana Highway from Ka'ahumanu Avenue to Airport Access Road with the following dates:

- FY 2009 – Design ($300,000)
- FY 2010 – Right-of-Way ($100,000)
- FY 2013 – Construction ($6,000,000)

The STIP notes that projects listed in FYs 2012 and 2013 are "informative only" and there is no definite date for start of construction. This project is not expected to change traffic patterns, but would improve traffic operations when implemented. HDOT is preparing for the highway widening project by reserving right-of-way along the project route, as it is doing for this proposed project.

Ka'ahumanu Avenue is a six-lane highway (Route 36) that provides access between Kahului and Wailuku. Its intersections with Wharf Street/Maui Mall driveway and Pu'unene Avenue are signalized and have separate left turn lanes on the highway approaches. The Wharf Street/Maui Mall driveway traffic signal has simultaneous signal phases for the side street approaches. The Pu'unene Avenue traffic signal operates on a split phase.

Pu'unene Avenue is four-lane collector (Route 350) that connects Ka'ahumanu Avenue with Kuihelani Highway and Mokulele Highway. The intersection with Kamehameha Avenue is signalized with separate left turn lanes on all approaches and an eight-phase traffic signal timing plan. The STIP lists several improvements for Pu'unene Avenue in the study area that are not expected to change traffic patterns:

- FY 2011 – Construction of bicycle improvements, Ka'ahumanu Avenue to Kuihelani Highway ($1,500,000)
- FY 2010 – Construction of safety improvements, Ka'ahumanu Avenue to Kamehameha Avenue ($500,000)

Kamehameha Avenue is a four-lane County roadway providing east-west access from Hana Highway to Pu'unene Avenue and to the residential community west of Pu'unene Avenue. Kamehameha Avenue serves the adjoining commercial uses from Hana Highway to Pu'unene Avenue.

The STIP lists another project which would impact the study intersections. The proposed Kahului Airport Access Road project has the following schedule:

- FY 2008 – Right-of-Way ($200,000)
- FY 2010 – Construction ($20,000,000)

This proposed project would divert traffic from Hana Highway and Dairy Road resulting in improved traffic operations on these two roadways. The impact of these traffic diversions was not analyzed in this study.

Traffic Volumes

Traffic turning movement counts were taken at the study intersections in two groups. Traffic counts were taken at the four Ka'ahumanu Avenue and Kamehameha Avenue intersections on April 21 and 23, and May 7 and 14, 2009, while the Maui Community College was in session. Traffic turning movement counts were taken at the Hana Highway intersections of Dairy Road and Wakea Avenue on May 20 and 21, 2009, while the college was in recess. Traffic turning movement counts require a traffic surveyor to observe traffic flow and record the movements of each vehicle crossing the intersection as either through or by their turning movements in 15 minute intervals. The worksheets from these traffic counts are included in **Appendix A**.

The current morning and afternoon peak hour traffic volumes are shown on **Figure 3**. The volumes are rounded to the nearest five vehicles per hour (vph). Traffic volumes at the Hana Highway intersections of Dairy Road and Wakea Avenue were lower as they were counted when the college was not in session. These traffic counts were adjusted upward to match the higher traffic counts taken at the Hana Highway and Hobron Avenue/Kamehameha Avenue intersection while the college was in session. The original counted volumes and the adjusted volumes are shown on **Figure 3**.

The traffic volumes at the project access intersection were not counted, but were obtained from other studies. The traffic volumes turning into/from Kanaha Place, the median break, and the roadway on the mauka side of the highway were obtained from the *Draft Traffic Impact Analysis Report, Maui Medical Plaza in Kahului, Maui, Hawaii,* by Phillip Rowell and Associates (February 2009). These traffic counts were taken three years ago but are thought to be unchanged and still applicable to this study. The through traffic volumes on Hana Highway were derived from the traffic counts taken at the Hana Highway and Hobron Avenue/Kamehameha Avenue intersection while the college was in session.

The peak direction of traffic flow on Hana Highway and Ka'ahumanu Avenue is toward Wailuku in the morning peak hour and in the opposite direction toward Paia in the afternoon peak hour. The existing traffic operations at the study intersections are discussed in the **Level of Service Analysis** section of this report.

TRAFFIC FORECASTS

The proposed project is expected to be fully occupied by 2013. During the four year period from the traffic count date to full occupancy, ambient traffic on the area roadways can be expected to increase due to regional growth and new projects in the area. The traffic that would be generated from the proposed project was added to the ambient traffic forecast to obtain the total with project traffic forecast.

Ambient Traffic Forecast

Traffic growth in the study area will come from regional growth in other areas whose traffic passes the project site and other projects planned in the vicinity of the proposed project. Therefore, the traffic which would be generated by these future projects was added to the estimate of regional traffic growth to obtain the ambient traffic forecast.

Several projects are planned in the Kahului area including:

- Hobron Triangle Phase 1
- Hobron Triangle Phase 2
- Maui Lani
- Kane Street Commercial Mixed Use Project
- Maui Business Park Phase 2
- Lono Avenue Student Housing
- Kahului Town Center
- Kitagawa Metal Recycling Warehouse

The traffic forecasts for these proposed projects adjacent to the project site were obtained from traffic impact analysis reports for the respective projects. The cumulative traffic assignments for the first seven projects were reported in the *Draft Traffic Impact Analysis Report, Maui Medical Plaza in Kahului, Maui, Hawaii,* by Phillip Rowell and Associates (February 2009) and are shown on **Figure 4.** The traffic volumes forecast to be generated by the Kitagawa project, as reported in the traffic impact assessment letter for the project, are negligible and would not add to the volumes shown on **Figure 4**. The afternoon generated traffic volumes are higher than the morning generated volumes.

The *Maui Long Range Land Transportation Plan,* prepared by Kaku Associates, Inc., (February 1997), forecasts an annual island-wide growth rate of 1.6% in its 20-year forecast. Compounding this annual growth rate for a four year period resulted in a 6.6% growth factor. The current morning and afternoon peak hour traffic volumes shown on **Figure 2** were increased using the 6.6% factor. The results are summarized on **Figure 5**, with volumes rounded to the nearest five vph. The traffic forecasts from **Figure 4** for the future adjacent projects are also included on **Figure 5**. The traffic operations at the study intersections with the ambient traffic forecasts are discussed in the **Level of Service Analysis** section of this report.

Project Generated Traffic

The traditional three-step process of trip generation, trip distribution, and trip assignment was used to forecast the future traffic which would be generated by the proposed project. The trip generation step forecasts the number of new trips that would be produced in each of the two study periods. The trip distribution step allocates these new trips by direction of travel. Finally, the trip assignment step assigns the trips to the specific turning movements at the study intersections.

The trip generation step forecasts the volume of vehicle trips that would be generated by the proposed project during the morning and afternoon peak periods. The Institute of Transportation Engineers' Trip Generation report (Seventh Edition, 2003) has trip generation equations or rates to calculate the number of morning and afternoon peak hour trips that would be generated by various land uses. Two sets of trip generation rates for the Medical Office Building (ITE Land Use 720) were utilized for the proposed project.

- 131,500 sf Medical Office Building
  Morning Peak Hour - 2.48 trips per 1,000 sf
  Afternoon Peak Hour - 3.72 trips per 1,000 sf

- Medical Office Building with 200 employees
  Morning Peak Hour - 0.53 trips per employee
  Afternoon Peak Hour - 1.06 trips per employee

The proposed medical office building is expected to generate 326 and 489 morning and afternoon peak hour trips, respectively, based on its floor area. It is expected to generate 106 and 212 morning and afternoon peak hour trips, respectively, based on proposed employees. The trip generation rates based on employees result in one-third the number of trips in the morning peak and one-half the number of trips in the afternoon peak hour in comparison to the number of trips generated based upon floor area. Both trip generation rates are used in the analysis to determine if different mitigating measures would be required for each. The trips based on employees are referred to as the low rate while the trips based on building area are referred to as the high rate.

The Trip Generation report also lists the percentage of inbound and outbound trips in each peak hour. The number of generated trips was divided into inbound and outbound trips based on the information from the report, as shown on **Table 1**. Typical of commercial developments, about three-fourths of the trips are inbound in the morning peak and outbound in the afternoon peak.

The project generated trips were then distributed by direction of travel to and from the project site. The four major directions of travel and the percentage of trips in each direction are shown below:

- Ka'ahumanu Avenue – 31%
- Kamehameha Avenue – 19%
- Dairy Road (inbound) – 19%
- Kamehameha Avenue to Pu'unene Avenue (outbound) – 19%
- Hana Highway – 31%

The Ka'ahumanu Avenue route would serve Wailuku and the communities west of Kahului. The Kamehameha Avenue route would serve the Kahului community. The Dairy Road and Kamehameha Avenue/Pu'unene Avenue routes would serve traffic from Kuihelani Highway and Mokulele Highway. The Hana Highway route would serve the communities east of Kahului. The trip distribution factors were then used in the trip distribution analysis on **Table 1**. The same factors were used for the morning (AM) and afternoon (PM) peak hours.

The project generated traffic volumes were assigned to the study area network, assuming that the Wakea Avenue intersection would remain unsignalized. Incoming trips on the Ka'ahumanu Avenue route would need to make a left turn through the median break of Hana Highway to access the project site. Outgoing trips would make a right turn onto Hana Highway and continue to Ka'ahumanu Avenue. Incoming trips on Kamehameha Avenue would make a right turn onto Hana Highway and make a left turn through the median. Outgoing trips would make a left turn from Hana Highway to Kamehameha Avenue. Incoming trips on the Dairy Road route would make a left turn onto Hana Highway and then make a right turn into the project site. Outgoing trips would make a left turn from Hana Highway to Kamehameha Avenue, and then a left turn onto Pu'unene Avenue to return to Kuihelani Highway or Mokulele Highway. Incoming trips on the Hana Highway route would make a right turn into the project site. Outgoing trips would have to turn onto Hana Highway and continue to Ka'ahumanu Avenue, make a U-turn through the median break, and return to Hana Highway. The results of the traffic assignment analysis are shown on **Figure 6** with the volumes not rounded. Four different scenarios are shown in **Figure 6**:

A - AM peak hour with low trip generation based on number of employees
B - PM peak hour with low trip generation based on number of employees
C - AM peak hour with high trip generation based on building area
D - PM peak hour with high trip generation based on building area

Total Forecast Volumes

The four project generated traffic assignment volumes from **Figure 6** were added to the ambient traffic forecasts from **Figure 5** to obtain the four total with project traffic forecasts shown on **Figure 7**. The traffic volumes are rounded to the nearest five vehicles per hour. As with the project generated traffic assignment figures, four figures are show for the total with project forecasts.

Two adjustments to the traffic assignments were made. First, 70% of the outbound trips from the project were assumed to use the project exit driveway. This adjustment is not shown on **Figure 7**. Second, an adjustment was made for the traffic pattern changes that would be required when a traffic signal is installed at the Wakea Avenue intersection, such as the closure of the median break. The second adjustment is included as an inset on **Figure 7**. It was assumed that traffic assignment changes would not occur with the addition of traffic signals (i.e. a greater number of left turns made from Wakea Avenue).

LEVEL OF SERVICE ANALYSIS

The concept of level of service is used to quantify the quality of traffic flow on roadway facilities. The Transportation Research Board (TRB) has developed procedures to calculate level of service value(s) by measuring traffic volumes against the capacities of different types of roadway facilities. Their Highway Capacity Manual 2000 (HCM2000) describes the various procedures developed for freeways, highways, signalized and unsignalized intersections, etc. The study intersections include both signalized and unsignalized intersections.

This section discusses the changes in quality of traffic operations at the study intersections with and without the proposed project. The forecast scenarios which were analyzed included:

- 2009 Existing Traffic
- 2013 Ambient Traffic Forecast
- 2013 Total with Project based on Employees (Low) Trip Generation
- 2013 Total with Project Low Trip Generation and Wakea Avenue Traffic Signal (for unsignalized intersection only)
- 2013 Total with Project based on Floor Area (High) Trip Generation
- 2013 Total with Project based on Floor Area (High) Trip Generation and Hana Highway widening.
- 2013 Total with Project High Trip Generation with off-site improvements.

Table 2 summarizes the signalized intersection level of service analysis while **Table 3** summarizes the unsignalized intersection level of service analysis. Each table shows the existing, ambient forecast, and the several total with project forecast levels of service placed side by side for each of the two (AM and PM) study periods. This format facilitates a comparison of levels of service for the different forecast scenarios and can give an indication of the traffic impacts of ambient traffic growth and the proposed project.

Hana Highway generally runs in a northwest to southeast direction. However, as the highway capacity program has a limitation to stay with the four major directions of travel, within the program Hana Highway is modeled with a north-south alignment and its side streets in with an east-west alignment. Ka'ahumanu Highway is described as running in an east-west direction and its side streets in a north-south direction. Pu'unene Avenue is described as running in a north-south direction and Kamehameha Avenue in an east-west direction.

Signalized Intersection Analysis

The methodology for analyzing signalized intersections calculates the levels of service for individual movements, approaches, and the intersection as a whole based on the average stopped delay per vehicle. The results range from level of service A (best with average delays less than ten seconds) to F (worst with average delays longer than 80 seconds), described as follows:

SIGNALIZED INTERSECTION LOS	
LEVEL OF SERVICE	**CONTROL DELAY PER VEHICLE (Seconds/Vehicle)**
A	< 10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	> 80.1

Many jurisdictions consider levels of service A to D as acceptable for areas like Maui, with levels of service E and F indicating the need for mitigating measures. For signalized intersections, the major streets can be designed to have a higher level of service than the side streets or turning lanes.

The five existing signalized study intersections include:

- Ka'ahumanu Avenue and Pu'unene Avenue
- Ka'ahumanu Avenue and Wharf Street/Maui Mall driveway
- Hana Highway and Hobron Avenue/Kamehameha Avenue
- Hana Highway and Dairy Road
- Pu'unene Avenue and Kamehameha Avenue.

The Hana Highway and Wakea Avenue intersection is currently unsignalized but is programmed for the installation of traffic signals in the near future. For the total with project high rate forecast scenario, the intersection was analyzed as an unsignalized and signalized intersection.

The results of the signalized intersection analysis shown on **Table 2** include the level of service, average delay, and volume/capacity (v/c) ratio for the intersection only. The traffic statistics for the individual approaches and movements are included on the worksheets in **Appendix B**. The traffic operation statistics for the signalized intersections were calculated with the Synchro 7 software program that simulates and optimizes traffic signal timings in a roadway network.

The Ka'ahumanu Avenue and Pu'unene Avenue intersection is currently operating at level of service C in the morning peak and is forecast to remain the same for the future scenarios. The intersection is currently operating at level of service D in the afternoon peak and is forecast to change to level of service E for the future conditions. This change in level of service would occur with the increase in ambient traffic and would remain at the same level of service E with the project generated traffic, except in the "with off-site improvements" scenario.

The Ka'ahumanu Avenue and Wharf Street/Maui Mall driveway intersection is currently operating at level of service A in the morning peak and is forecast to remain the same for the future scenarios, with the exception of the "with off-site improvements" scenario. The intersection is currently operating at level of service B in the afternoon peak and is forecast to remain the same or better for all of the forecast conditions. The above results indicate that traffic operations at these two Ka'ahumanu Avenue intersections would not be adversely affected by traffic generated from the proposed project.

The Hana Highway and Hobron Avenue/Kamehameha Avenue intersection is the closest signalized intersection to the proposed project, and all traffic exiting the project would have to pass through it. The intersection is currently operating at level of service C in the morning peak and is forecast to change to level of service D or remain at level of service C for the future scenarios. Hobron Avenue is the only approach operating at an unacceptable level of service E in the morning peak. This approach is forecast to change from level of service E to F with the increase in ambient traffic, with slight increases in delay due to traffic from the proposed project.

The intersection is currently operating at level of service F in the afternoon peak and is forecast to experience longer delays as increases in ambient traffic and project generated traffic are added. The Hana Highway eastbound, Hobron Avenue, and Kamehameha Avenue approaches are currently operating at level of service F. The Kamehameha Avenue approach is operating at level of service F in part due to the long delays caused by the high traffic volumes on the right turn lane. Delay on the Kamehameha Avenue single right turn lane would lengthen with the increased ambient traffic and lengthen further with the additional project generated traffic. Delay on the eastbound approach of Hana Highway would increase with the additional traffic from the ambient traffic and the proposed project. Delay on the Hobron Avenue approach would increase with the ambient traffic but remain unchanged with the additional project generated traffic.

The proposed widening of Hana Highway would mitigate some of the traffic problems at the Hobron Avenue/Kamehameha Avenue intersection by increasing the capacity of Hana Highway as evidenced by the reduced v/c value shown on **Table 2**. The intersection level of service during the PM peak would remain at level of service F; however, there would be reductions in delay on the two Hana Highway approach through lanes and a shorter cycle length would be possible. Other improvements which could improve traffic operations include converting the Kamehameha Avenue shared left turn/through lane into an exclusive left turn lane and changing the split-phase operation into an eight-phase traffic signal timing plan. Alternatively, the left turn movement from the Kamehameha Avenue approach could be prohibited to eliminate the split-phase. An eight-phase traffic signal timing plan is slightly more efficient than a split-phase, and can provide slightly greater traffic capacity.

The addition of a second right turn lane could be done without any right-of-way acquisition as shown on **Figure 8** to increase the capacity for this movement. The intersection level of service during the PM peak would still be at level of service F; however, the delay would be reduced as evidenced by the reduced v/c value shown on **Table 2**. The level of service for the right turn movement would improve from F to D.

The above improvements would widen the Kamehameha Avenue approach from two to three/four lanes and probably require right-of-way acquisition for the four lane improvements.

The Hana Highway and Dairy Road intersection is currently operating at level of service D in the morning peak and is forecast to change to level of service E for the future scenarios with the high trip generation rates. The intersection is currently operating at level of service E in the afternoon peak and is forecast to remain the same for the ambient forecast condition. However, it would change to level of service F for the future with project scenarios.

The construction of the two proposed roadway improvement projects would help to mitigate the existing and forecast traffic problems at this intersection. As previously discussed, the planned widening of Hana Highway to six lanes would need to be combined with other mitigating actions to bring about level of service D or better conditions, especially at the Hobron Avenue/Kamehameha Avenue intersection. The proposed Kahului Airport Access Road would divert traffic from Dairy Road and result in improved traffic operations at this intersection.

The Pu'unene Avenue and Kamehameha Avenue intersection is currently operating at level of service D in the morning peak and is forecast to remain the same for the future scenarios. The intersection is currently operating at level of service D in the afternoon peak and is forecast to remain the same for the future scenarios, with one exception. This result indicates that the traffic operations at this intersection would not be affected by traffic generated from the proposed project.

The Hana Highway and Wakea Avenue intersection would operate at level of service C in both peak periods with traffic signal control and the proposed project. The traffic operations at this intersection would not be adversely affected by traffic generated by the proposed project.

Unsignalized Intersection Analysis

The procedure used for analyzing unsignalized intersections calculates vehicle delays and levels of service based on the distribution of gaps in traffic on the major street and driver judgment in selecting gaps through which to execute turns. For two-way stop intersections where only the minor street traffic is controlled by a stop sign, levels of service are calculated for the critical turning movements including outbound movements from the stop-controlled approach and left turns from the main road to the minor road. The procedure does not calculate an overall intersection level of service.

The Highway Capacity Manual defines the relationship between level of service and delay (in seconds/vehicle) for unsignalized intersections as shown below:

UNSIGNALIZED INTERSECTION LOS	
LEVEL OF SERVICE	**DELAY (Seconds/Vehicle)**
A	< 10.0
B	10.1 to 15.0
C	15.1 to 25.0
D	25.1 to 35.0
E	35.1 to 50.0
F	> 50.1

Levels of service A to D are considered acceptable for unsignalized intersections. Level of service F (with average delays longer than 50 seconds) is considered undesirable for unsignalized intersections and would indicate the possible need for mitigation.
Three unsignalized intersections which were analyzed are located on Hana Highway and include:

- The proposed project access,
- The proposed project exit east of the project access, and
- Wakea Avenue.

Drivers leaving the project and wanting to travel eastbound on Hana Highway would need to make a U-turn in the existing median opening on Ka'ahumanu Avenue. The U-turn movement was analyzed as a southbound left turn movement onto eastbound Ka'ahumanu Avenue.

The results of the unsignalized intersection analysis shown on **Table 3** include level of service, delay, and queue length. The traffic operations statistics were generated by the Highway Capacity Analysis Program (HCAP), as the Synchro program focuses on signalized intersections. The HCAP does not accurately calculate the level of service for the proposed project access and project exit roadways since it is limited to an analysis of three main roadway lanes. For the proposed project, the highway would have four lanes fronting the project site. Therefore, the procedure is expected to underestimate (calculate worse than actual) level of service for the outbound right turn movements from the two project roadways for the total with project scenarios. The affected level of service results are marked by an asterisk (*) to indicate that the actual levels are expected to be better than shown.

The current traffic movements analyzed by the HCAP at the project access intersection include the project access roadway, the left turns through the median break, and a roadway on the mauka side of Hana Highway across from the median break. The proposed project access roadway would be incorporated onto the existing Kanaha Place alignment serving the adjacent commercial center, as previously described. Only right turn movements are permitted out of the driveway as is currently the case. When the Wakea Avenue traffic signal is implemented, the median break would be closed and the left turn movements would be diverted to a U-turn lane at Wakea Avenue. The commercial center/project driveway (Kanaha Place) would then be restricted to right turn in, right turn out movements.

The analysis results shown on **Table 3** indicate that the outbound right turn movement at the project access driveway is currently operating at levels of service C and B in the morning and afternoon peaks, respectively, indicating acceptable traffic operations. The movement is forecast to be at an acceptable level of service C for the future scenarios, except in the PM peak with high trip generation and off-site improvement scenario. A still acceptable level of service D is forecast for this scenario. The proposed project access roadway is expected to have acceptable traffic operations even with the calculation of worse than actual levels of service by the analysis program.

The left turn from the highway median break is currently operating at levels of service C and B in the morning and afternoon peaks, respectively, and is forecast to decline one level to D and C with the future scenarios. While levels of service B and C imply acceptable conditions, observations of highway traffic operations elsewhere indicate that left turns from the highway are difficult to make during levels of service B and C conditions and would probably require mitigation. The above analysis indicates that left turns from the highway median break would require mitigation for the current and all future peak hour conditions. The proposed implementation of traffic signals at Wakea Avenue would allow this median break to be closed and would be one form of mitigation.

The proposed project exit driveway would be located east of the project access driveway and would be present only for the total with project scenarios. The project exit driveway is expected to handle up to 70% of the traffic leaving the proposed project based on the site design. The exit driveway is forecast to operate at level of service C in the morning peak with the low trip generation rates, and level D with the high trip generation rates. The driveway is forecast to operate at level of service D in the afternoon peak with the low trip generation rates, and level F with the high trip generation rates, although the actual operations may be better than calculated. These results indicate the possible need for mitigation at this intersection with the high trip generation rates. A proactive plan to ensure that the trips produced by the proposed project are closer to the low trip generation rates would be one mitigating measure.

The Wakea Avenue eastbound approach is currently operating as separate left and right turn lanes although it is not wide enough to be striped as such. The right turn movement is operating at level of service B in the morning peak, and is forecast to remain at the same level for the future scenarios. This movement is operating at level of service F in the afternoon peak. The left turn movement at the eastbound approach is already operating at level of service F in both peak periods. The left turn movement from the highway is currently operating at level of service C in the morning peak, and is forecast to remain at the same level in the future scenarios. It is currently operating at level of service D in the afternoon peak and is forecast to worsen to level F in the future. These results indicate the need for mitigation at this intersection. The proposed implementation of traffic signals would be one form of mitigation as previously discussed.

The existing U-turn on Ka'ahumanu Avenue would operate at level of service B in the morning peak and at level of service C or D in the afternoon peak with the project, indicating acceptable conditions. The longest calculated queue length is for three vehicles. A proposed design for the U-turn storage lane is shown on **Figure 9**.

RECOMMENDATIONS AND CONCLUSIONS

The traffic impacts of the proposed project can be minimized with the implementation of adequate mitigation. Project management should pursue the implementation of their proposed project improvements as previously discussed in this report.

Project management should pursue its proposal to widen the northwest bound approach of Hana Highway to include three through lanes and an acceleration/deceleration lane fronting the entire project site. The third through lane would be designed to accommodate the future widening of Hana Highway and would minimize the reconstruction activity fronting the project site when Hana Highway is widened from Ka'ahumanu Street to Dairy Road. The acceleration/deceleration lane would provide a long length for traffic exiting the project to merge into the through lanes and would also provide space for a shuttle bus stop to encourage transit access to the project.

Project management should implement a Traffic Management Plan to minimize the volume of trips generated to and from the proposed project. Two distinct trip generation rates were analyzed based on number of expected employees and building floor area. The number of trips with the former rate was less than half the number of trips with the latter rate. The level of service analysis indicated that several intersections would be more adversely affected with the higher number of trips. A proactive program to reduce the volume of vehicle trips made to the proposed project to be closer to the lower rate could mitigate some of the problems associated with the high trip rates.

Several roadway improvement projects proposed for the study area by the State and County would mitigate existing and ambient traffic problems as well as the additional traffic generated by the proposed project. These roadway improvement projects include:

1. Widening of Hana Highway from Ka'ahumanu Avenue to (new) Airport Access Road.
2. New Kahului Airport Access Road.
3. Installation of traffic signals at the Hana Highway and Wakea Avenue intersection.

In addition to the Hana Highway widening, other improvements could be made on the Kamehameha Avenue approach. Project management is proposing to add a second right turn lane to increase the roadway traffic capacity. Alternatively, the shared left turn lane could be made into a separate left turn lane so that the current split-phase signal timing could be replaced with an eight-phase traffic signal timing plan. An eight-phase traffic signal timing plan is slightly more efficient than a split-phase timing plan and can provide more capacity along the roadway.

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8. *Highway Capacity Analysis Program, Version 1*, Catalina Engineering, Inc., 2003.

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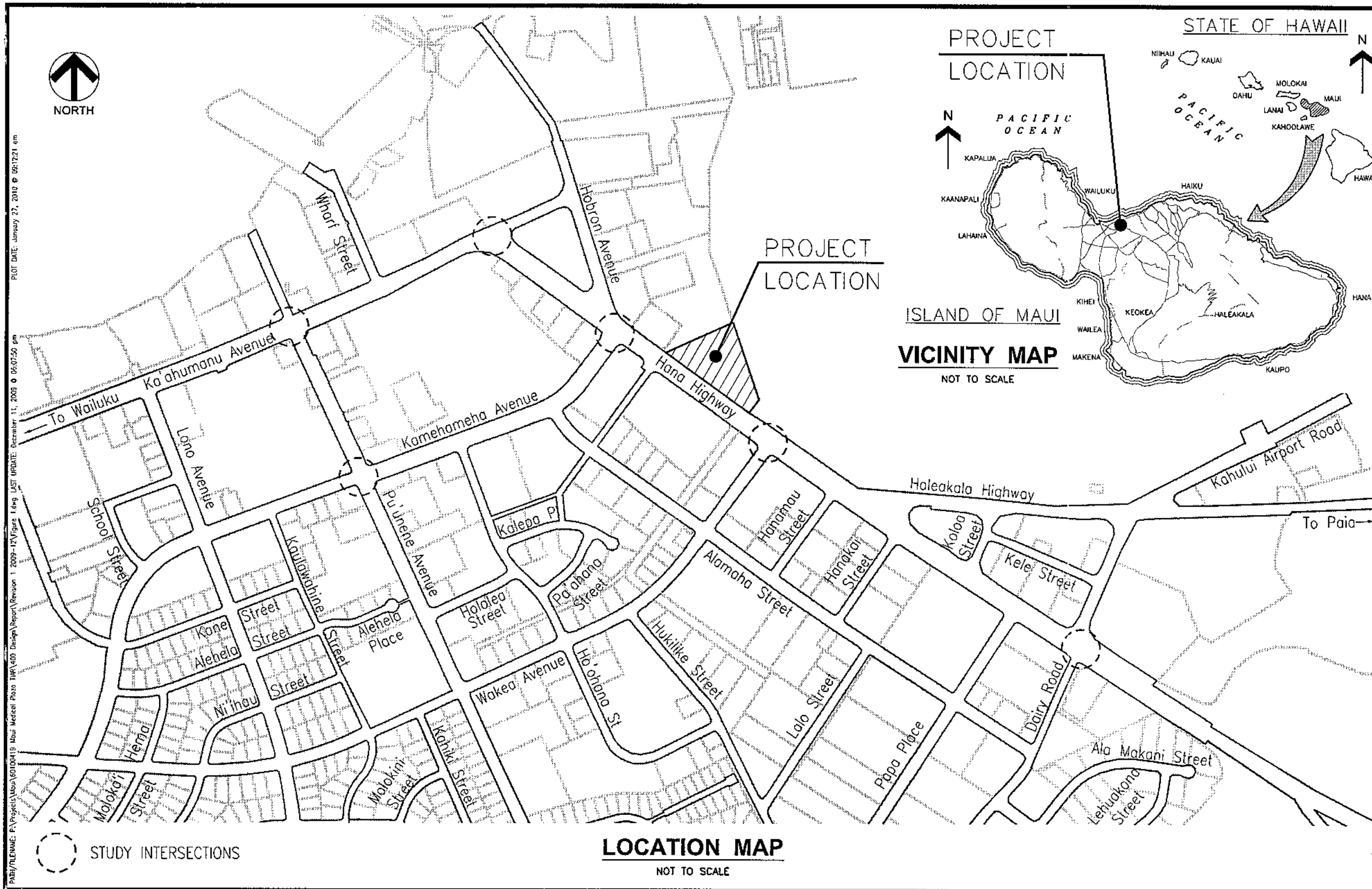
Figures



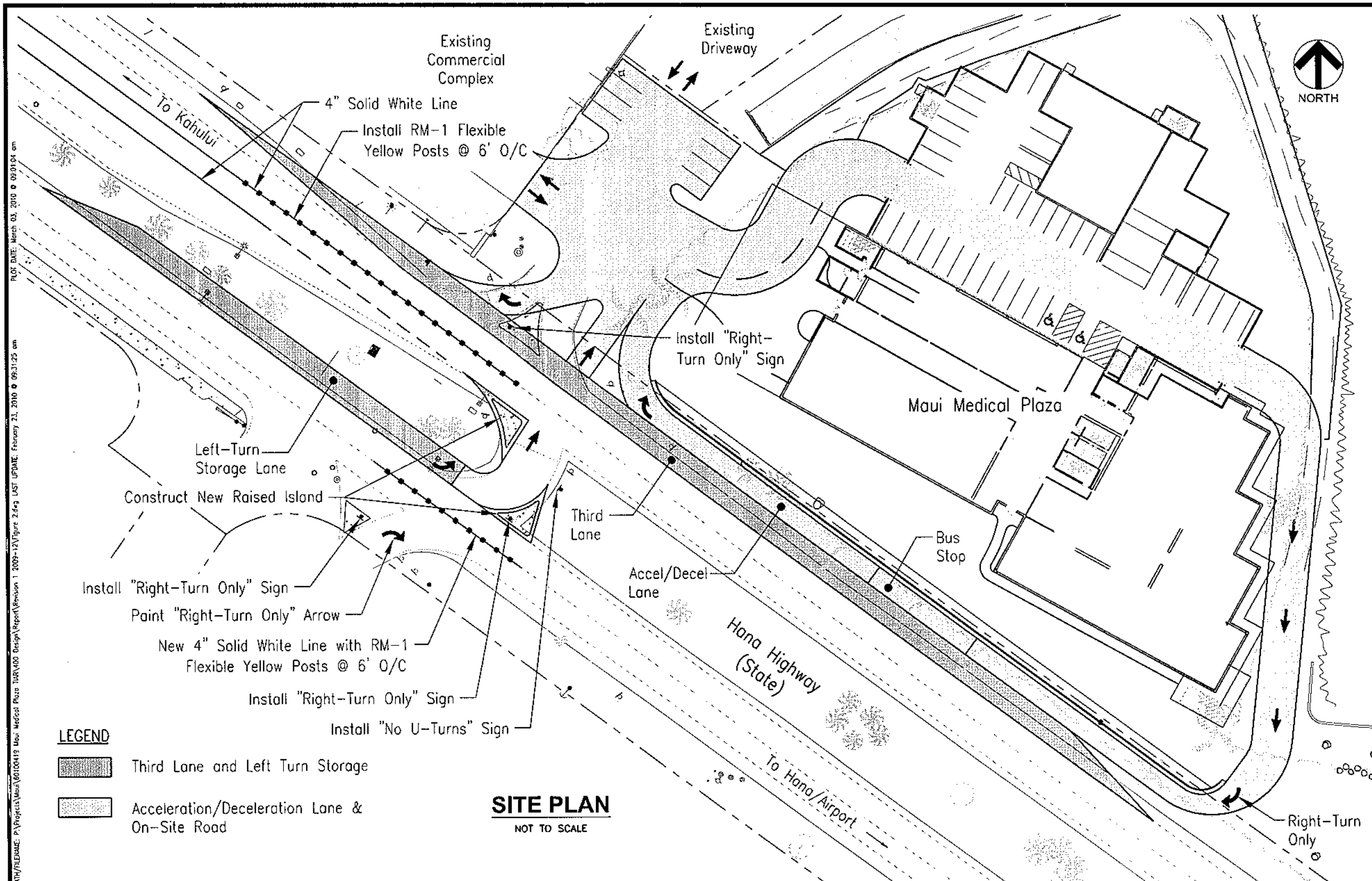
AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 1
LOCATION MAP
TRAFFIC IMPACT ANALYSIS REPORT, FIRST REVISION
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

JANUARY 2010

PATH/FILENAME: P:\Projects\Maui\60100419 Maui Medical Plaza TIAR\400 Design\Report\Revision 1 2009-12\Figure 1.dwg LAST UPDATE: December 11, 2009 @ 05:07:50 pm PLOT DATE: January 27, 2010 @ 09:12:21 am



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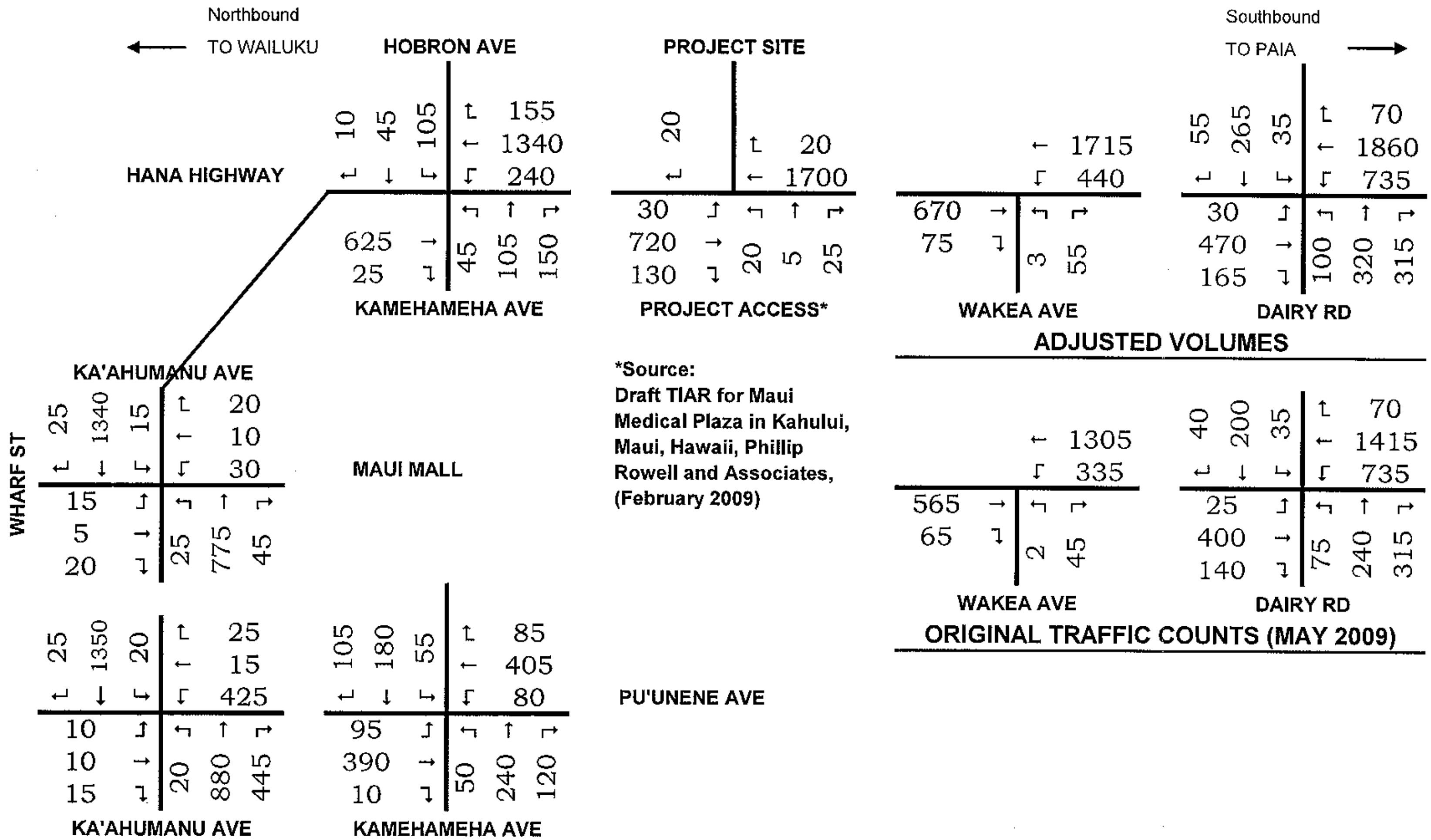
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 2
SITE PLAN
TRAFFIC IMPACT ANALYSIS REPORT, FIRST REVISION
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

JANUARY 2010

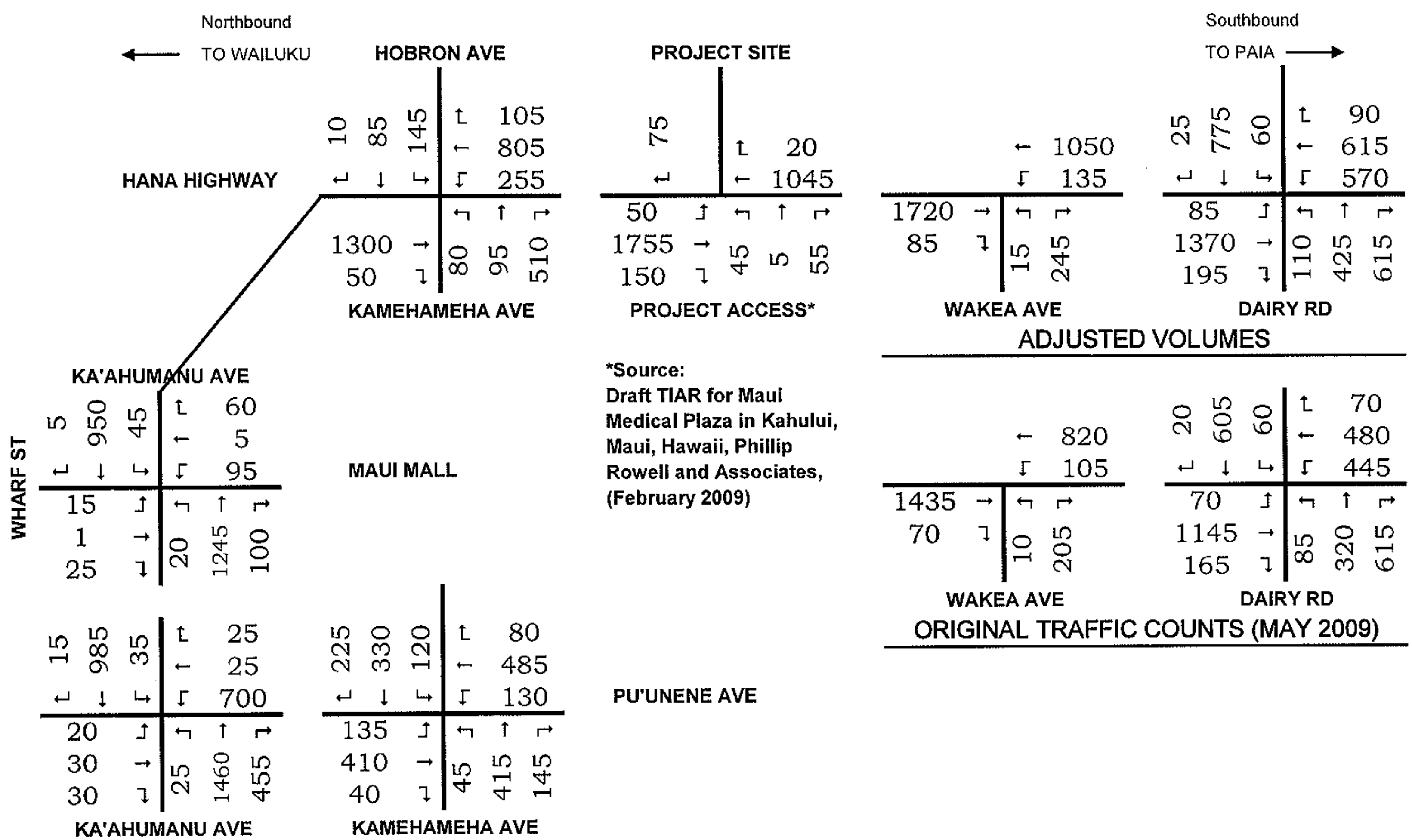


AM PEAK HOUR

Not to scale

2009 EXISTING TRAFFIC VOLUMES

FIGURE 3A

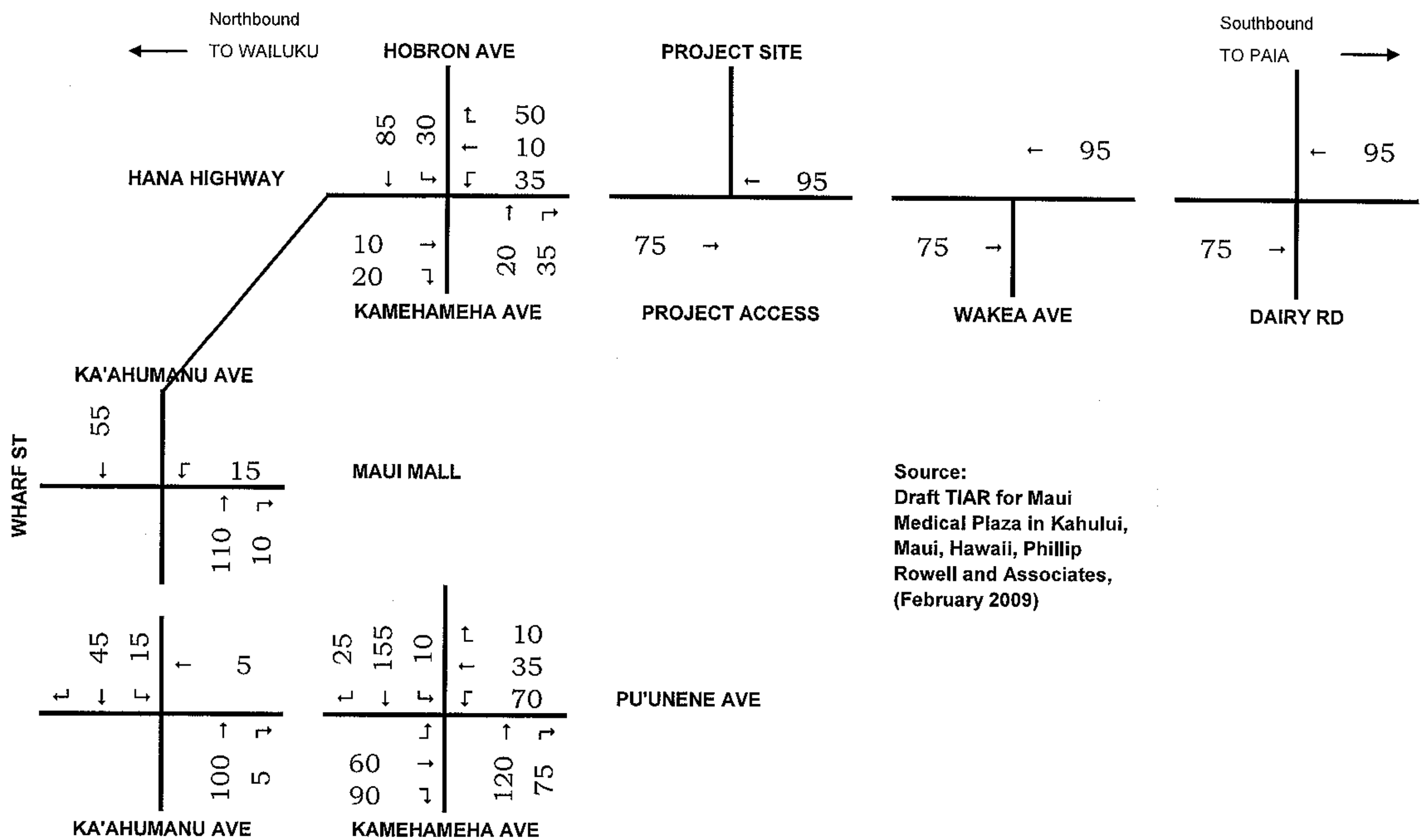


PM PEAK HOUR

2009 EXISTING TRAFFIC VOLUMES

Not to scale

FIGURE 3B



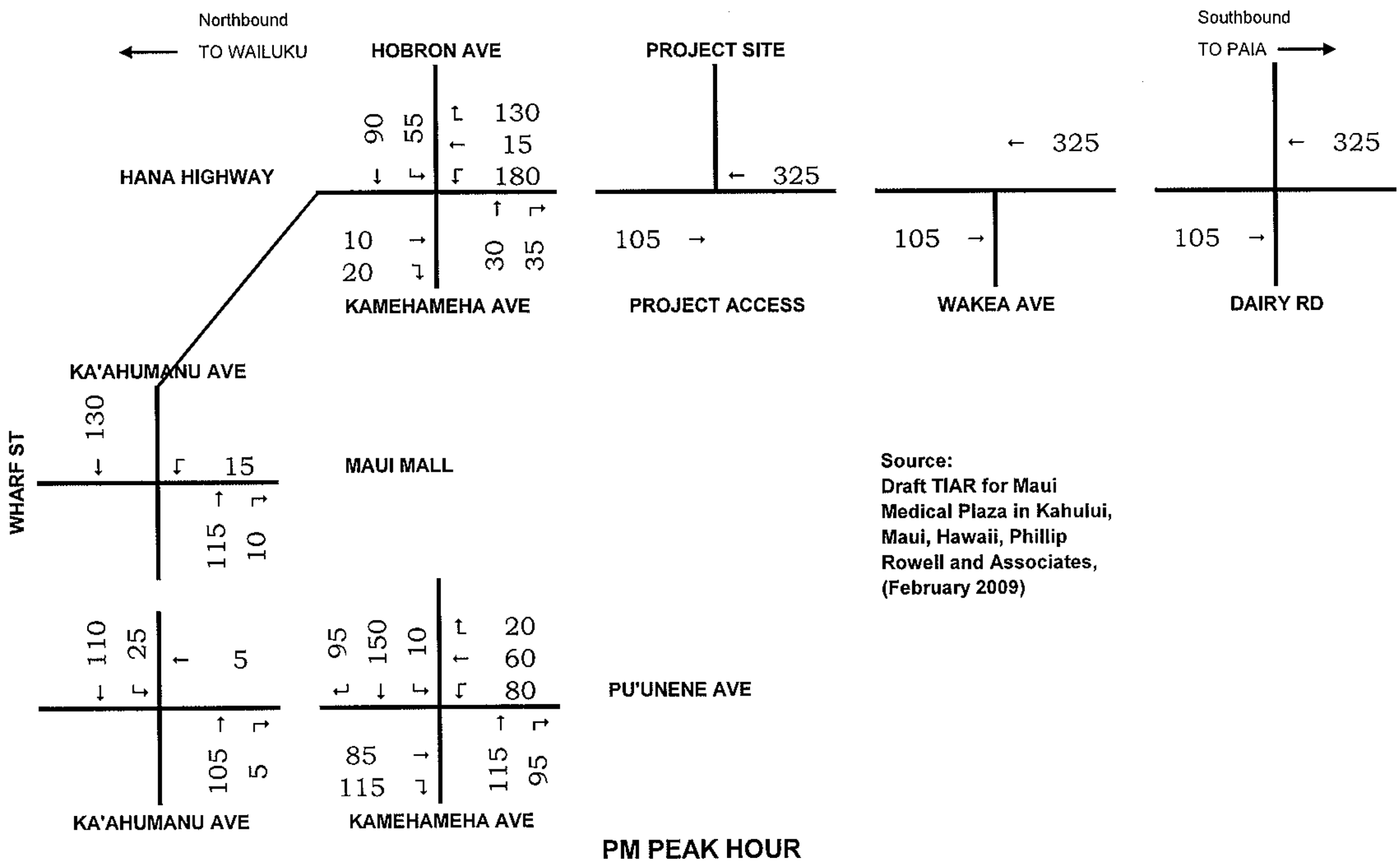
Source:
Draft TIAR for Maui Medical Plaza in Kahului, Maui, Hawaii, Phillip Rowell and Associates, (February 2009)

AM PEAK HOUR

Not to scale

TRAFFIC GENERATED BY FUTURE ADJACENT PROJECTS

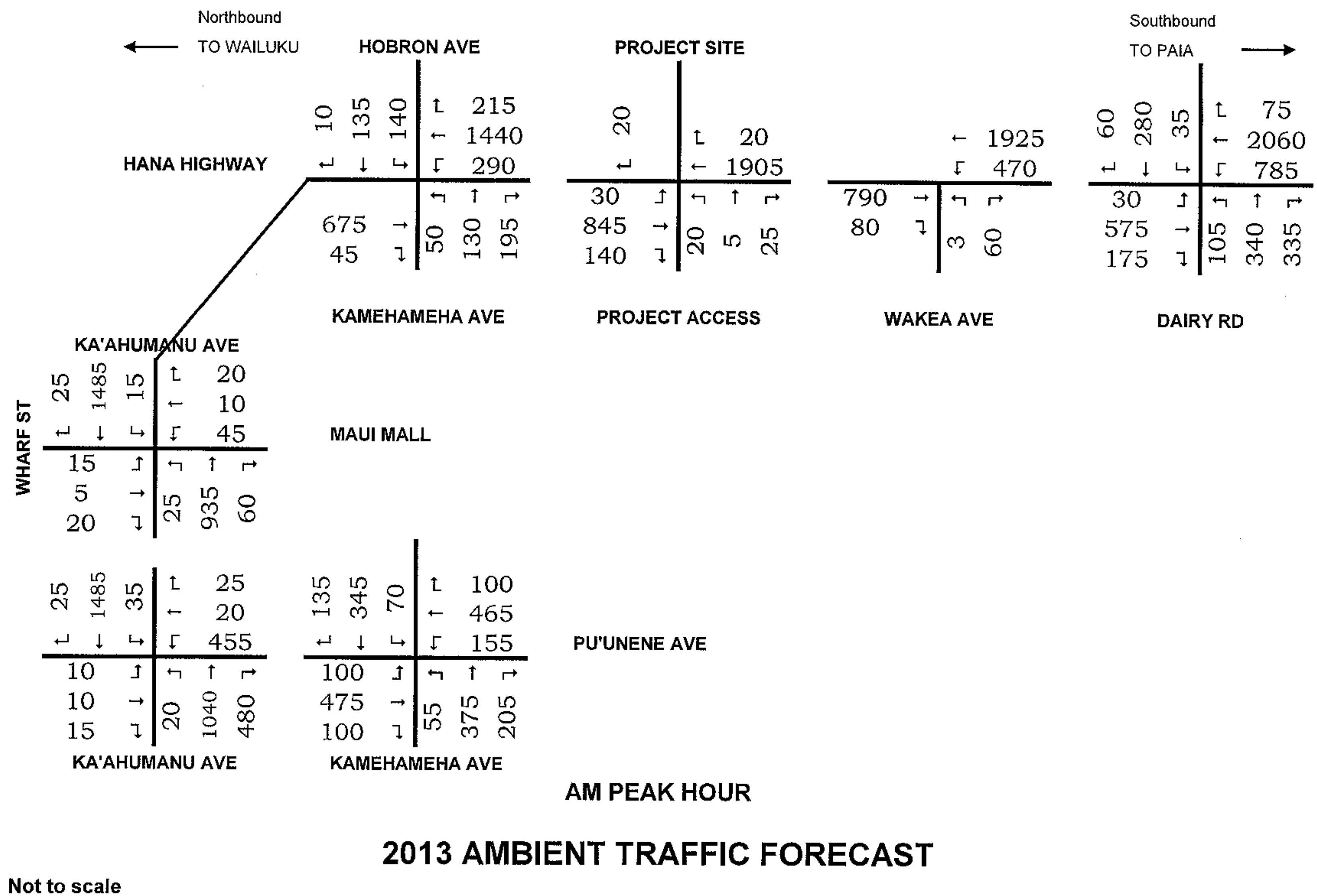
FIGURE 4A



TRAFFIC GENERATED BY FUTURE ADJACENT PROJECTS

Not to scale

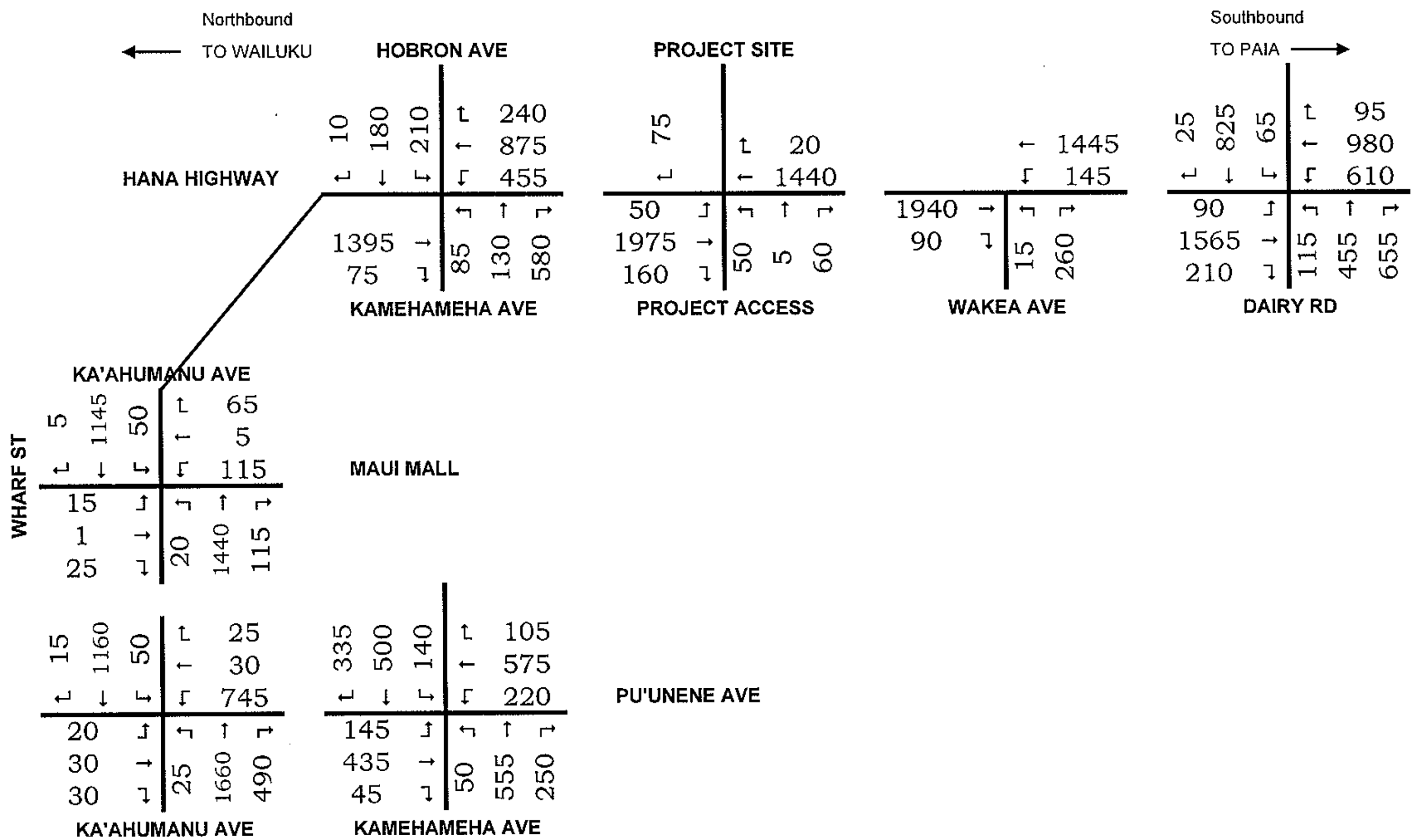
FIGURE 4B



AM PEAK HOUR

2013 AMBIENT TRAFFIC FORECAST

FIGURE 5A

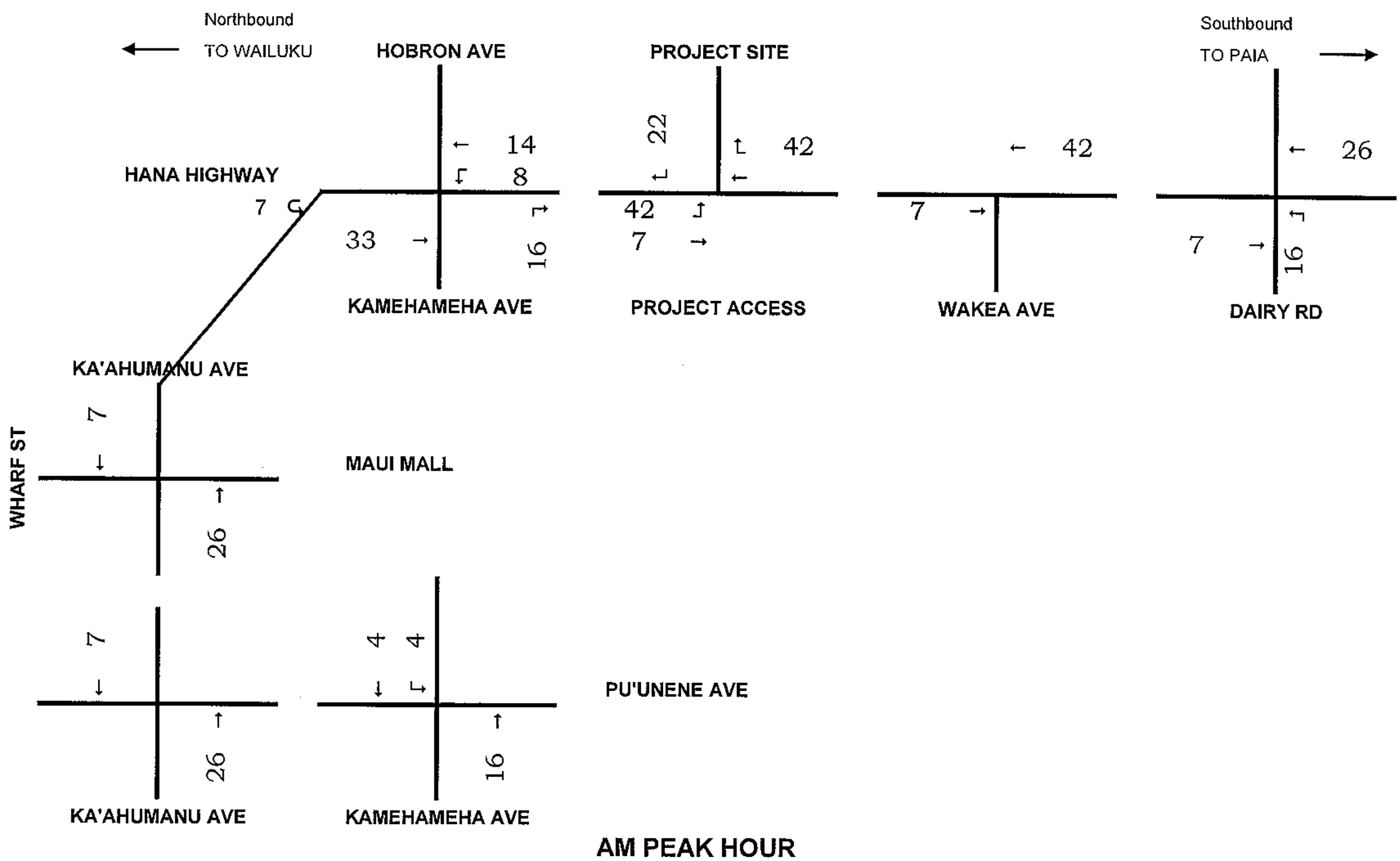


PM PEAK HOUR

2013 AMBIENT TRAFFIC FORECAST

Not to scale

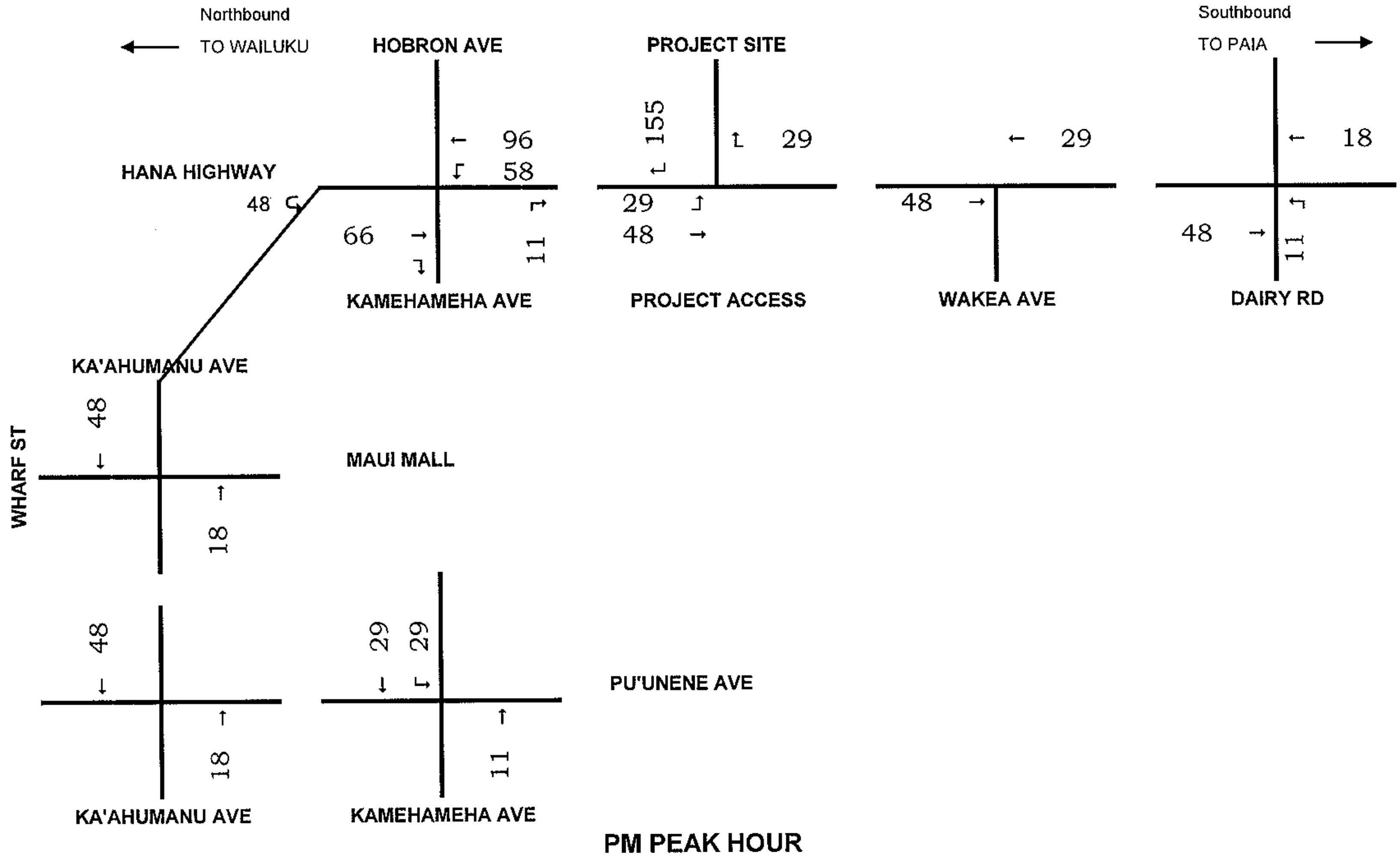
FIGURE 5B



PROJECT GENERATED TRAFFIC ASSIGNMENT BASED ON EMPLOYEES (LOW RATE)

Not to scale

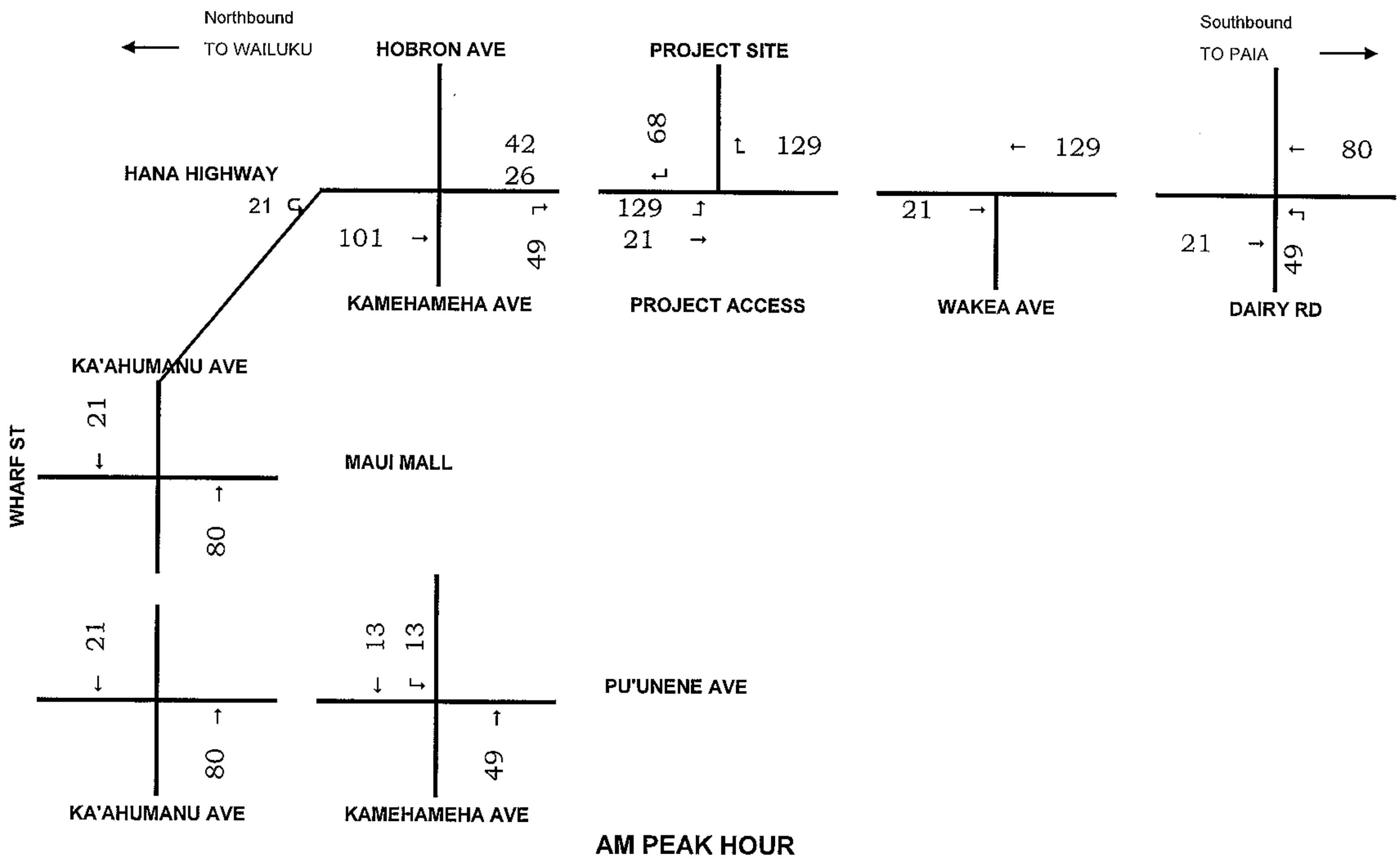
FIGURE 6A



PROJECT GENERATED TRAFFIC ASSIGNMENT BASED ON EMPLOYEES (LOW RATE)

Not to scale

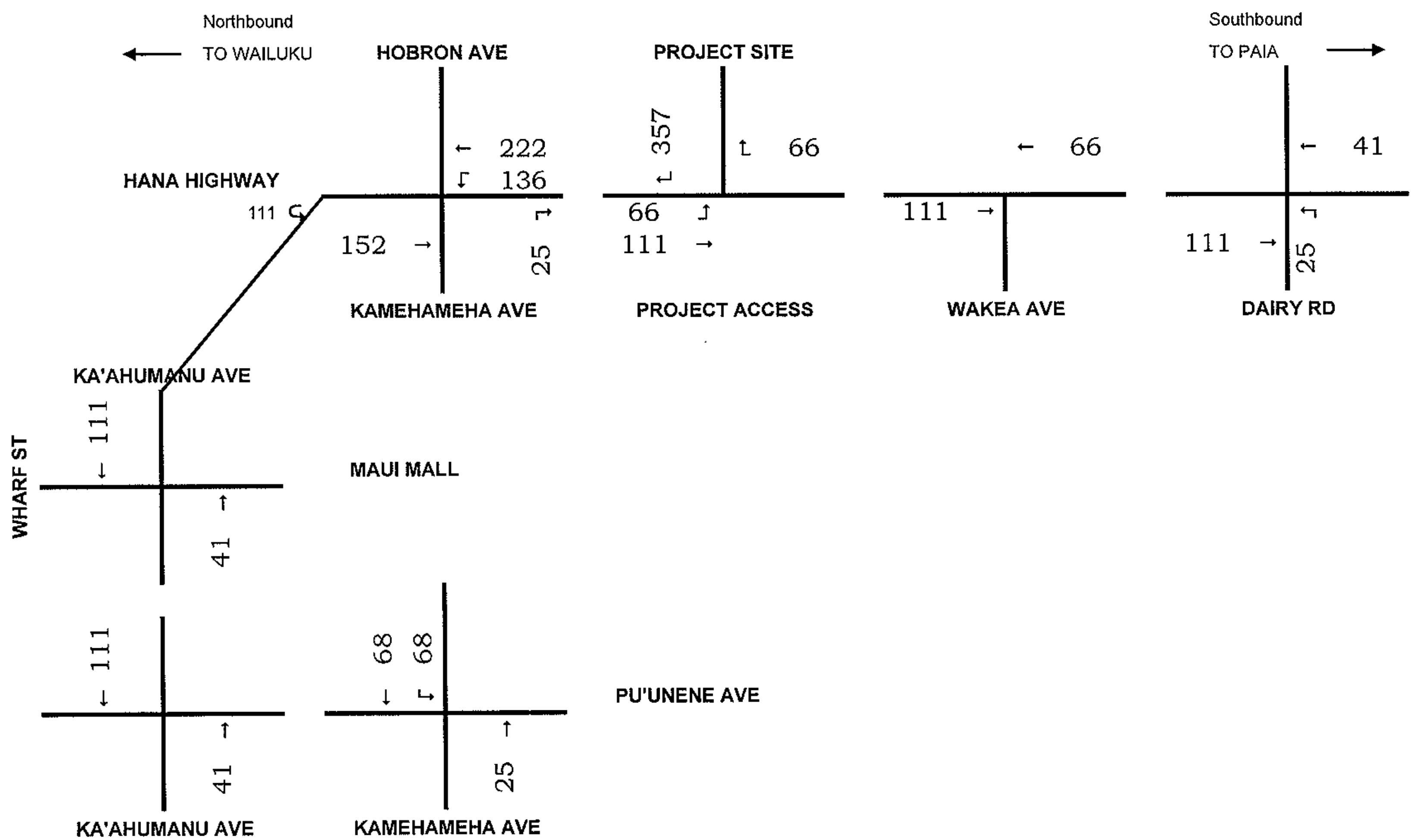
FIGURE 6B



PROJECT GENERATED TRAFFIC ASSIGNMENT BASED ON FLOOR AREA (HIGH RATE)

Not to scale

FIGURE 6C

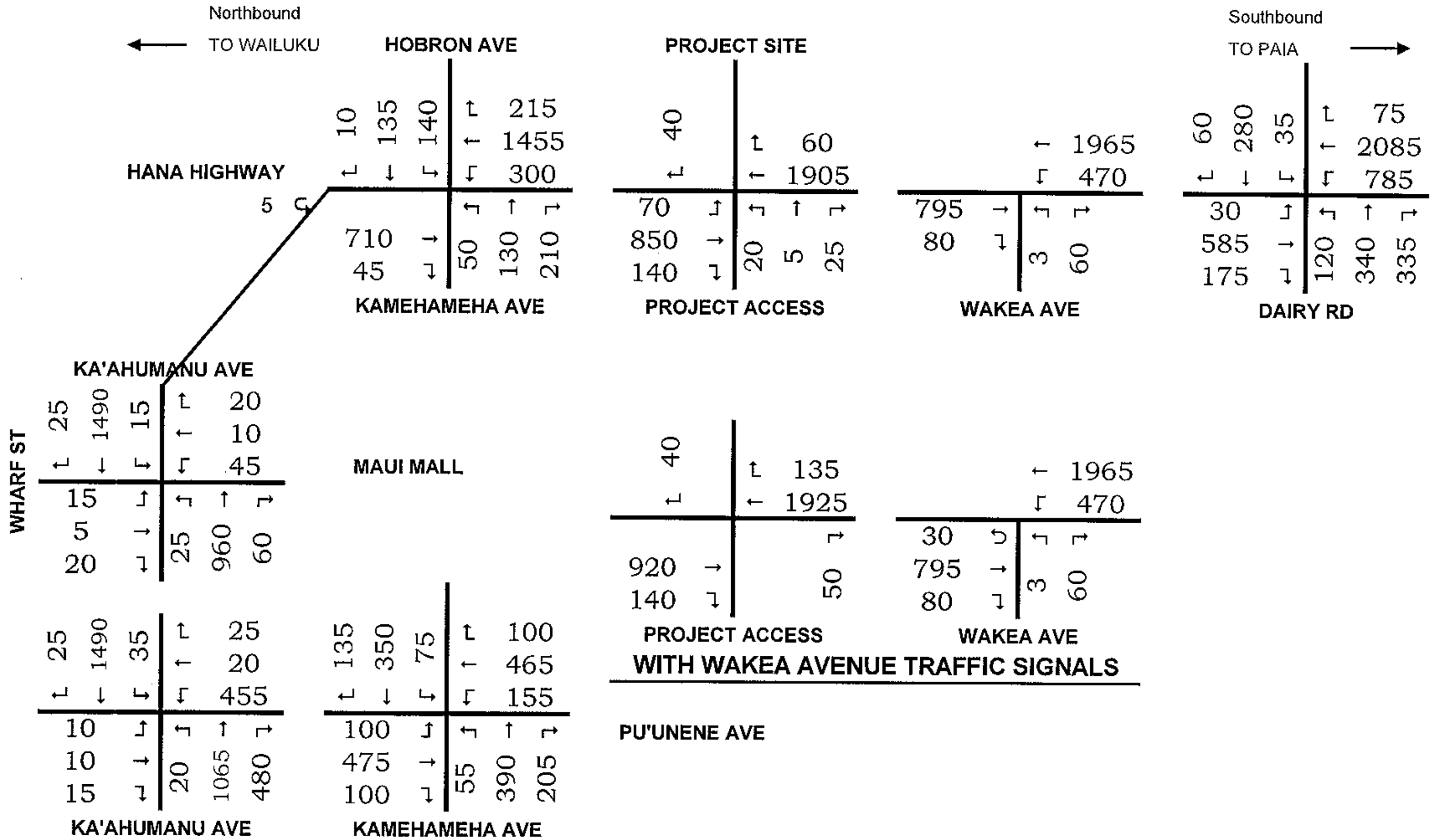


PM PEAK HOUR

PROJECT GENERATED TRAFFIC ASSIGNMENT BASED ON FLOOR AREA (HIGH RATE)

Not to scale

FIGURE 6D

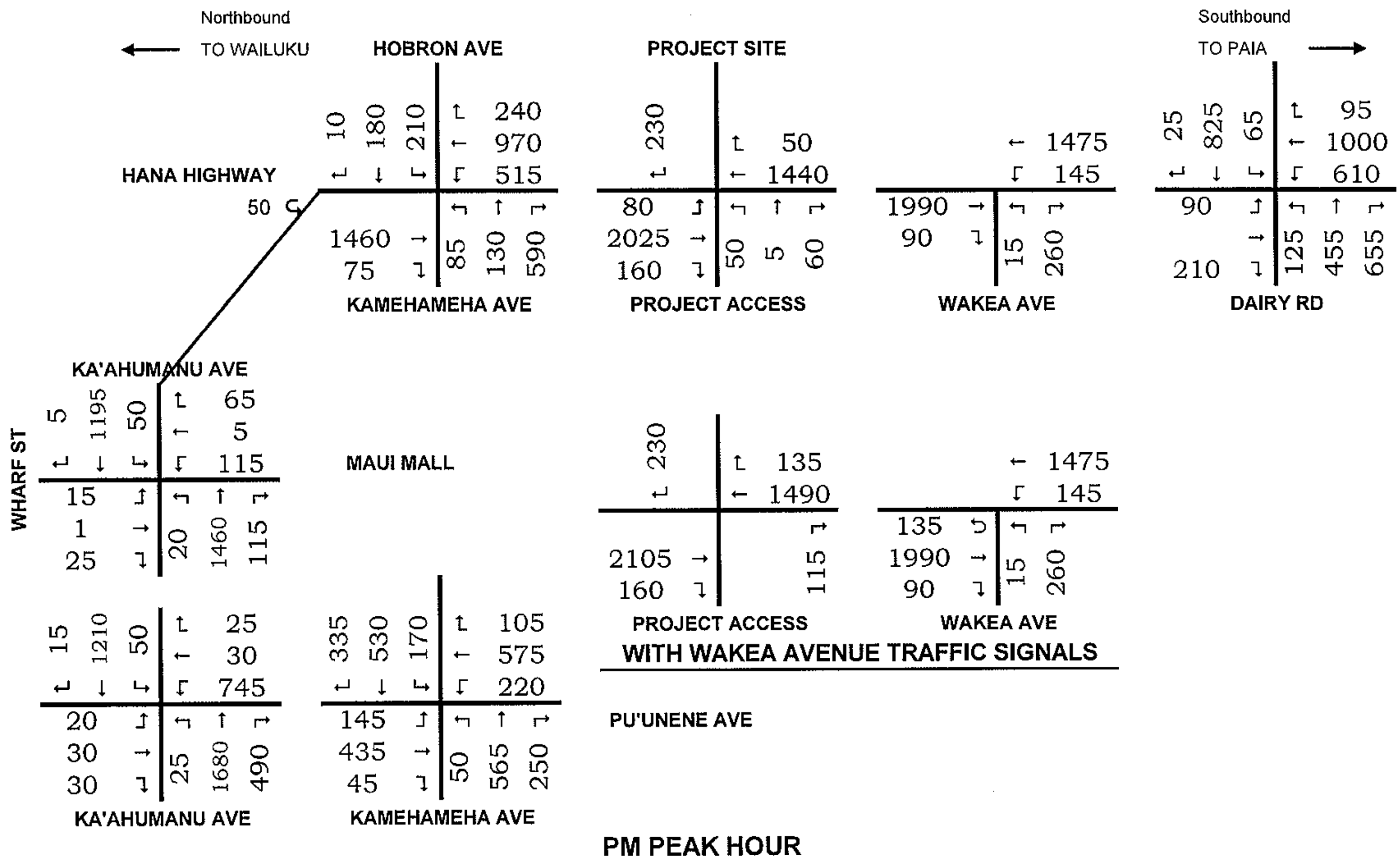


AM PEAK HOUR

2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH LOW TRIP GENERATION

Not to scale

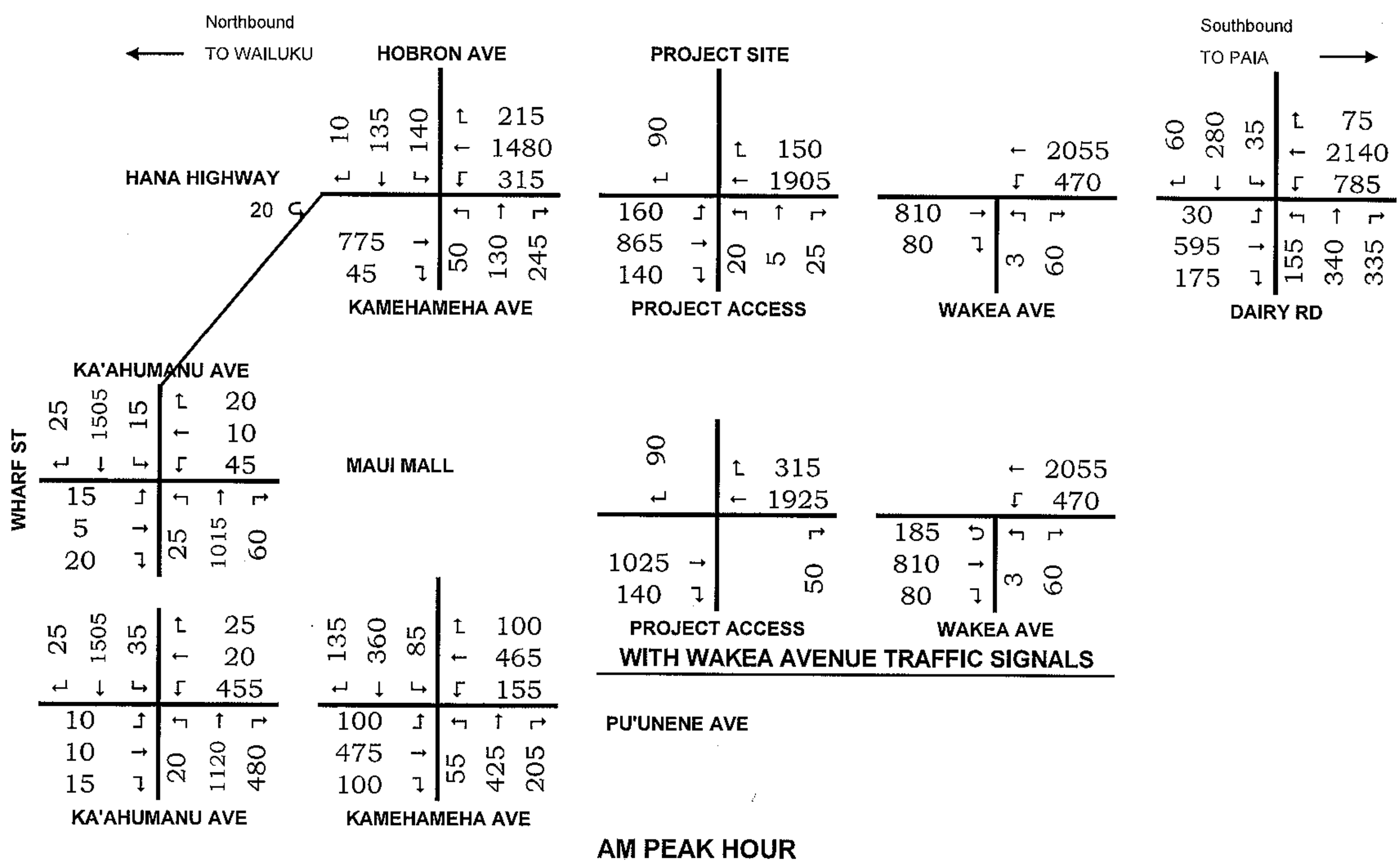
FIGURE 7A



2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH LOW TRIP GENERATION

Not to scale

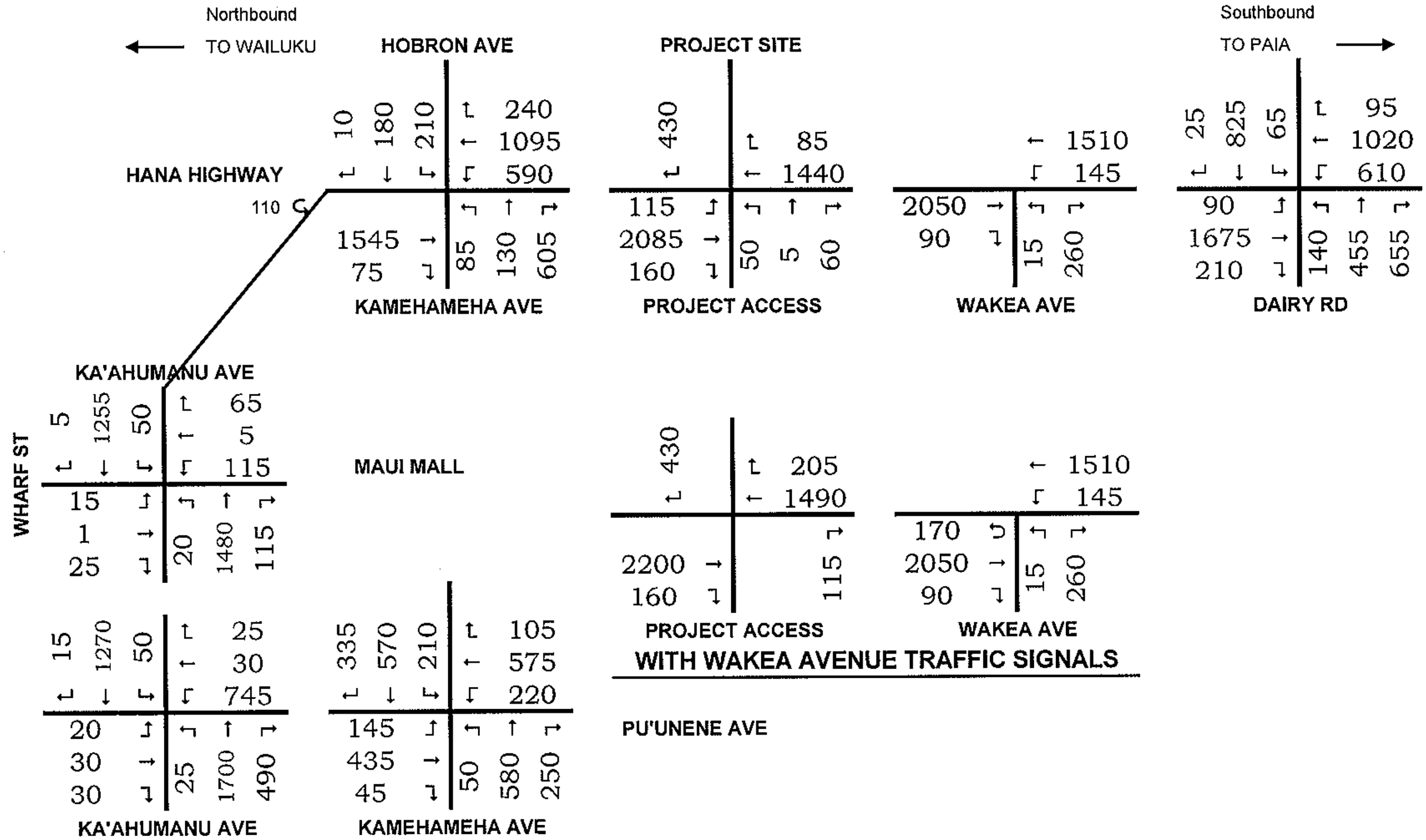
FIGURE 7B



2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH HIGH TRIP GENERATION

Not to scale

FIGURE 7C

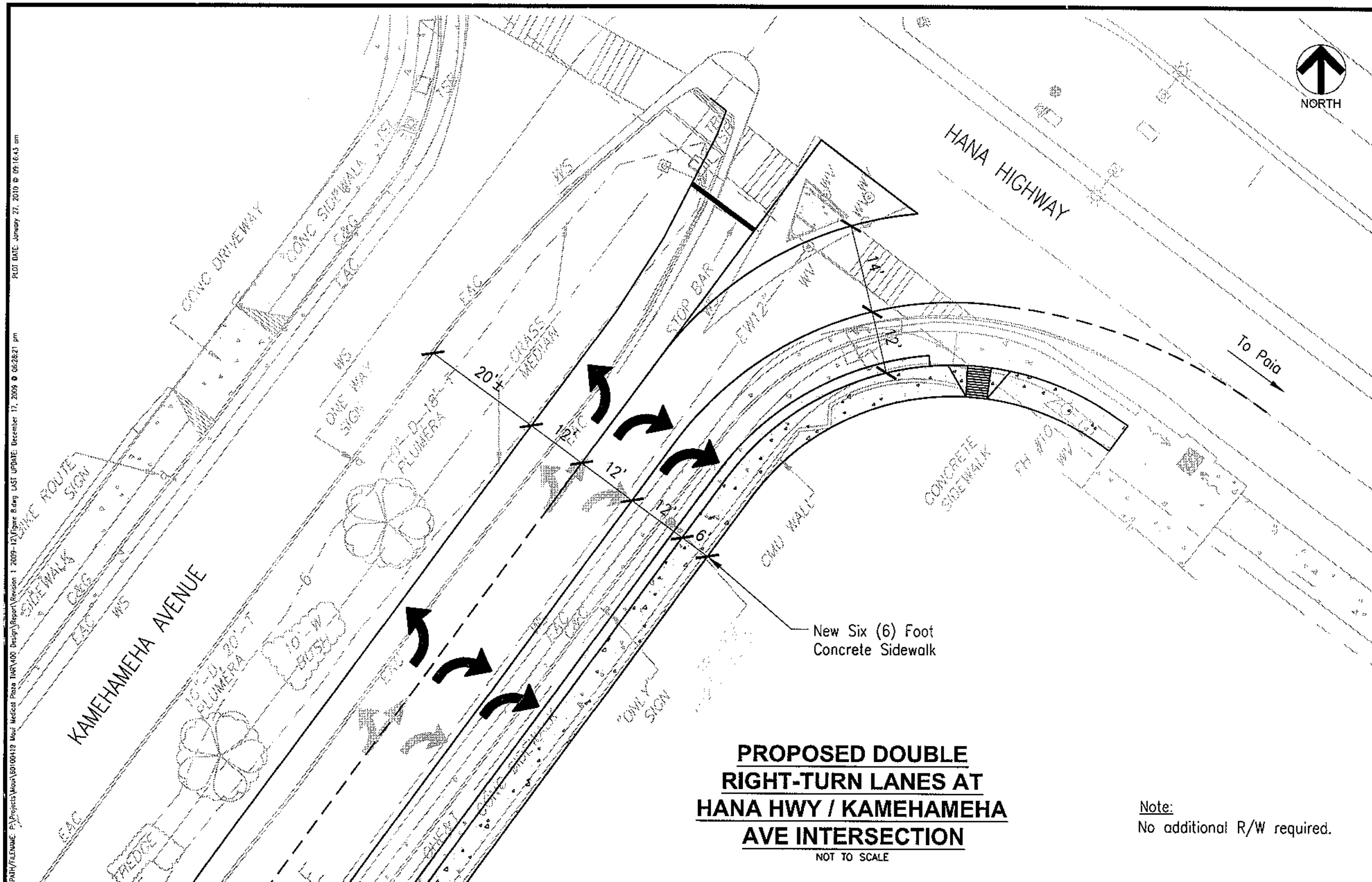


PM PEAK HOUR

2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH HIGH TRIP GENERATION

Not to scale

FIGURE 7D



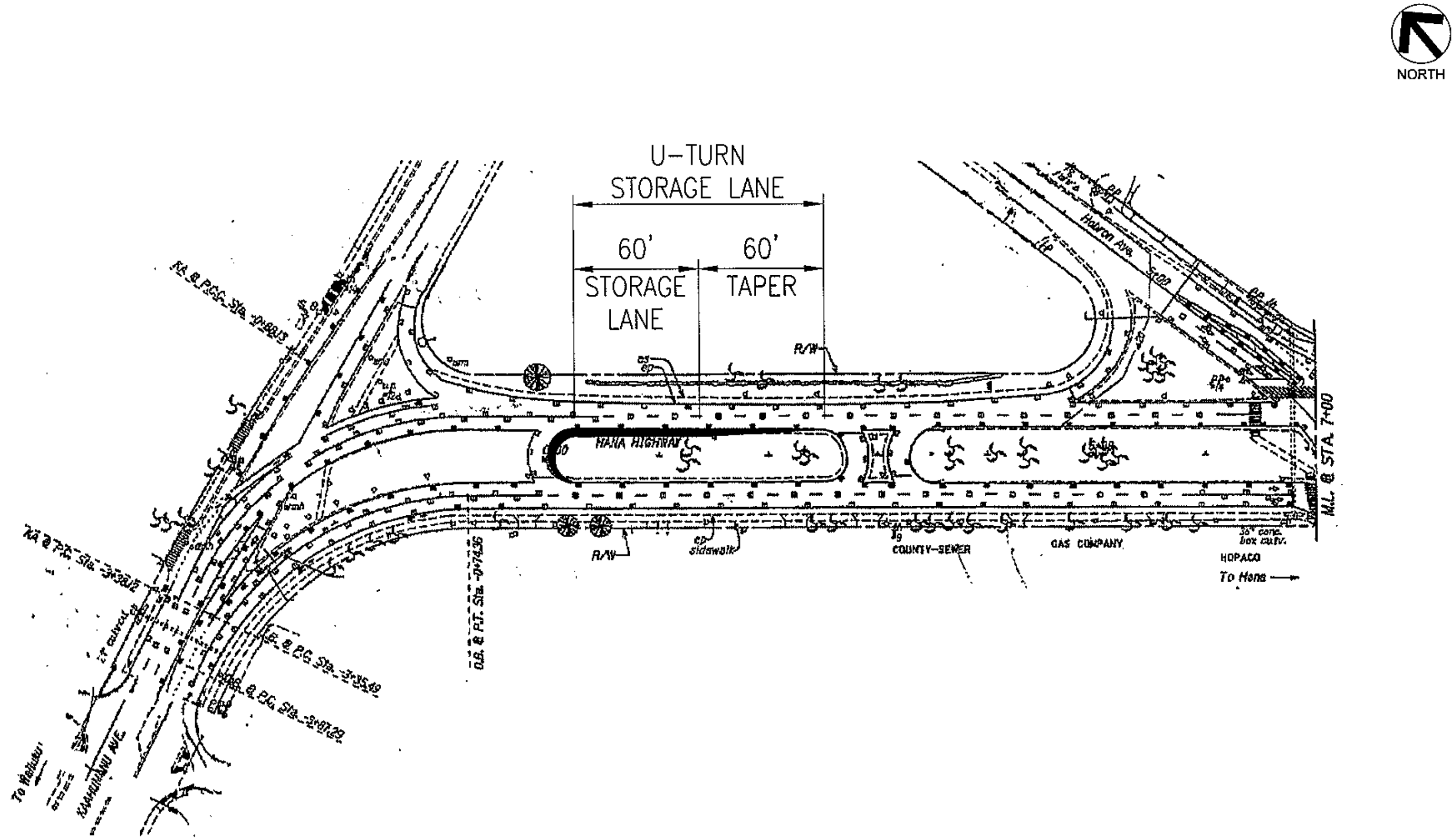
PATH/FILENAME: P:\Projects\Maui\60100419 Maui Medical Plaza TIAR\400 Design\Report\Revision 1 2009-12\Figure 8.dwg LAST UPDATE: December 17, 2009 @ 06:28:21 pm PLOT DATE: January 27, 2010 @ 09:16:43 am

AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 8
PROPOSED DOUBLE RT-TURN LANES
TRAFFIC IMPACT ANALYSIS REPORT, FIRST REVISION
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

JANUARY 2010



PROPOSED U-TURN STORAGE LANE

NOT TO SCALE

AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 9

PROPOSED U-TURN STORAGE LANE

TRAFFIC IMPACT ANALYSIS REPORT, FIRST REVISION
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

JANUARY 2010

Tables

TABLE 1
TRIP GENERATION AND DISTRIBUTION ANALYSIS

AM TRIP GENERATION
131,500 sf Medical Office Building (LU 720)

	TRIPS	Entering	Exiting
T = 2.48(X)		79%	21%
T =	326	258	68

AM TRIP DISTRIBUTION

Direction	Trips	Ka'ahumanu Ave	Kamehameha Ave	Dairy/ Pu'unene	Hana Hwy
		31%	19%	19%	31%
Entering	258	80	49	49	80
Exiting	68	21	13	13	21

PM TRIP GENERATION
131,500 sf Medical Office Building (LU 720)

	TRIPS	Entering	Exiting
T = 3.72(X)		27%	73%
T =	489	132	357

PM TRIP DISTRIBUTION

Direction	Trips	Ka'ahumanu Ave	Kamehameha Ave	Dairy/ Pu'unene	Hana Hwy
		31%	19%	19%	31%
Entering	132	41	25	25	41
Exiting	357	111	68	68	111

AM TRIP GENERATION
Medical Office Building w/200 Employees (LU 720)

	TRIPS	Entering	Exiting
T = 0.53(X)		79%	21%
T =	106	84	22

AM TRIP DISTRIBUTION

Direction	Trips	Ka'ahumanu Ave	Kamehameha Ave	Dairy/ Pu'unene	Hana Hwy
		31%	19%	19%	31%
Entering	84	26	16	16	26
Exiting	22	7	4	4	7

PM TRIP GENERATION
Medical Office Building w/200 Employees (LU 720)

	TRIPS	Entering	Exiting
T = 1.06(X)		27%	73%
T =	212	57	155

PM TRIP DISTRIBUTION

Direction	Trips	Ka'ahumanu Ave	Kamehameha Ave	Dairy/ Pu'unene	Hana Hwy
		31%	19%	19%	31%
Entering	57	18	11	11	18
Exiting	155	48	29	29	48

TABLE 2
SIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

INTERSECTION	2009 EXISTING			2013 AMBIENT			2013 TOTAL LOW			2013 TOTAL HIGH			2013 TOTAL HIGH W/ WAKEA SIGNAL		
	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C	LOS	Delay	V/C
AM PEAK HOUR															
Ka'ahumanu Ave & Pu'unene Ave	C	30.7	0.62	C	24.3	0.71	C	24.9	0.72	C	26.2	0.74	C	26.0	0.77
Ka'ahumanu Ave & Wharf St/Maui Mall	A	8.9	0.39	A	5.5	0.44	A	5.4	0.44	A	3.7	0.46	B	16.5	0.44
Hana Hwy & Hobron/Kamehameha	C	26.2	0.75	D	39.8	0.82	D	39.1	0.81	C	32.7	0.83	C	33.0	0.83
Hana Hwy & Diary Road	D	39.3	0.90	D	46.7	1.00	D	54.3	1.05	E	55	1.03	E	55.2	1.03
Pu'unene Ave & Kamehameha Ave	D	43.0	0.79	D	43.3	0.82	D	43.6	0.82	D	45.3	0.85	D	45.6	0.85
Hana Hwy & Wakea Ave													C	23.6	0.88
PM PEAK HOUR															
Ka'ahumanu Ave & Pu'unene Ave	D	40.6	0.91	E	57.8	1.01	E	56.9	1.02	E	55.1	1.03	D	52.6	1.03
Ka'ahumanu Ave & Wharf St/Maui Mall	B	12.4	0.61	B	12.1	0.70	B	13.5	0.71	A	9.1	0.72	B	12.0	0.72
Hana Hwy & Hobron/Kamehameha	F	91.7	1.18	F	>100	1.36	F	>100	1.39	F	>100	1.46	F	>100	1.46
Hana Hwy & Diary Road	E	66.5	1.02	E	76.7	1.08	F	81.9	1.11	F	85.2	1.19	F	89.3	1.19
Pu'unene Ave & Kamehameha Ave	D	50.6	0.85	D	51.6	0.92	E	56.6	0.92	D	51.3	0.94	D	52.2	0.94
Hana Hwy & Wakea Ave													C	26.2	0.94

TABLE 3
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

INTERSECTION	2009 EXISTING			2013 AMBIENT			2013 TOTAL LOW			2013 TOTAL LOW W/ WAKEA SIGNAL			2013 TOTAL HIGH			2013 TOTAL HIGH W/ WAKEA SIGNAL		
Approach	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue	LOS	Delay	Queue
AM PEAK HOUR																		
PROJECT ACCESS																		
Mauka Rdwy, EB LT	F	>100	5	F	>100	6	F	>100	7	B	14.2	1	F	>100	8	C	15.1	1
Proj. DW, WB RT	C	20.3	1	C	23.6	1	C*	22.3	1	C*	22.6	1	C*	23.8	1	C*	24.2	1
Hwy Median, SB LT	C	18.4	1	C	21.9	1	D	27.5	1	NA			D	30.8	2	NA		
PROJECT EXIT																		
Proj. DW, WB RT							C*	24.3	1	C*	24.7	1	D*	29.3	1	D*	29.9	1
WAKEA AVE																		
Wakea Ave EB RT	B	11.9	1	B	12.7	1	B	12.9	1	NA			B	13	1	NA		
Wakea Ave EB LT	F	>100	1	F	>100	1	F	>100	1				F	>100	1			
Hana Hwy NB LT	C	16.6	4	C	23.5	7	C	23.8	7				C	24.7	7			
PM PEAK HOUR																		
PROJECT ACCESS																		
Roadway, Eastbnd	F	>100	16	F	>100	18	F	>100	18	F	82.3	5	F	>100	18	F	>100	6
Proj. DW, WB RT	B	14.9	1	C	20.1	1	C*	20.3	1	C*	20.3	1	C*	24.5	2	D*	26	2
Hwy Median, SB LT	B	11.9	1	C	15.7	1	C	17.3	1	NA			C	19.9	2	NA		
PROJECT EXIT																		
Proj. DW, WB RT							D*	28.6	3	D*	30.8	3	F*	92.5	12	F*	>100	13
WAKEA AVE																		
Wakea Ave EB RT	F	>100	12	F	>100	18	F	>100	18	NA			F	>100	19	NA		
Wakea Ave EB LT	F	>100	3	F	>100	4	F	>100	4				F	>100	4			
Hana Hwy NB LT	D	31.7	3	F	55.4	5	F	62.7	5				F	73.3	6			

LEGEND:

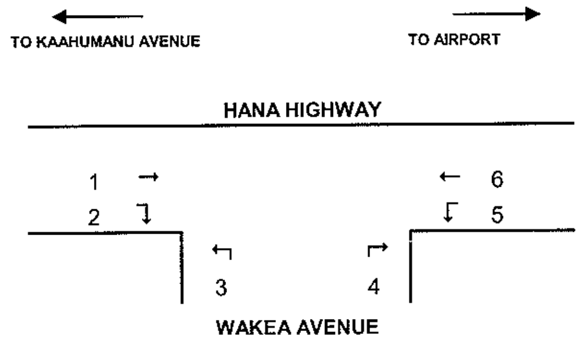
EB	Eastbound	RT	Right Turn
WB	Westbound	LT	Left Turn
SB	Southbound	NB	Northbound

* Indicates that HCAP cannot properly analyze four lanes of traffic and that the expected level of service would be higher than shown.

Appendix A

Traffic Turning Movement Counts

TRAFFIC TURNING MOVEMENT COUNT
MAUI MEDICAL PLAZA



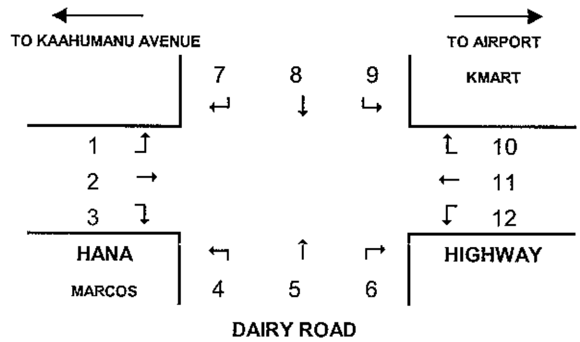
LOCATION: Hana Highway / Wakea Avenue
DATE: Thursday, May 21, 2009
TIME: 6:30a-8:30a / 3:30p-5:30p
WEATHER: Clear Sunny
RECORDER: Mike Lipscomb

TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
6:30-6:45a	125	11	2	23	55	229	445
6:45-7:00a	98	11	0	14	30	149	302
7:00-7:15a	81	13	0	10	17	103	224
7:15-7:30a	135	14	2	13	65	251	480
7:30-7:45a	140	18	0	18	87	325	588
7:45-8:00a	149	14	0	12	84	331	590
8:00-8:15a	145	16	0	6	87	327	581
8:15-8:30a	133	15	2	9	77	321	557
6:30-8:30a	1006	112	6	105	502	2036	3767
7:30-8:30a	567	63	2	45	335	1304	2316
PHF	0.97				0.99		

TIME PERIOD	MOVEMENT NUMBER 1	2	3	4	5	6	TOTAL
3:30-3:45p	278	25	4	52	49	183	591
3:45-4:00p	292	17	6	52	39	208	614
4:00-4:15p	334	23	1	58	29	185	630
4:15-4:30p	354	22	3	59	31	184	653
4:30-4:45p	375	21	3	50	24	213	686
4:45-5:00p	346	15	4	47	29	200	641
5:00-5:15p	378	19	0	65	26	210	698
5:15-5:30p	334	16	4	44	25	197	620
3:30-5:30p	2691	158	25	427	252	1580	5133
4:30-5:30p	1433	71	11	206	104	820	2645
PHF	0.95				0.98		

TRAFFIC TURNING MOVEMENT COUNT
MAUI MEDICAL PLAZA

LOCATION:	Hana Highway / Dairy Road
DATE:	Wednesday, May 20, 2009
TIME:	6:30a-8:30a / 3:30p-5:30p
WEATHER:	Clear Sunny
RECORDER:	Mike Lipscomb; Keith Oszman, Jr.



TIME PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
6:30-6:45a	3	78	19	13	51	49	6	42	6	22	310	146	745
6:45-7:00a	8	87	20	14	56	54	4	36	6	24	279	132	720
7:00-7:15a	2	139	24	12	52	63	4	30	2	18	305	163	814
7:15-7:30a	7	102	37	22	66	82	5	42	5	11	381	175	935
7:30-7:45a	8	101	34	21	65	75	12	41	9	19	366	192	943
7:45-8:00a	7	103	32	20	67	78	14	79	11	24	373	186	994
8:00-8:15a	4	92	38	13	44	78	10	40	8	16	294	180	817
8:15-8:30a	13	82	44	22	62	110	10	56	10	18	212	150	789
6:00-8:30a	52	784	248	137	463	589	65	366	57	152	2520	1324	6757
7:15-8:15a	26	398	141	76	242	313	41	202	33	70	1414	733	3689
PHF	0.97			0.93			0.66			0.98			

TIME PERIOD	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
3:30-3:45p	11	259	67	27	122	128	9	160	13	22	158	124	1100
3:45-4:00p	21	237	33	36	107	156	5	147	11	14	175	127	1069
4:00-4:15p	7	226	39	27	89	143	7	179	15	26	179	139	1076
4:15-4:30p	16	226	39	20	100	128	6	165	13	19	109	117	958
4:30-4:45p	20	289	45	24	81	168	3	144	8	16	115	121	1034
4:45-5:00p	19	336	47	18	57	170	7	167	18	12	138	118	1107
5:00-5:15p	14	292	32	21	82	149	4	131	21	25	120	91	982
5:15-5:30p	25	224	33	24	75	155	11	132	15	18	115	91	918
2:00-5:30p	133	2089	335	197	713	1197	52	1225	114	152	1109	928	8244
3:30-4:30p	55	948	178	110	418	555	27	651	52	81	621	507	4203
PHF	0.88			0.98			0.91			0.88			
4:15-5:15	69	1143	163	83	320	615	20	607	60	72	482	447	4081
4:30-5:30	78	1141	157	87	295	642	25	574	62	71	488	421	4041

Appendix B

Signalized Intersection Level of Service (LOS) Calculations

Timings
6: Kaahumanu Av. & Puunene Av

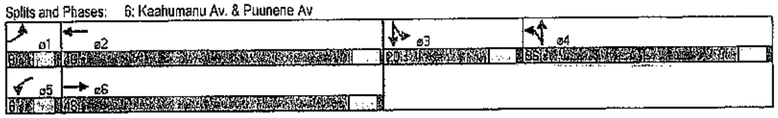
11/26/2009

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	20	1120	35	1505	455	20	10	15
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	8.0	46.0	8.0	46.0	36.0	36.0	20.0	20.0
Total Split (%)	7.3%	41.8%	7.3%	41.8%	32.7%	32.7%	18.2%	18.2%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	3.0	41.6	3.0	45.3	30.0	30.0	14.0	14.0
Actuated g/C Ratio	0.03	0.38	0.03	0.41	0.27	0.27	0.13	0.13
v/c Ratio	0.45	0.91	0.79	0.79	0.59	0.59	0.10	0.08
Control Delay	81.5	39.1	147.5	15.2	28.3	27.5	43.7	19.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	81.5	39.1	147.5	15.2	28.3	27.5	43.7	19.5
LOS	F	D	F	B	C	C	D	B
Approach Delay		39.6		18.2		27.9	33.5	
Approach LOS		D		B		C	C	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 56 (51%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 29.0 — Intersection LOS: C
Intersection Capacity Utilization 62.9% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av



Timings
7: Kaahumanu Av. & Wharf Street

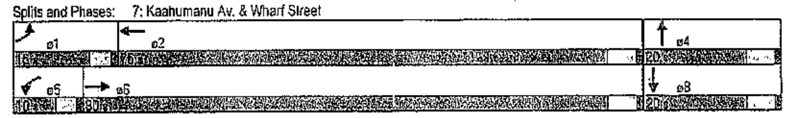
11/26/2009

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	25	1015	60	15	505	45	10	15	5	20
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	15.0	80.0	80.0	10.0	75.0	20.0	20.0	20.0	20.0	20.0
Total Split (%)	13.6%	72.7%	72.7%	9.1%	68.2%	18.2%	18.2%	18.2%	18.2%	18.2%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	6.2	80.0	80.0	4.8	76.7	14.0	14.0		14.0	14.0
Actuated g/C Ratio	0.06	0.73	0.73	0.04	0.70	0.13	0.13		0.13	0.13
v/c Ratio	0.27	0.43	0.06	0.21	0.47	0.27	0.14		0.11	0.10
Control Delay	51.4	0.6	0.0	79.2	1.1	48.2	24.4		44.3	18.2
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	51.4	0.6	0.0	79.2	1.2	48.2	24.4		44.3	18.2
LOS	D	A	A	E	A	D	C		D	B
Approach Delay		1.7			1.9		38.6		31.3	
Approach LOS		A			A		D		C	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 72 (65%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.47
Intersection Signal Delay: 3.3 — Intersection LOS: A
Intersection Capacity Utilization 51.3% — ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



Timings
8: Kaahumanu Av. & Hobron Av.
11/26/2009

Lane Group	EBR	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL	NER
Lane Configurations									
Volume (vph)	775	140	135	10	315	1480	215	130	245
Turn Type	custom		Prot	Perm	Prot		Perm		Prot
Protected Phases		3	3		5	2		4	4
Permitted Phases	6			3			2		
Detector Phase	6	3	3	3	5	2	2	4	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0
Total Split (s)	42.0	23.0	23.0	23.0	20.0	62.0	62.0	25.0	25.0
Total Split (%)	38.2%	20.9%	20.9%	20.9%	18.2%	56.4%	56.4%	22.7%	22.7%
Yellow Time (s)	4.0	6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.5	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0
Lead/Lag	Lag	Lead	Lead	Lead	Lead			Lag	Lag
Lead-Lag Optimize?									
Recall Mode	C-Max	None	None	None	Max	C-Max	C-Max	Max	Max
Act Effct Green (s)	36.5	13.3	13.3	14.3	16.0	56.5	56.5	20.7	20.7
Actuated g/C Ratio	0.33	0.12	0.12	0.13	0.15	0.51	0.51	0.19	0.19
v/c Ratio	0.74	0.71	0.76	0.05	0.68	0.63	0.25	0.59	0.62
Control Delay	18.9	64.3	71.6	20.4	52.6	20.6	2.6	39.8	7.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	64.3	71.6	20.4	52.6	20.6	2.6	39.8	7.4
LOS	B	E	E	C	D	C	A	D	A
Approach Delay		66.1				23.7		21.2	
Approach LOS		E				C		C	

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 16 (15%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 25.7 — Intersection LOS: C
Intersection Capacity Utilization 62.1% — ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.

ø2 ø3 ø4
ø5 ø6

23 s 25 s 20 s 42 s

Timings
58: Hana Highway & Dairy Road
11/26/2009

Lane Group	SEL	SET	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Volume (vph)	30	595	785	2140	75	155	340	335	35	280	60
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	9.0	27.0	28.0	46.0	46.0	15.0	25.0	25.0	10.0	20.0	20.0
Total Split (%)	10.0%	30.0%	31.1%	51.1%	51.1%	16.7%	27.8%	27.8%	11.1%	22.2%	22.2%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	3.0	20.2	22.0	43.0	43.0	9.0	20.5	20.5	3.9	11.4	12.4
Actuated g/C Ratio	0.03	0.23	0.25	0.50	0.50	0.10	0.24	0.24	0.05	0.13	0.14
v/c Ratio	0.53	0.69	0.97	0.92	0.10	0.91	0.44	0.56	0.47	0.65	0.23
Control Delay	75.2	31.1	59.1	29.5	4.3	89.4	31.4	7.4	62.3	43.1	11.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.2	31.1	59.1	29.5	4.3	89.4	31.4	7.4	62.3	43.1	11.2
LOS	E	C	E	C	A	F	C	A	E	D	B
Approach Delay		32.8		36.6			32.5			39.9	
Approach LOS		C		D			C			D	

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 86.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 35.6 — Intersection LOS: D
Intersection Capacity Utilization 81.0% — ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

ø1 ø2 ø3 ø4
ø5 ø6 ø7 ø8

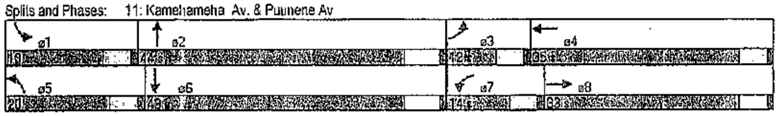
28 s 27 s 10 s 25 s
9 s 46 s 15 s 20 s

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations	↰	↑↱	↰	↑	↱	↰	↑↑↱	↰	↑↑↱
Volume (vph)	55	425	85	360	135	155	465	100	475
Turn Type	Prot		Prot		Perm	Prot		Prot	
Protected Phases	3	8	7	4		5	2	1	6
Permitted Phases					4				
Detector Phase	3	8	7	4	4	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	8.0	4.0	8.0	8.0	4.0	10.0	4.0	10.0
Minimum Split (s)	9.0	30.0	9.0	30.0	30.0	9.0	41.0	9.0	41.0
Total Split (s)	12.0	33.0	14.0	35.0	35.0	20.0	44.0	19.0	43.0
Total Split (%)	10.9%	30.0%	12.7%	31.8%	31.8%	18.2%	40.0%	17.3%	39.1%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	6.0	7.0	6.0	7.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	5.6	24.1	7.4	27.9	28.9	12.5	43.8	9.7	41.0
Actuated g/C Ratio	0.05	0.22	0.07	0.25	0.26	0.11	0.40	0.09	0.37
v/c Ratio	0.67	0.86	0.77	0.83	0.28	0.83	0.44	0.69	0.48
Control Delay	85.3	48.7	91.2	42.0	3.9	80.2	25.7	84.0	9.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	85.3	48.7	91.2	42.0	3.9	80.2	25.7	84.0	9.0
LOS	F	D	F	D	A	F	C	F	A
Approach Delay		51.7		40.3			37.5		20.1
Approach LOS		D		D			D		C

Intersection Summary

Cycle Length: 110
Actuated Cycle Length: 110
Offset: 84 (76%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 37.3 — Intersection LOS: D
Intersection Capacity Utilization 68.8% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 11: Kamehameha Av. & Puunene Av



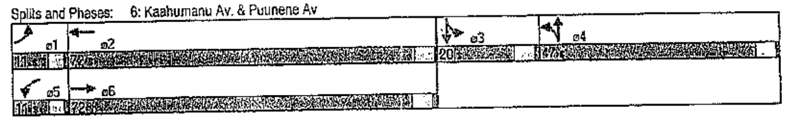
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰	↰↑↱			↰↑	↱
Volume (vph)	20	1120	480	35	1505	25	455	20	25	10	10	15
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.955			0.998			0.985				0.850
Flt Protected	0.950			0.950			0.950	0.961			0.976	
Satd. Flow (prot)	1719	4718	0	1719	4930	0	1633	1627	0	0	1766	1538
Flt Permitted	0.950			0.950			0.950	0.961			0.976	
Satd. Flow (perm)	1719	4718	0	1719	4930	0	1633	1627	0	0	1766	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		92			2			4				16
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		491			576			1003			377	
Travel Time (s)		13.4			15.7			27.4			10.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	1179	505	37	1584	26	479	21	26	11	11	16
Shared Lane Traffic (%)							45%					
Lane Group Flow (vph)	21	1684	0	37	1610	0	263	263	0	0	22	16
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases												3
Detector Phase	1	6		5	2		4	4		3	3	3
Switch Phase												
Minimum Initial (s)	4.0	15.0		4.0	15.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	23.0		8.0	22.5		36.0	36.0		20.0	20.0	20.0
Total Split (s)	11.0	72.0	0.0	11.0	72.0	0.0	47.0	47.0	0.0	20.0	20.0	20.0
Total Split (%)	7.3%	48.0%	0.0%	7.3%	48.0%	0.0%	31.3%	31.3%	0.0%	13.3%	13.3%	13.3%
Maximum Green (s)	7.0	67.0		7.0	67.5		42.0	42.0		15.0	15.0	15.0
Yellow Time (s)	3.0	4.0		3.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	0.5		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	4.0	5.0	5.5	4.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	5.0		2.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max		None	C-Max		Max	Max		Max	Max	Max
Walk Time (s)		7.0			7.0		7.0	7.0				
Flash Dont Walk (s)		10.0			10.0		24.0	24.0				
Pedestrian Calls (#/hr)		0			0		0	0				
Act Effct Green (s)	5.0	68.3		5.4	71.0		41.0	41.0			14.0	14.0
Actuated g/C Ratio	0.03	0.46		0.04	0.47		0.27	0.27			0.09	0.09

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.37	0.77		0.60	0.69		0.59	0.59			0.13	0.10
Control Delay	88.0	35.5		137.9	14.8		41.3	40.4			64.6	25.9
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0			0.0	0.0
Total Delay	88.0	35.5		137.9	14.9		41.3	40.4			64.6	25.9
LOS	F	D		F	B		D	D			E	C
Approach Delay		36.1			17.6			40.8			48.3	
Approach LOS		D			B			D			D	
Queue Length 50th (ft)	21	489		35	611		241	236			20	0
Queue Length 95th (ft)	51	553		#86	568		354	350			50	25
Internal Link Dist (ft)		411			496			923			297	
Turn Bay Length (ft)												
Base Capacity (vph)	69	2199		69	2336		446	448			165	158
Starvation Cap Reductn	0	0		0	97		0	0			0	0
Spillback Cap Reductn	0	0		0	0		0	0			0	0
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	0.30	0.77		0.54	0.72		0.59	0.59			0.13	0.10

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 148 (99%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 29.1 Intersection LOS: C
Intersection Capacity Utilization 62.9% ICU Level of Service B
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Kaahumanu Av. & Puunene Av



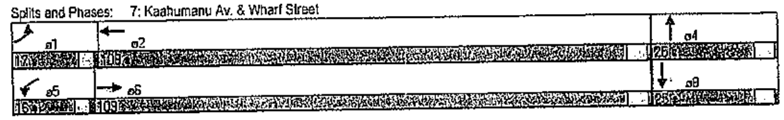
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱		↰	↱			↰	↱
Volume (vph)	25	1015	60	15	1505	25	45	10	20	15	5	20
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.998			0.902				0.850
Flt Protected	0.950			0.950			0.950				0.963	
Satd. Flow (prot)	1719	3438	1538	1719	4930	0	1719	1632	0	0	1743	1538
Flt Permitted	0.950			0.950			0.744				0.811	
Satd. Flow (perm)	1719	3438	1538	1719	4930	0	1346	1632	0	0	1468	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			63		3			21				21
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		576			745			284			611	
Travel Time (s)		15.7			20.3			7.7			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	1068	63	16	1584	26	47	11	21	16	5	21
Shared Lane Traffic (%)												
Lane Group Flow (vph)	26	1068	63	16	1610	0	47	32	0	0	21	21
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Perm	Prot			Perm			Perm		Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases			6				4			8		8
Detector Phase	1	6	6	5	2		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0		10.0	10.0		10.0	10.0	10.0
Total Split (s)	17.0	109.0	109.0	16.0	108.0	0.0	25.0	25.0	0.0	25.0	25.0	25.0
Total Split (%)	11.3%	72.7%	72.7%	10.7%	72.0%	0.0%	16.7%	16.7%	0.0%	16.7%	16.7%	16.7%
Maximum Green (s)	13.0	104.0	104.0	12.0	103.0		20.0	20.0		20.0	20.0	20.0
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes							
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max		Max	Max	Max
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		10.0	10.0		10.0		23.0	23.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	0
Act Effct Green (s)	6.8	114.1	114.1	6.0	111.2		19.0	19.0			19.0	19.0
Actuated g/C Ratio	0.05	0.76	0.76	0.04	0.74		0.13	0.13			0.13	0.13

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.33	0.41	0.05	0.23	0.44		0.28	0.14			0.11	0.10
Control Delay	77.3	0.7	0.1	79.5	16.5		64.1	31.3			59.9	22.0
Queue Delay	0.0	0.1	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	77.3	0.7	0.1	79.5	16.6		64.1	31.3			59.9	22.0
LOS	E	A	A	E	B		E	C			E	C
Approach Delay		2.4			17.2			50.8			40.9	
Approach LOS		A			B			D			D	
Queue Length 50th (ft)	26	6	0	14	480		42	10			19	0
Queue Length 95th (ft)	m36	15	m0	m17	605		86	44			47	28
Internal Link Dist (ft)		496			665			204			531	
Turn Bay Length (ft)												
Base Capacity (vph)	138	2614	1184	126	3656		170	225			186	213
Starvation Cap Reductn	0	416	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	250		0	0			0	1
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.19	0.49	0.05	0.13	0.47		0.28	0.14			0.11	0.10

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 14 (9%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.44
Intersection Signal Delay: 12.6 Intersection LOS: B
Intersection Capacity Utilization 51.3% ICU Level of Service A
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



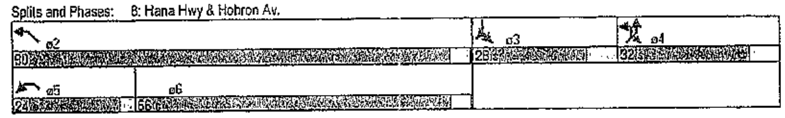
Lane Group	EBL	EBR	EBR2	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL2	NEL	NER
Lane Configurations												
Volume (vph)	0	775	45	140	135	10	315	1480	215	50	130	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	1.00	0.97	0.97	1.00	1.00	1.00	0.88
Frt		0.850			0.850	0.850			0.850			0.850
Flt Protected				0.950			0.950	0.950			0.950	
Satd. Flow (prot)	0	2707	0	1719	1538	1538	3335	3335	1538	0	1719	2707
Flt Permitted				0.950			0.950	0.950			0.950	
Satd. Flow (perm)	0	2707	0	1719	1538	1538	3335	3335	1538	0	1719	2707
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				11			170			258
Link Speed (mph)	25			25				25			25	
Link Distance (ft)	782			406				406			1802	
Travel Time (s)	21.3			11.1				11.1			49.1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	816	47	147	142	11	332	1558	226	53	137	258
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	863	0	147	142	11	332	1558	226	0	190	258
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Right	Left	Right	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12				48			12	
Link Offset(ft)	0			0				0			0	
Crosswalk Width(ft)	16			16				16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	9	15	9	9	15	15	9	15	15	9
Turn Type		custom			Prot	Perm	Prot		Perm	Split		Prot
Protected Phases				3	3		5	2		4	4	4
Permitted Phases		6				3			2			
Detector Phase		6		3	3	3	5	2	2	4	4	4
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)		26.5		23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0	21.0
Total Split (s)	0.0	66.0	0.0	28.0	28.0	28.0	24.0	90.0	90.0	32.0	32.0	32.0
Total Split (%)	0.0%	44.0%	0.0%	18.7%	18.7%	18.7%	16.0%	60.0%	60.0%	21.3%	21.3%	21.3%
Maximum Green (s)		61.5		22.0	22.0	22.0	21.0	85.5	85.5	26.0	26.0	26.0
Yellow Time (s)		4.0		6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0	6.0
All-Red Time (s)		0.5		0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	4.0	5.5	4.0	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0	7.0
Lead/Lag		Lag		Lead	Lead	Lead	Lead			Lag	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)		5.0		3.0	3.0	3.0	3.0	5.0	5.0	3.0	3.0	3.0
Recall Mode		C-Max		None	None	None	Max	C-Max	C-Max	Max	Max	Max
Walk Time (s)		7.0		7.0	7.0	7.0		7.0	7.0			
Flash Dont Walk (s)		15.0		10.0	10.0	10.0		16.0	16.0			
Pedestrian Calls (#/hr)		10		10	10	10		10	10			
Act Effct Green (s)		60.5		17.2	17.2	18.2	20.0	84.5	84.5		28.8	28.8
Actuated g/C Ratio		0.40		0.11	0.11	0.12	0.13	0.56	0.56		0.19	0.19

Lane Group	EBL	EBR	EBR2	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL2	NEL	NER
v/c Ratio		0.79		0.75	0.80	0.06	0.76	0.83	0.24		0.58	0.35
Control Delay		22.9		86.0	95.2	26.0	81.4	22.3	6.3		52.3	8.0
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay		22.9		86.0	95.2	26.0	81.4	22.3	6.3		52.3	8.0
LOS		C		F	F	C	F	C	A		D	A
Approach Delay				88.2				29.8			26.8	
Approach LOS				F				C			C	
Queue Length 50th (ft)		456		141	137	0	157	193	3		81	5
Queue Length 95th (ft)		556		217	212	20	m225	543	m94		216	35
Internal Link Dist (ft)	702			326				326			1722	
Turn Bay Length (ft)												
Base Capacity (vph)		1094		241	215	235	445	1879	941		330	728
Starvation Cap Reductn		0		0	0	0	0	0	0		0	0
Spillback Cap Reductn		0		0	0	0	0	0	0		0	0
Storage Cap Reductn		0		0	0	0	0	0	0		0	0
Reduced v/c Ratio		0.79		0.61	0.66	0.05	0.75	0.83	0.24		0.58	0.35

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 66 (44%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.83
Intersection Signal Delay: 32.6 Intersection LOS: C
Intersection Capacity Utilization 76.2% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hana Hwy & Hobron Av.



Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations	↰	↑↑↑↱		↰↰	↑↑	↱	↰	↑↑	↱	↰	↑↑	↱
Volume (vph)	30	595	175	785	2140	75	155	340	335	35	280	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.91	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.966				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	4772	0	3335	3438	1538	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1719	4772	0	3335	3438	1538	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		53				48			353			59
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1200			298			441			410	
Travel Time (s)		32.7			8.1			12.0			11.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	32	626	184	826	2253	79	163	358	353	37	295	63
Shared Lane Traffic (%)												
Lane Group Flow (vph)	32	810	0	826	2253	79	163	358	353	37	295	63
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6			4			8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	20.0		4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0		9.0	27.0	27.0	9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	9.0	56.0	0.0	54.0	101.0	101.0	20.0	28.0	28.0	12.0	20.0	20.0
Total Split (%)	6.0%	37.3%	0.0%	36.0%	67.3%	67.3%	13.3%	18.7%	18.7%	8.0%	13.3%	13.3%
Maximum Green (s)	4.0	51.0		49.0	96.0	96.0	15.0	23.0	23.0	7.0	15.0	15.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		15.0			15.0	15.0		15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)		0			0	0		0	0		0	0
Act Effct Green (s)	3.0	56.8		41.2	95.0	95.0	14.0	24.5	24.5	5.4	14.0	15.0
Actuated g/C Ratio	0.02	0.38		0.27	0.63	0.63	0.09	0.16	0.16	0.04	0.09	0.10

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
v/c Ratio	0.94	0.44		0.90	1.03	0.08	1.02	0.64	0.65	0.60	0.92	0.30
Control Delay	208.4	20.7		65.9	56.5	5.0	141.2	65.3	11.4	106.8	100.0	20.1
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	208.4	20.7		65.9	56.5	5.0	141.2	65.3	11.4	106.8	100.0	20.1
LOS	F	C		E	E	A	F	E	B	F	F	C
Approach Delay		27.9			57.7			57.7			87.9	
Approach LOS		C			E			E			F	
Queue Length 50th (ft)	29	232		402	~1243	11	~166	177	0	36	153	4
Queue Length 95th (ft)	m#88	217		457	#1370	32	#322	236	101	#86	#245	51
Internal Link Dist (ft)		1120			218			361			330	
Turn Bay Length (ft)												
Base Capacity (vph)	34	1841		1067	2177	992	160	562	547	69	321	207
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.94	0.44		0.77	1.03	0.08	1.02	0.64	0.65	0.54	0.92	0.30

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 148 (99%), Referenced to phase 2:SET and 6:NWT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 55.2 Intersection LOS: E
Intersection Capacity Utilization 98.8% ICU Level of Service F
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 58: Hana Highway & Dairy Road

ø1 51s
ø2 56s
ø3 12s
ø4 20s
ø5 9s
ø6 101s
ø7 20s
ø8 20s

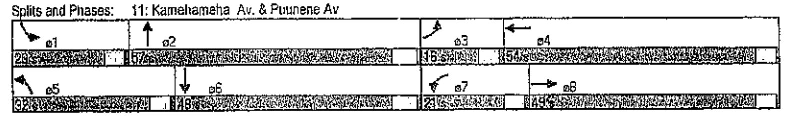
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	55	425	205	85	360	135	155	465	100	100	475	100
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.951				0.850		0.973			0.974	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	3270	0	1719	1810	1538	1719	3345	0	1719	3349	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1719	3270	0	1719	1810	1538	1719	3345	0	1719	3349	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		55				142		18			16	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1026			1802			721			1003	
Travel Time (s)		28.0			49.1			19.7			27.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	58	447	216	89	379	142	163	489	105	105	500	105
Shared Lane Traffic (%)												
Lane Group Flow (vph)	58	663	0	89	379	142	163	594	0	105	605	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases						4						
Detector Phase	3	8		7	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	8.0		4.0	8.0	8.0	4.0	10.0		4.0	10.0	
Minimum Split (s)	9.0	30.0		9.0	30.0	30.0	9.0	41.0		9.0	41.0	
Total Split (s)	16.0	49.0	0.0	21.0	54.0	54.0	32.0	57.0	0.0	23.0	48.0	0.0
Total Split (%)	10.7%	32.7%	0.0%	14.0%	36.0%	36.0%	21.3%	38.0%	0.0%	15.3%	32.0%	0.0%
Maximum Green (s)	11.0	44.0		16.0	49.0	49.0	27.0	51.0		18.0	42.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	5.0	6.0	7.0	4.0	6.0	7.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	4.5		2.0	4.5	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Walk Time (s)		4.0						7.0			7.0	
Flash Dont Walk (s)		20.0						28.0			28.0	
Pedestrian Calls (#/hr)		0						0			0	
Act Effct Green (s)	7.9	33.7		10.9	38.8	39.8	17.5	67.9		12.5	62.9	
Actuated g/C Ratio	0.05	0.22		0.07	0.26	0.27	0.12	0.45		0.08	0.42	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.64	0.86		0.71	0.81	0.28	0.81	0.39		0.73	0.43	
Control Delay	99.3	61.9		68.2	54.1	10.1	92.5	29.7		113.3	13.1	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	99.3	61.9		68.2	54.1	10.1	92.5	29.7		113.3	13.1	
LOS	F	E		E	D	B	F	C		F	B	
Approach Delay		65.0			45.9			43.2			27.9	
Approach LOS		E			D			D			C	
Queue Length 50th (ft)	57	306		49	382	64	158	194		102	86	
Queue Length 95th (ft)	106	357		m79	m485	m101	230	300		m135	272	
Internal Link Dist (ft)		946			1722			641			923	
Turn Bay Length (ft)												
Base Capacity (vph)	115	977		172	579	598	298	1524		197	1413	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.50	0.68		0.52	0.65	0.24	0.55	0.39		0.53	0.43	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 25 (17%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.85
Intersection Signal Delay: 45.5 Intersection LOS: D
Intersection Capacity Utilization 68.8% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Kamehameha Av. & Puunene Av



Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
Lane Configurations							
Volume (vph)	95	795	80	470	1965	3	60
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00
Frt		0.986				0.871	
Flt Protected	0.950			0.950		0.998	
Satd. Flow (prot)	1719	3390	0	1719	3438	1573	0
Flt Permitted	0.950			0.950		0.998	
Satd. Flow (perm)	1719	3390	0	1719	3438	1573	0
Right Turn on Red			Yes				Yes
Satd. Flow (RTOR)		8				63	
Link Speed (mph)		25			25	25	
Link Distance (ft)		708			503	1187	
Travel Time (s)		19.3			13.7	32.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	100	837	84	495	2068	3	63
Shared Lane Traffic (%)							
Lane Group Flow (vph)	100	921	0	495	2068	66	0
Enter Blocked Intersection	No	No	No	No	No	No	No
Lane Alignment	R NA	Left	Right	Left	Left	Left	Right
Median Width(ft)		12			12	12	
Link Offset(ft)		0			0	0	
Crosswalk Width(ft)		16			16	16	
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		9	15		15	9
Turn Type	Prot			Prot			
Protected Phases	5			1		4	
Permitted Phases		2			6		
Detector Phase	5	2		1	6	4	
Switch Phase							
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	
Minimum Split (s)	8.0	25.0		8.0	20.0	25.0	
Total Split (s)	18.0	62.0	0.0	63.0	107.0	25.0	0.0
Total Split (%)	12.0%	41.3%	0.0%	42.0%	71.3%	16.7%	0.0%
Maximum Green (s)	14.0	55.0		59.0	104.0	18.0	
Yellow Time (s)	3.0	5.0		3.0	3.0	5.0	
All-Red Time (s)	1.0	2.0		1.0	0.0	2.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0	4.0	4.0	3.0	7.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	
Recall Mode	None	C-Min		None	C-Min	Min	
Walk Time (s)		7.0				7.0	
Flash Dont Walk (s)		11.0				11.0	
Pedestrian Calls (#/hr)		0				0	
Act Effct Green (s)	14.1	75.8		49.2	114.9	7.0	
Actuated g/C Ratio	0.09	0.51		0.33	0.77	0.05	

Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
v/c Ratio	0.62	0.54		0.88	0.79	0.49	
Control Delay	68.6	18.7		53.4	16.0	29.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	
Total Delay	68.6	18.7		53.4	16.0	29.0	
LOS	E	B		D	B	C	
Approach Delay		23.6			23.3	29.0	
Approach LOS		C			C	C	
Queue Length 50th (ft)	99	213		412	470	3	
Queue Length 95th (ft)	m141	241		m323	m1082	53	
Internal Link Dist (ft)		628			423	1107	
Turn Bay Length (ft)							
Base Capacity (vph)	178	1717		678	2634	244	
Starvation Cap Reductn	0	0		0	0	0	
Spillback Cap Reductn	0	0		0	0	0	
Storage Cap Reductn	0	0		0	0	0	
Reduced v/c Ratio	0.56	0.54		0.73	0.79	0.27	

Intersection Summary
Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 38 (25%), Referenced to phase 2:SET and 6:NWT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.88
Intersection Signal Delay: 23.5 Intersection LOS: C
Intersection Capacity Utilization 76.0% ICU Level of Service D
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: Hana Hwy. & Wakea Avenue

ø1	ø2	ø4
63 s	82 s	25 s

ø5	ø6
18 s	107 s

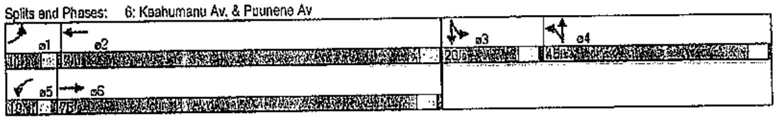
Timings
6: Kaahumanu Av. & Puunene Av
11/26/2009

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	75.0	10.0	74.0	45.0	45.0	20.0	20.0
Total Split (%)	7.3%	50.0%	6.7%	49.3%	30.0%	30.0%	13.3%	13.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	69.0	5.0	73.0	39.0	39.0	14.0	14.0
Actuated g/C Ratio	0.03	0.46	0.03	0.49	0.26	0.26	0.09	0.09
v/c Ratio	0.44	1.03	0.93	0.56	1.00	0.98	0.32	0.16
Control Delay	92.9	66.9	187.5	6.8	78.7	75.4	69.2	21.9
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	92.9	66.9	187.5	6.9	78.7	75.4	69.2	21.9
LOS	F	E	F	A	E	E	E	C
Approach Delay		67.1		13.7		77.1	51.4	
Approach LOS		E		B		E	D	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 132 (88%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 52.5 — Intersection LOS: D
Intersection Capacity Utilization 82.6% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av



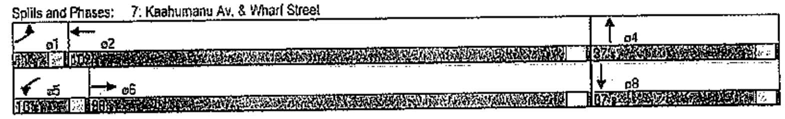
Timings
7: Kaahumanu Av. & Wharf Street
11/26/2009

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	20	1480	115	50	1255	115	5	15	1	25
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	98.0	98.0	15.0	102.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	7.3%	65.3%	65.3%	10.0%	68.0%	24.7%	24.7%	24.7%	24.7%	24.7%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.5	95.7	95.7	8.3	100.4	31.0	31.0		31.0	31.0
Actuated g/C Ratio	0.04	0.64	0.64	0.06	0.67	0.21	0.21		0.21	0.21
v/c Ratio	0.33	0.71	0.12	0.56	0.40	0.43	0.19		0.06	0.08
Control Delay	85.5	2.0	0.0	73.1	19.8	57.5	13.3		48.6	18.3
Queue Delay	0.0	0.5	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	85.5	2.4	0.0	73.1	19.8	57.5	13.3		48.6	16.3
LOS	F	A	A	E	B	E	B		D	B
Approach Delay		3.3			21.8		40.9		29.1	
Approach LOS		A			C		D		C	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 4 (3%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 13.5 — Intersection LOS: B
Intersection Capacity Utilization 64.6% — ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



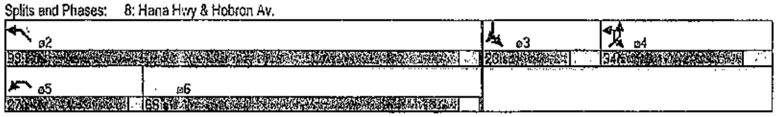
8: Hana Hwy & Hobron Av.

Lane Group	EBR	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL	NER
Lane Configurations									
Volume (vph)	1545	210	180	10	590	1095	240	130	605
Turn Type	custom		Prot	Perm	Prot		Perm		Prot
Protected Phases		3	3		5	2		4	4
Permitted Phases	6			3			2		
Detector Phase	6	3	3	3	5	2	2	4	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0
Total Split (s)	66.0	23.0	23.0	23.0	27.0	93.0	93.0	34.0	34.0
Total Split (%)	44.0%	15.3%	15.3%	15.3%	18.0%	62.0%	62.0%	22.7%	22.7%
Yellow Time (s)	4.0	6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.5	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0
Lead/Lag	Lag	Lead	Lead	Lead	Lead			Lag	Lag
Lead-Lag Optimize?									
Recall Mode	C-Max	None	None	None	Max	C-Max	C-Max	Max	Max
Act Effct Green (s)	60.5	16.0	16.0	17.0	23.0	87.5	87.5	27.0	27.0
Actuated g/C Ratio	0.40	0.11	0.11	0.11	0.15	0.58	0.58	0.18	0.18
v/c Ratio	1.20	1.21	1.15	0.06	1.22	0.41	0.25	0.73	1.28
Control Delay	132.3	187.4	173.7	28.1	165.3	17.6	2.2	52.8	155.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	132.3	187.4	173.7	28.1	165.3	17.6	2.2	52.8	155.2
LOS	F	F	F	C	F	B	A	D	F
Approach Delay		177.1				61.0		128.4	
Approach LOS		F				E		F	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 72 (48%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.28
Intersection Signal Delay: 106.5 — Intersection LOS: F
Intersection Capacity Utilization 85.7% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.



58: Hana Highway & Dairy Road

Lane Group	SEL	SET	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	455	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	22.0	61.0	32.0	71.0	71.0	17.0	46.0	46.0	11.0	40.0	40.0
Total Split (%)	14.7%	40.7%	21.3%	47.3%	47.3%	11.3%	30.7%	30.7%	7.3%	26.7%	26.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	Min	None	Min	Min	None	None	None	None	None	None
Act Effct Green (s)	11.5	55.0	26.0	69.5	69.5	11.0	40.0	40.0	5.0	34.0	35.0
Actuated g/C Ratio	0.08	0.37	0.17	0.46	0.46	0.07	0.27	0.27	0.03	0.23	0.23
v/c Ratio	0.73	1.11	1.11	0.47	0.13	1.17	0.52	1.10	1.19	1.11	0.07
Control Delay	96.2	100.7	126.9	28.8	4.7	189.3	49.3	96.9	238.0	120.3	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	96.2	100.7	126.9	28.8	4.7	189.3	49.3	96.9	238.0	120.3	21.2
LOS	F	F	F	C	A	F	D	F	F	F	C
Approach Delay		100.5		62.2			89.9			126.0	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Natural Cycle: 150
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.19
Intersection Signal Delay: 90.9 — Intersection LOS: F
Intersection Capacity Utilization 105.0% — ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

Timings
11: Kamehameha Av. & Puunene Av

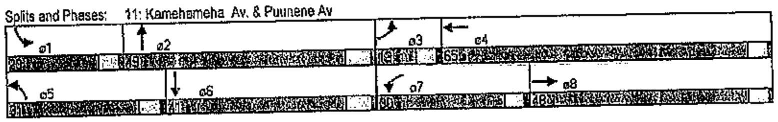
11/26/2009

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Configurations									
Volume (vph)	50	560	210	570	335	220	575	145	435
Turn Type	Prot		Prot		Perm	Prot		Prot	
Protected Phases	3	8	7	4		5	2	1	6
Permitted Phases					4				
Detector Phase	3	8	7	4	4	5	2	1	6
Switch Phase									
Minimum Initial (s)	4.0	8.0	4.0	8.0	8.0	4.0	10.0	4.0	10.0
Minimum Split (s)	9.0	30.0	9.0	30.0	30.0	9.0	41.0	9.0	41.0
Total Split (s)	13.0	48.0	30.0	65.0	65.0	31.0	49.0	23.0	41.0
Total Split (%)	8.7%	32.0%	20.0%	43.3%	43.3%	20.7%	32.7%	15.3%	27.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	5.0	4.0	5.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	5.0	6.0	7.0	6.0	7.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lead	Lag
Lead-Lag Optimize?									
Recall Mode	None	None	None	None	None	None	C-Max	None	C-Max
Act Effct Green (s)	6.5	41.0	21.4	58.0	59.0	22.3	47.4	15.3	40.4
Actuated g/C Ratio	0.04	0.27	0.14	0.39	0.39	0.15	0.32	0.10	0.27
v/c Ratio	0.72	0.94	0.90	0.86	0.46	0.91	0.67	0.87	0.55
Control Delay	115.4	68.4	100.7	34.4	4.1	98.9	48.6	98.9	23.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	115.4	68.4	100.7	34.4	4.1	98.9	48.6	98.9	23.9
LOS	F	E	F	C	A	F	D	F	C
Approach Delay		71.1		37.7			61.0		41.4
Approach LOS		E		D			E		D

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 8 (5%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 52.7 — Intersection LOS: D
Intersection Capacity Utilization 83.8% — ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 11: Kamehameha Av. & Puunene Av



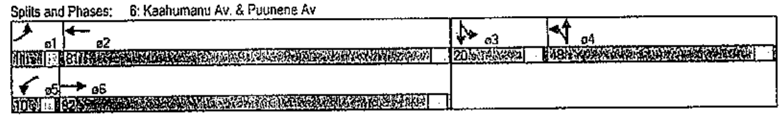
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑↱		↰	↑↑↱		↰	✥			↰↑	↱
Volume (vph)	25	1700	490	50	1270	15	745	30	25	20	30	30
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.91	1.00	0.91	0.91	0.95	0.95	1.00	1.00	1.00	1.00
Frt		0.966			0.998			0.991				0.850
Flt Protected	0.950			0.950			0.950	0.959			0.981	
Satd. Flow (prot)	1719	4772	0	1719	4930	0	1633	1634	0	0	1775	1538
Flt Permitted	0.950			0.950			0.950	0.959			0.981	
Satd. Flow (perm)	1719	4772	0	1719	4930	0	1633	1634	0	0	1775	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		62			1			2				32
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		491			576			1003			377	
Travel Time (s)		13.4			15.7			27.4			10.3	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	26	1789	516	53	1337	16	784	32	26	21	32	32
Shared Lane Traffic (%)							46%					
Lane Group Flow (vph)	26	2305	0	53	1353	0	423	419	0	0	53	32
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot			Split			Split		Perm
Protected Phases	1	6		5	2		4	4		3	3	
Permitted Phases												3
Detector Phase	1	6		5	2		4	4		3	3	3
Switch Phase												
Minimum Initial (s)	4.0	15.0		4.0	15.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	23.0		8.0	22.5		36.0	36.0		20.0	20.0	20.0
Total Split (s)	11.0	82.0	0.0	10.0	81.0	0.0	48.0	48.0	0.0	20.0	20.0	20.0
Total Split (%)	6.9%	51.3%	0.0%	6.3%	50.6%	0.0%	30.0%	30.0%	0.0%	12.5%	12.5%	12.5%
Maximum Green (s)	7.0	77.0		6.0	76.5		43.0	43.0		15.0	15.0	15.0
Yellow Time (s)	3.0	4.0		3.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	0.5		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	4.0	5.0	5.5	4.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag		Lead	Lag		Lag	Lag		Lead	Lead	Lead
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	5.0		2.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	Max		None	C-Max		Max	Max		Max	Max	Max
Walk Time (s)		7.0			7.0		7.0	7.0				
Flash Dont Walk (s)		10.0			10.0		24.0	24.0				
Pedestrian Calls (#/hr)		0			0		0	0				
Act Effct Green (s)	5.2	76.0		5.0	79.9		42.0	42.0			14.0	14.0
Actuated g/C Ratio	0.03	0.48		0.03	0.50		0.26	0.26			0.09	0.09

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.47	1.00		0.98	0.55		0.99	0.97			0.34	0.20
Control Delay	102.0	59.7		210.6	7.5		80.9	77.7			75.3	22.7
Queue Delay	0.0	0.0		0.0	0.1		0.0	0.0			0.0	0.0
Total Delay	102.0	59.7		210.6	7.6		80.9	77.7			75.3	22.7
LOS	F	E		F	A		F	E			E	C
Approach Delay		60.2			15.2			79.3			55.5	
Approach LOS		E			B			E			E	
Queue Length 50th (ft)	27	~864		59	80		461	455			53	0
Queue Length 95th (ft)	63	#990		#161	90		#708	#694			102	36
Internal Link Dist (ft)		411			496			923			297	
Turn Bay Length (ft)												
Base Capacity (vph)	64	2299		54	2464		429	430			155	164
Starvation Cap Reductn	0	0		0	259		0	0			0	0
Spillback Cap Reductn	0	0		0	0		0	0			0	0
Storage Cap Reductn	0	0		0	0		0	0			0	0
Reduced v/c Ratio	0.41	1.00		0.98	0.61		0.99	0.97			0.34	0.20

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 134 (84%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 50.0 Intersection LOS: D
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 6: Kaahumanu Av. & Puunene Av



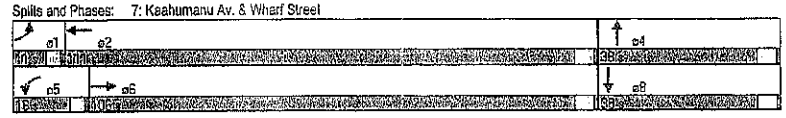
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↑↱		↰	↱			↰	↱
Volume (vph)	20	1480	115	50	1255	5	115	5	65	15	1	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	1.00	1.00	0.91	0.91	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850		0.999			0.860				0.850
Flt Protected	0.950			0.950			0.950				0.955	
Satd. Flow (prot)	1719	3438	1538	1719	4935	0	1719	1556	0	0	1728	1538
Flt Permitted	0.950			0.950			0.746				0.789	
Satd. Flow (perm)	1719	3438	1538	1719	4935	0	1350	1556	0	0	1428	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			97		1			68				26
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		576			745			284			611	
Travel Time (s)		15.7			20.3			7.7			16.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	21	1558	121	53	1321	5	121	5	68	16	1	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	21	1558	121	53	1326	0	121	73	0	0	17	26
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot		Perm	Prot			Perm			Perm		Perm
Protected Phases	1	6		5	2			4			8	
Permitted Phases			6				4			8		8
Detector Phase	1	6	6	5	2		4	4		8	8	8
Switch Phase												
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0		4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0		36.0	36.0		36.0	36.0	36.0
Total Split (s)	11.0	106.0	106.0	16.0	111.0	0.0	38.0	38.0	0.0	38.0	38.0	38.0
Total Split (%)	6.9%	66.3%	66.3%	10.0%	69.4%	0.0%	23.8%	23.8%	0.0%	23.8%	23.8%	23.8%
Maximum Green (s)	7.0	101.0	101.0	12.0	106.0		33.0	33.0		33.0	33.0	33.0
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0		4.0	4.0		4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0		1.0	1.0		1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	4.0	6.0	6.0	4.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag							
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	5.0	5.0	3.0	5.0		3.0	3.0		3.0	3.0	3.0
Recall Mode	None	C-Max	C-Max	None	C-Max		Max	Max		Max	Max	Max
Walk Time (s)		7.0	7.0		7.0		7.0	7.0		7.0	7.0	7.0
Flash Dont Walk (s)		10.0	10.0		10.0		23.0	23.0		24.0	24.0	24.0
Pedestrian Calls (#/hr)		0	0		0		0	0		0	0	0
Act Effct Green (s)	5.6	104.2	104.2	8.8	109.4		32.0	32.0			32.0	32.0
Actuated g/C Ratio	0.04	0.65	0.65	0.06	0.68		0.20	0.20			0.20	0.20

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.35	0.70	0.12	0.56	0.39		0.45	0.20			0.06	0.08
Control Delay	90.8	2.0	0.1	88.9	16.0		62.4	13.9			52.7	17.4
Queue Delay	0.0	0.3	0.0	0.0	0.0		0.0	0.0			0.0	0.0
Total Delay	90.8	2.3	0.1	88.9	16.0		62.4	13.9			52.7	17.4
LOS	F	A	A	F	B		E	B			D	B
Approach Delay		3.3			18.8			44.2			31.4	
Approach LOS		A			B			D			C	
Queue Length 50th (ft)	23	28	0	56	263		113	4			15	0
Queue Length 95th (ft)	m23	m29	m0	m104	m337		183	51			38	29
Internal Link Dist (ft)		496			665			204			531	
Turn Bay Length (ft)												
Base Capacity (vph)	64	2240	1036	118	3375		270	366			286	328
Starvation Cap Reductn	0	197	0	0	0		0	0			0	0
Spillback Cap Reductn	0	0	0	0	0		0	0			0	0
Storage Cap Reductn	0	0	0	0	0		0	0			0	0
Reduced v/c Ratio	0.33	0.76	0.12	0.45	0.39		0.45	0.20			0.06	0.08

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 154 (96%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



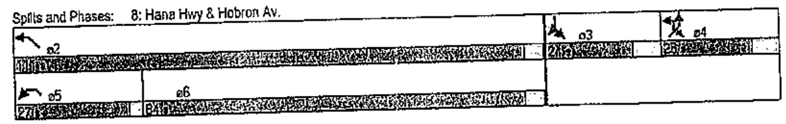
Lane Group	EBL	EBR	EBR2	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL2	NEL	NER
Lane Configurations												
Volume (vph)	0	1545	75	210	180	10	590	1095	240	85	130	605
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.88	1.00	1.00	1.00	1.00	0.97	0.97	1.00	1.00	1.00	0.88
Frt		0.850			0.850	0.850			0.850			0.850
Flt Protected				0.950			0.950	0.950			0.950	
Satd. Flow (prot)	0	2707	0	1719	1538	1538	3335	3335	1538	0	1719	2707
Flt Permitted				0.950			0.950	0.950			0.950	
Satd. Flow (perm)	0	2707	0	1719	1539	1538	3335	3335	1538	0	1719	2707
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		4				11			253			410
Link Speed (mph)	25			25				25			25	
Link Distance (ft)	782			406				406			1802	
Travel Time (s)	21.3			11.1				11.1			49.1	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	1626	79	221	189	11	621	1153	253	89	137	637
Shared Lane Traffic (%)												
Lane Group Flow (vph)	0	1705	0	221	189	11	621	1153	253	0	226	637
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Right	Right	Left	Right	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)	0			12				48			12	
Link Offset(ft)	0			0				0			0	
Crosswalk Width(ft)	16			16				16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9	9	15	9	9	15	15	9	15	15	9
Turn Type		custom			Prot	Perm	Prot		Perm	Split		Prot
Protected Phases				3	3		5	2		4	4	4
Permitted Phases		6				3			2			
Detector Phase		6		3	3	3	5	2	2	4	4	4
Switch Phase												
Minimum Initial (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)		26.5		23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0	21.0
Total Split (s)	0.0	84.0	0.0	24.0	24.0	24.0	27.0	111.0	111.0	25.0	25.0	25.0
Total Split (%)	0.0%	52.5%	0.0%	15.0%	15.0%	15.0%	16.9%	69.4%	69.4%	15.6%	15.6%	15.6%
Maximum Green (s)		79.5		18.0	18.0	18.0	24.0	106.5	106.5	19.0	19.0	19.0
Yellow Time (s)		4.0		6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0	6.0
All-Red Time (s)		0.5		0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0
Lost Time Adjust (s)	0.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	4.0	6.6	4.0	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0	7.0
Lead/Lag		Lag		Lead	Lead	Lead	Lead			Lag	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)		5.0		3.0	3.0	3.0	3.0	5.0	5.0	3.0	3.0	3.0
Recall Mode		C-Max		None	None	None	Max	C-Max	C-Max	Max	Max	Max
Walk Time (s)		7.0		7.0	7.0	7.0		7.0	7.0			
Flash Dont Walk (s)		15.0		10.0	10.0	10.0		16.0	16.0			
Pedestrian Calls (#/hr)		10		10	10	10		10	10			
Act Effct Green (s)		78.5		17.0	17.0	18.0	23.0	105.5	105.5		18.0	18.0
Actuated g/C Ratio		0.49		0.11	0.11	0.11	0.14	0.66	0.66		0.11	0.11

Lane Group	EBL	EBR	EBR2	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL2	NEL	NER
v/c Ratio		1.28		1.21	1.16	0.06	1.30	0.52	0.23		1.17	0.95
Control Delay		167.4		190.4	179.1	28.5	201.5	16.2	4.3		151.8	35.1
Queue Delay		0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay		167.4		190.4	179.1	28.5	201.5	16.2	4.3		151.8	35.1
LOS		F		F	F	C	F	B	A		F	D
Approach Delay				181.1				71.5			65.7	
Approach LOS				F				E			E	
Queue Length 50th (ft)		~1308		~281	~233	0	~434	239	14		~272	92
Queue Length 95th (ft)		#1461		#459	#399	21	#563	345	78		m#358	m#235
Internal Link Dist (ft)	702			326				326			1722	
Turn Bay Length (ft)												
Base Capacity (vph)		1330		183	163	183	479	2199	1100		193	668
Starvation Cap Reductn		0		0	0	0	0	0	0		0	0
Spillback Cap Reductn		0		0	0	0	0	0	0		0	0
Storage Cap Reductn		0		0	0	0	0	0	0		0	0
Reduced v/c Ratio		1.28		1.21	1.16	0.06	1.30	0.52	0.23		1.17	0.95

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 72 (45%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.30
Intersection Signal Delay: 112.3 Intersection LOS: F
Intersection Capacity Utilization 88.3% ICU Level of Service E
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 8: Hana Hwy & Hobron Av.



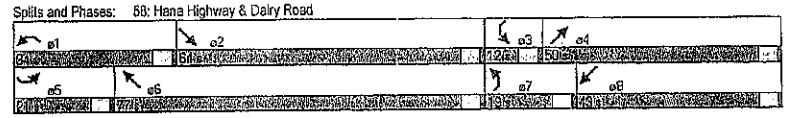
Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
Lane Configurations												
Volume (vph)	90	1675	210	610	1020	95	140	455	655	65	825	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.91	0.91	0.97	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.983				0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	4856	0	3335	3438	1538	1719	3438	1538	1719	3438	1538
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1719	4856	0	3335	3438	1538	1719	3438	1538	1719	3438	1538
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		15				79			299			18
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1200			298			441			410	
Travel Time (s)		32.7			8.1			12.0			11.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	95	1763	221	642	1074	100	147	479	689	68	868	26
Shared Lane Traffic (%)												
Lane Group Flow (vph)	95	1984	0	642	1074	100	147	479	689	68	868	26
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2		1	6		7	4		3	8	
Permitted Phases						6			4			8
Detector Phase	5	2		1	6	6	7	4	4	3	8	8
Switch Phase												
Minimum Initial (s)	4.0	20.0		4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0		9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	64.0	0.0	34.0	77.0	77.0	19.0	50.0	50.0	12.0	43.0	43.0
Total Split (%)	13.1%	40.0%	0.0%	21.3%	48.1%	48.1%	11.9%	31.3%	31.3%	7.5%	26.9%	26.9%
Maximum Green (s)	16.0	59.0		29.0	72.0	72.0	14.0	45.0	45.0	7.0	38.0	38.0
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	3.0	3.0	2.0	3.0	3.0
Recall Mode	None	C-Min		None	C-Min	C-Min	None	None	None	None	None	None
Walk Time (s)		7.0			7.0	7.0		7.0	7.0		7.0	7.0
Flash Dont Walk (s)		15.0			15.0	15.0		15.0	15.0		15.0	15.0
Pedestrian Calls (#/hr)		0			0	0		0	0		0	0
Act Effct Green (s)	11.7	58.0		28.0	74.3	74.3	13.0	44.0	44.0	6.0	37.0	38.0
Actuated g/C Ratio	0.07	0.36		0.18	0.46	0.46	0.08	0.28	0.28	0.04	0.23	0.24

Lane Group	SEL	SET	SER	NWL	NWT	NWR	NEL	NET	NER	SWL	SWT	SWR
v/c Ratio	0.76	1.12		1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07
Control Delay	88.9	101.5		126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	88.9	101.5		126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
LOS	F	F		F	D	A	F	D	F	F	F	C
Approach Delay		100.9			66.7			82.4			119.1	
Approach LOS		F			E			F			F	
Queue Length 50th (ft)	97	~878		~391	457	12	~167	223	~561	~78	~536	7
Queue Length 95th (ft)	m103	#972		#518	557	49	#321	283	#815	#188	#673	34
Internal Link Dist (ft)		1120			218			361			330	
Turn Bay Length (ft)												
Base Capacity (vph)	161	1770		584	1597	757	140	945	640	64	795	379
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	1.12		1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 8 (5%), Referenced to phase 2:SET and 6:NWT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 89.7 Intersection LOS: F
Intersection Capacity Utilization 105.0% ICU Level of Service G
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 58: Hana Highway & Dairy Road



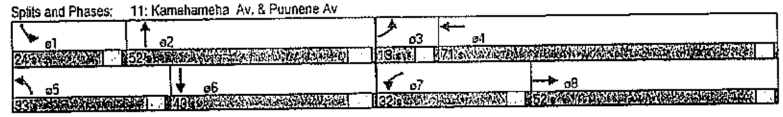
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↑↱		↰	↑	↱	↰	↑↱		↰	↑↱	
Volume (vph)	50	580	250	210	570	335	220	575	105	145	435	45
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	1.00	1.00	1.00	0.95	0.95	1.00	0.95	0.95
Frt		0.955				0.850		0.977			0.986	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1719	3283	0	1719	1810	1538	1719	3359	0	1719	3390	0
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	1719	3283	0	1719	1810	1538	1719	3359	0	1719	3390	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		42				248		13			6	
Link Speed (mph)		25			25			25			25	
Link Distance (ft)		1026			1802			721			1003	
Travel Time (s)		28.0			49.1			19.7			27.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	53	611	263	221	600	353	232	605	111	153	458	47
Shared Lane Traffic (%)												
Lane Group Flow (vph)	53	874	0	221	600	353	232	716	0	153	505	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot			Prot		Perm	Prot			Prot		
Protected Phases	3	8		7	4		5	2		1	6	
Permitted Phases						4						
Detector Phase	3	8		7	4	4	5	2		1	6	
Switch Phase												
Minimum Initial (s)	4.0	8.0		4.0	8.0	8.0	4.0	10.0		4.0	10.0	
Minimum Split (s)	9.0	30.0		9.0	30.0	30.0	9.0	41.0		9.0	41.0	
Total Split (s)	13.0	52.0	0.0	32.0	71.0	71.0	33.0	52.0	0.0	24.0	43.0	0.0
Total Split (%)	8.1%	32.5%	0.0%	20.0%	44.4%	44.4%	20.6%	32.5%	0.0%	15.0%	26.9%	0.0%
Maximum Green (s)	8.0	47.0		27.0	66.0	66.0	28.0	46.0		19.0	37.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	5.0		4.0	5.0	
All-Red Time (s)	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	
Lost Time Adjust (s)	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	4.0	6.0	6.0	5.0	6.0	7.0	4.0	6.0	7.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag	Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	2.0	3.0		2.0	3.0	3.0	2.0	4.5		2.0	4.5	
Recall Mode	None	None		None	None	None	None	C-Max		None	C-Max	
Walk Time (s)		4.0						7.0			7.0	
Flash Dont Walk (s)		20.0						28.0			28.0	
Pedestrian Calls (#/hr)		0						0			0	
Act Effct Green (s)	6.6	44.3		22.8	62.7	63.7	23.8	51.7		16.3	44.2	
Actuated g/C Ratio	0.04	0.28		0.14	0.39	0.40	0.15	0.32		0.10	0.28	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
v/c Ratio	0.76	0.93		0.90	0.85	0.46	0.91	0.66		0.87	0.54	
Control Delay	127.4	70.1		69.5	39.0	6.7	103.0	50.7		104.2	25.9	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0	
Total Delay	127.4	70.1		69.5	39.0	6.7	103.0	50.7		104.2	25.9	
LOS	F	E		E	D	A	F	D		F	C	
Approach Delay		73.4			35.0			63.5			44.1	
Approach LOS		E			D			E			D	
Queue Length 50th (ft)	56	442		149	635	38	239	355		147	206	
Queue Length 95th (ft)	#133	#562		m130	m554	m30	#371	434		m160	m223	
Internal Link Dist (ft)		946			1722			641			923	
Turn Bay Length (ft)												
Base Capacity (vph)	75	978		279	735	780	290	1093		194	940	
Starvation Cap Reductn	0	0		0	0	0	0	0		0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0		0	0	
Storage Cap Reductn	0	0		0	0	0	0	0		0	0	
Reduced v/c Ratio	0.71	0.89		0.79	0.82	0.45	0.80	0.66		0.79	0.54	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:NBT and 6:SBT, Start of Yellow
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.93
Intersection Signal Delay: 53.5 Intersection LOS: D
Intersection Capacity Utilization 83.8% ICU Level of Service E
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 11: Kamehameha Av. & Puunene Av



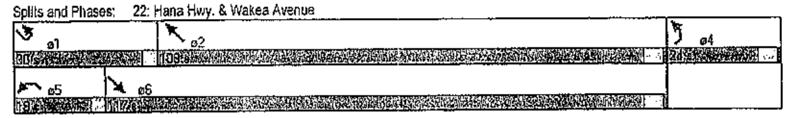
Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
Lane Configurations	↶	↑↑↱		↰	↑↑	Y	
Volume (vph)	170	2050	90	145	1510	15	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00
Frt		0.994				0.872	
Flt Protected	0.950			0.950		0.997	
Satd. Flow (prot)	1719	3417	0	1719	3438	1573	0
Flt Permitted	0.950			0.950		0.997	
Satd. Flow (perm)	1719	3417	0	1719	3438	1573	0
Right Turn on Red			Yes				Yes
Satd. Flow (RTOR)		7				154	
Link Speed (mph)		25			25	25	
Link Distance (ft)		708			503	1187	
Travel Time (s)		19.3			13.7	32.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	2158	95	153	1589	16	274
Shared Lane Traffic (%)							
Lane Group Flow (vph)	179	2253	0	153	1589	290	0
Enter Blocked Intersection	No	No	No	No	No	No	No
Lane Alignment	R NA	Left	Right	Left	Left	Left	Right
Median Width(ft)		12			12	12	
Link Offset(ft)		0			0	0	
Crosswalk Width(ft)		16			16	16	
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		9	15		15	9
Turn Type	Prot			custom			
Protected Phases	1	6		5	2	4	
Permitted Phases				5			
Detector Phase	1	6		5	2	4	
Switch Phase							
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	
Minimum Split (s)	8.0	23.0		8.0	20.0	23.0	
Total Split (s)	30.0	117.0	0.0	19.0	106.0	24.0	0.0
Total Split (%)	18.8%	73.1%	0.0%	11.9%	66.3%	15.0%	0.0%
Maximum Green (s)	27.0	112.0		16.0	101.0	19.0	
Yellow Time (s)	3.0	4.0		3.0	4.0	4.0	
All-Red Time (s)	0.0	1.0		0.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	4.0	3.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	
Recall Mode	None	Min		None	C-Min	Min	
Walk Time (s)		7.0				7.0	
Flash Dont Walk (s)		11.0				11.0	
Pedestrian Calls (#/hr)		0				0	
Act Effct Green (s)	21.4	113.6		15.8	108.0	17.6	
Actuated g/C Ratio	0.13	0.71		0.10	0.68	0.11	

Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
v/c Ratio	0.78	0.93		0.90	0.68	0.94	
Control Delay	65.7	12.0		134.2	17.4	68.9	
Queue Delay	0.0	3.4		0.0	0.0	0.0	
Total Delay	65.7	15.4		134.2	17.4	68.9	
LOS	E	B		F	B	E	
Approach Delay		19.1			27.7	68.9	
Approach LOS		B			C	E	
Queue Length 50th (ft)	186	348		153	733	149	
Queue Length 95th (ft)	m162	m298		m#282	m825	#327	
Internal Link Dist (ft)		628			423	1107	
Turn Bay Length (ft)							
Base Capacity (vph)	290	2429		172	2320	323	
Starvation Cap Reductn	0	119		0	0	0	
Spillback Cap Reductn	0	0		0	0	0	
Storage Cap Reductn	0	0		0	0	0	
Reduced v/c Ratio	0.62	0.98		0.89	0.68	0.90	

Intersection Summary

Area Type: Other
Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:NWT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 25.7 Intersection LOS: C
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15
\# 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: Hana Hwy. & Wakea Avenue



Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
Lane Configurations							
Volume (vph)	170	2050	90	145	1510	15	260
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	1.00	1.00
Frt		0.994				0.872	
Flt Protected	0.950			0.950		0.997	
Satd. Flow (prot)	1719	3417	0	1719	3438	1573	0
Flt Permitted	0.950			0.950		0.997	
Satd. Flow (perm)	1719	3417	0	1719	3438	1573	0
Right Turn on Red			Yes				Yes
Satd. Flow (RTOR)		7				155	
Link Speed (mph)		25			25	25	
Link Distance (ft)		708			503	1187	
Travel Time (s)		19.3			13.7	32.4	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	179	2158	95	153	1589	16	274
Shared Lane Traffic (%)							
Lane Group Flow (vph)	179	2253	0	153	1589	290	0
Enter Blocked Intersection	No	No	No	No	No	No	No
Lane Alignment	R NA	Left	Right	Left	Left	Left	Right
Median Width(ft)		12			12	12	
Link Offset(ft)		0			0	0	
Crosswalk Width(ft)		16			16	16	
Two way Left Turn Lane							
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	9		9	15		15	9
Turn Type	Prot			custom			
Protected Phases	1	6		5	2	4	
Permitted Phases				5			
Detector Phase	1	6		5	2	4	
Switch Phase							
Minimum Initial (s)	4.0	4.0		4.0	4.0	4.0	
Minimum Split (s)	8.0	23.0		8.0	20.0	23.0	
Total Split (s)	28.0	109.0	0.0	18.0	99.0	23.0	0.0
Total Split (%)	18.7%	72.7%	0.0%	12.0%	66.0%	15.3%	0.0%
Maximum Green (s)	25.0	104.0		15.0	94.0	18.0	
Yellow Time (s)	3.0	4.0		3.0	4.0	4.0	
All-Red Time (s)	0.0	1.0		0.0	1.0	1.0	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	4.0	3.0	5.0	5.0	4.0
Lead/Lag	Lead	Lag		Lead	Lag		
Lead-Lag Optimize?							
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	
Recall Mode	None	Min		None	C-Min	Min	
Walk Time (s)		7.0				7.0	
Flash Dont Walk (s)		11.0				11.0	
Pedestrian Calls (#/hr)		0				0	
Act Effct Green (s)	20.2	106.5		14.9	100.2	16.6	
Actuated g/C Ratio	0.13	0.70		0.10	0.67	0.11	

Lane Group	SEU	SET	SER	NWL	NWT	NEL	NER
v/c Ratio	0.77	0.94		0.89	0.69	0.93	
Control Delay	59.3	16.5		131.0	14.1	66.0	
Queue Delay	0.0	3.3		0.0	0.0	0.0	
Total Delay	59.3	19.8		131.0	14.1	66.0	
LOS	E	B		F	B	E	
Approach Delay		22.7			24.3	66.0	
Approach LOS		C			C	E	
Queue Length 50th (ft)	173	413		154	659	137	
Queue Length 95th (ft)	m122	m240		m#275	m771	#309	
Internal Link Dist (ft)		628			423	1107	
Turn Bay Length (ft)							
Base Capacity (vph)	287	2406		173	2297	325	
Starvation Cap Reductn	0	102		0	0	0	
Spillback Cap Reductn	0	0		0	0	0	
Storage Cap Reductn	0	0		0	0	0	
Reduced v/c Ratio	0.62	0.98		0.88	0.69	0.89	

Intersection Summary

Area Type: Other
Cycle Length: 150
Actuated Cycle Length: 150
Offset: 144 (96%), Referenced to phase 2:NWT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 22: Hana Hwy. & Wakea Avenue

ø1	ø2	ø4
28	99	23

ø5	ø6
18	109

Lane Group	SEU	SET	NWL	NWT	NEL
Lane Configurations					
Volume (vph)	170	2050	145	1510	15
Turn Type	Prot		custom		
Protected Phases	1	6	5	2	4
Permitted Phases			5		
Detector Phase	1	6	5	2	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	20.0	23.0
Total Split (s)	28.0	109.0	18.0	99.0	23.0
Total Split (%)	18.7%	72.7%	12.0%	66.0%	15.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	Min	None	C-Min	Min
Act Effct Green (s)	20.2	105.5	14.9	100.2	16.8
Actuated g/C Ratio	0.13	0.70	0.10	0.67	0.11
v/c Ratio	0.77	0.94	0.89	0.69	0.93
Control Delay	59.3	16.5	131.0	14.1	66.0
Queue Delay	0.0	3.3	0.0	0.0	0.0
Total Delay	59.3	19.8	131.0	14.1	66.0
LOS	E	B	F	B	E
Approach Delay		22.7		24.3	66.0
Approach LOS		C		C	E

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 144 (96%), Referenced to phase 2:NWT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 26.2 Intersection LOS: C
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 22: Hana Hwy. & Wakea Avenue

ø1	ø2	ø4
[illegible]	99 s	23 s
ø5	ø6	
[illegible]	109 s	

Lane Group	EBR	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL	NER
Lane Configurations									
Volume (vph)	1300	145	85	10	255	805	105	95	510
Turn Type	custom		Prot	Perm	Prot		Perm		Prot
Protected Phases		3	3		5	2		4	4
Permitted Phases	6			3			2		
Detector Phase	6	3	3	3	5	2	2	4	4
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0
Total Split (s)	72.0	23.0	23.0	23.0	20.0	92.0	92.0	35.0	35.0
Total Split (%)	48.0%	15.3%	15.3%	15.3%	13.3%	61.3%	61.3%	23.3%	23.3%
Yellow Time (s)	4.0	6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	6.5	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0
Lead/Lag	Lag	Lead	Lead	Lead	Lead			Lag	Lag
Lead-Lag Optimize?									
Recall Mode	C-Max	None	None	None	Max	C-Max	C-Max	Max	Max
Act Effct Green (s)	66.5	15.3	15.3	16.3	16.0	86.5	86.5	28.7	28.7
Actuated g/C Ratio	0.44	0.10	0.10	0.11	0.11	0.58	0.58	0.19	0.19
v/c Ratio	1.18	0.87	0.57	0.06	0.75	0.44	0.12	0.56	1.14
Control Delay	125.5	107.5	78.8	28.2	79.0	18.9	2.6	95.2	139.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	125.5	107.5	78.8	28.2	79.0	18.9	2.6	95.2	139.8
LOS	F	F	E	C	E	B	A	F	F
Approach Delay		93.9				30.6		128.4	
Approach LOS		F				C		F	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 30 (20%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.18
Intersection Signal Delay: 91.7 Intersection LOS: F
Intersection Capacity Utilization 89.2% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.

ø2 ø3 ø4
ø5 ø6

Lane Group	EBR	SBL	SBR	SBR2	NWL2	NWL	NWR	NEL2	NEL	NER
Lane Configurations										
Volume (vph)	1545	210	180	10	590	1095	240	85	130	605
Turn Type	custom		custom	custom	Prot		custom	Prot		custom
Protected Phases		3			5			7		
Permitted Phases	6		8	8		2	2		4	4
Detector Phase	6	3	8	8	5	2	2	7	4	4
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	21.0	23.0	23.0	23.0	20.0	27.5	27.5	21.0	21.0	21.0
Total Split (s)	78.0	24.0	34.0	34.0	27.0	105.0	105.0	21.0	31.0	31.0
Total Split (%)	48.8%	15.0%	21.3%	21.3%	16.9%	65.6%	65.6%	13.1%	19.4%	19.4%
Yellow Time (s)	6.0	6.0	6.0	6.0	3.0	4.0	4.0	6.0	6.0	6.0
All-Red Time (s)	0.0	0.0	0.0	0.0	0.0	0.5	0.5	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	0.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	7.0	7.0	7.0	6.0	4.0	5.5	5.5	7.0	7.0	7.0
Lead/Lag	Lag	Lead	Lag	Lag	Lead			Lead	Lag	Lag
Lead-Lag Optimize?										
Recall Mode	C-Max	None	None	None	Max	C-Max	C-Max	Max	Max	Max
Act Effct Green (s)	71.0	17.0	27.0	28.0	23.0	99.5	99.5	14.0	24.0	24.0
Actuated g/C Ratio	0.44	0.11	0.17	0.18	0.14	0.62	0.62	0.09	0.15	0.15
v/c Ratio	1.42	1.21	0.73	0.04	1.30	0.56	0.24	0.59	0.50	1.44
Control Delay	214.0	190.4	79.9	24.3	204.8	18.2	4.4	112.9	51.0	226.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	214.0	190.4	79.9	24.3	204.8	18.2	4.4	112.9	51.0	226.3
LOS	F	F	E	C	F	B	A	F	D	F
Approach Delay		136.5				73.6			186.7	
Approach LOS		F				E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 72 (45%), Referenced to phase 2:NWL and 6:EBR, Start of Yellow
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.44
Intersection Signal Delay: 146.1 Intersection LOS: F
Intersection Capacity Utilization 105.8% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.

ø2 ø3 ø4
ø5 ø6 ø7 ø8

Appendix C

Unsignalized Intersection Level of Service (LOS) Calculations

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	11/26/200
Agency or Company	AECOM	Major Street	KAAHUMANU AVE
Analysis Period/Year	TOT LO AM 2013	Minor Street	U TURN
Comment	2013 AM PK UTURN W/ LOW TRIP GEN		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T			L
Lane 2	T			
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		995								15		
PHF		.9								.9		
Proportion of heavy vehicles, HV		3								3		
Flow rate		1106								17		
Flare storage (# of vehs)												
Median storage (# of vehs)											0	

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	L	17	461	.037	<1	13.1	B	13.1
	2								B
	3								
		1							
		4							

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information		Site Information	
Analyst	WY	Jurisdiction/Date	11/26/200
Agency or Company	AECOM	Major Street	KAAHUMANU AVE
Analysis Period/Year	TOT HI AM 2013	Minor Street	U TURN
Comment	2013 AM PK UTURN W/ HIGH TRIP GEN		

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T			L
Lane 2	T			
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1050								30		
PHF		.9								.9		
Proportion of heavy vehicles, HV		3								3		
Flow rate		1167								33		
Flare storage (# of vehs)												
Median storage (# of vehs)											0	

Signal upstream of Movement 2 ____ ft Movement 5 ____ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	L	33	441	.075	<1	13.8	B	13.8
	2								B
	3								
		1							
		4							

CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company: AECOM
Analysis Period/Year: TOT HI PM 2013
Comment: 2013 PM PK UTURN W/ HIGH TRIP GEN

Site Information

Jurisdiction/Date: 11/26/200
Major Street: KAAHUMANU AVE
Minor Street: U TURN

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T			L
Lane 2	T			
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1560								60		
PHF		.9								.9		
Proportion of heavy vehicles, HV		3								3		
Flow rate		1733								67		
Flare storage (# of vehs)												
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ______ ft Movement 5 ______ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	L	67	290	.231	1	21.1	C	21.1
	2								C
	3								
		①							
		④							

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CHAPTER 17 - TWSC - UNSIGNALIZED INTERSECTIONS WORKSHEET

Analysis Summary

General Information

Analyst: WY
Agency or Company: AECOM
Analysis Period/Year: TOT HI PM 2013
Comment: 2013 PM PK UTURN W/ HIGH TRIP GEN

Site Information

Jurisdiction/Date: 11/21/200
Major Street: KAAHUMANU AVE
Minor Street: U TURN

Input Data

Lane Configuration	EB	WB	NB	SB
Lane 1 (curb)	T			L
Lane 2	T			
Lane 3				

	EB			WB			NB			SB		
Movement	1 (LT)	2 (TH)	3 (RT)	4 (LT)	5 (TH)	6 (RT)	7 (LT)	8 (TH)	9 (RT)	10 (LT)	11 (TH)	12 (RT)
Volume (veh/h)		1560								140		
PHF		.9								.9		
Proportion of heavy vehicles, HV		3								3		
Flow rate		1733								156		
Flare storage (# of vehs)												
Median storage (# of vehs)										0		

Signal upstream of Movement 2 ______ ft Movement 5 ______ ft

Length of study period (h) .25

Output Data

	Lane	Movement	Flow Rate (veh/h)	Capacity (veh/h)	v/c	Queue Length (veh)	Control Delay (s)	LOS	Approach Delay and LOS
NB	1								
	2								
	3								
SB	1	L	156	290	.537	3	30.9	D	30.9
	2								D
	3								
		①							
		④							

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APPENDIX J-1.

Letter from State Department of Transportation Granting Conditional Approval for Vehicle Access Rights

LINDA LINGLE
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 688A
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 600
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 636
TECHNICAL DESIGN SERVICE, ROOM 688

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 602

MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD, ROOM 691
KAPOLEI, HAWAII 96707

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

HWY-RM
3.87594

RECEIVED
MAR 22 2010
By__________

March 18, 2010

Mr. Lloyd P.C.W. Lee, Sr., P.E.
Senior Project Manager
AECOM Pacific, Inc.
100 Pauahi Street, Suite 207
Hilo, Hawaii 96720

Dear Mr. Lee:

SUBJECT: HALEAKALA ROAD AND PAIA SPUR
HAWAII PROJECT NO. DA-NC 8(1)
KAHULUI TOWN TO KAUNOA SCHOOL
TMK: (2) 3-7-11: 028
REQUEST FOR VEHICLE ACCESS RIGHTS:
MAUI MEDICAL PLAZA AT KANAHA

We have conceptually approved your request and shall continue to process your request subject to the following conditions:

1. Kanaha Professional Plaza, LLC (KPP) shall comply with all applicable statutes, ordinances, rules and regulations of the Federal, State and County governments.

2. All improvements (driveways/sidewalks, etc.) must comply with current Americans with Disabilities Act (ADA) requirements. The driveway layout must conform to Department of Transportation standards for residential driveways.

3. KPP must execute a "Grant of Limited Vehicle Access Rights" document whereby you are granted access for your proposed use and all other rights of vehicle access are restricted along the remainder of the property's Hana Highway frontage.

4. KPP must submit an updated title search for their property, TMK: (2) 3-7-11: 028 to show status of title.

5. KPP shall be responsible for all costs associated with the stipulated highway improvements for the access location.

6. Please provide proof of H.R.S. Chapter 343-5 compliance (E.A. or E.I.S. documentation) when submitting your application for Permit to Perform Work upon State Highways.

7. The requested access shall be granted for the proposed use. Any future increase in density of the lot by an owner, via CPR or the subdivision of the existing/proposed lots, shall require the owner to obtain the use of additional access rights to Hana Highway.

8. KPP must submit two (2) copies of metes and bounds description of the subject area along with a parcel map, which will be used as Exhibits to the document.

9. KPP must submit four (4) sets of construction plans to our Maui Permit Engineer, at our Maui District Office, 650 Palapala Drive, Kahului, Hawaii 96732, for review and approval.

10. KPP shall defend, hold harmless and indemnify the State, from and against all claims or demands for bodily injury, property damage and/or death.

11. KPP shall be responsible for all documentation and recording fees incurred for the requested access.

12. The Highways Division reserves the right to add or impose additional conditions as necessary to mitigate adverse impacts to the State.

If KPP is agreeable to the foregoing conditions, please sign the acceptance portion of this letter and return it to our office. If we do not receive the signed acceptance portion within thirty (30) days from the date of this letter, we will assume you are no longer interested in pursuing the matter.

If you have any questions, please call me at 692-7338.

Very truly yours,

Jaime K. Yamashiro

JAIME K. YAMASHIRO
Right-of-Way Agent
Property Management Section

ACCEPTANCE:

Kanaha Professional Plaza, LLC accepts all terms and conditions as set forth in the Department of Transportation letter (ref. HWY-RM 3.87594) dated March 18, 2010.

Robert T. McDaniel III

Date: 3.25.2010

Print Name: Robert T. McDaniel III

Its: Member

APPENDIX J-2.

Supplement to Traffic Impact Analysis Report

Traffic Impact Analysis Report First Supplement

for

Maui Medical Plaza at Kanaha
Kahului, Island of Maui, Hawai'i

Tax Map Key Number *(2)3-7-011: 028*

MARCH 2011

Prepared for:

Maui Medical Plaza at Kanaha
350 Hukiliki Street, Suite 3D
Kahului, HI 96732

Prepared by:

AECOM
American Savings Bank Tower
1001 Bishop Street, Suite 1600
Honolulu, Hawai'i 96813

Maui Medical Plaza at Kanaha

Kahului, Island of Maui, Hawai'i

Traffic Impact Analysis Report

TMK (2) 3-7-011: 028

<u>FIRST SUPPLEMENT</u>

March 2011

WARREN M. YAMAMOTO
LICENSED PROFESSIONAL ENGINEER
NO. 3893-C
HAWAII, U.S.A.

Expiration Date:
April 30, 2012

This work was prepared by me or under my direct supervision.

Signature

10 MAR 2011
Date

AECOM

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TRAFFIC IMPACT ANALYSIS REPORT
for the
MAUI MEDICAL PLAZA AT KANAHA
First Supplement

The Maui Medical Plaza at Kanaha, a medical office plaza, is being planned for Kahului, Maui, Hawai'i. The original *Traffic Impact Analysis Report (TIAR) for Maui Medical Plaza at Kanaha* dated August 2009 identified the traffic impacts of the proposed project and recommended traffic mitigating measures. The first revision of the report, *Traffic Impact Analysis Report for Maui Medical Plaza at Kanaha, First Revision (RTIAR),* dated January 2010 responded to comments made by the State of Hawai'i, Department of Transportation (HDOT). This first supplemental report responds specifically to comments made to the RTIAR by the HDOT and Maui County planning agencies. It does not repeat information provided in the RTIAR unless the old information is needed to put the new information into perspective. Subsequent to the release of the RTIAR, the HDOT indicated they will be installing a traffic signal at the Hana Highway/Wakea Avenue intersection. The impact of this improvement was also incorporated into this analysis.

The purpose of this supplemental report is to provide responses to the RTIAR comment letters provided by the HDOT, dated September 30, 2010, the County of Maui (Department of Planning) Maui Planning Commission (MPC), dated August 24, 2010, and lastly the County of Maui, Department of Planning, Urban Design Review Board (UDRB), dated October 15, 2010. Copies of the mentioned letters are included in **Appendix A** for reference.

The specific comments derived from the letters are listed below. Each comment is identified by the agency and the comment number as referenced in the agency letters. The corresponding responses are listed at the end of the list of comments.

HDOT AND MAUI COUNTY AGENCIES COMMENTS:

1. [HDOT 1a]. Widen northwest bound Hana Highway to include three lanes and a new acceleration/deceleration lane as described on page 20.

2. [HDOT 1b]. Graphically, Figure 2 shows a bus stop in the middle of the acceleration/deceleration lane. This is not acceptable for new construction projects on a major urban arterial highway, particularly when the lane is designed as an acceleration/deceleration lane.

   [URDB 3]. Recommend that the proposed bus stop not be located as part of the proposed acceleration/deceleration lane as depicted in the site plans presented. Locate the bus stop close to the project.

3. [HDOT 1c]. Develop and implement a traffic management plan (TMP) that includes proactive programs to lower trip generation rates, as noted on page 21 of the RTIAR. Submit the TMP to HDOT for approval.

4. [HDOT 1f]. The RTIAR should discuss transit and pedestrian circulation.

5. [HDOT 1g]. The effects of a coordinated system from Kaahumanu Avenue to Kahului Airport Access Road should be included in the RTIAR.

6. [HDOT 1d]. Improve the Hana Highway and Kamehameha Avenue/Hobron Avenue intersection as discussed in the RTIAR. It is HDOT's understanding that eliminating the split phase will provide more capacity through the intersection. HDOT recommends implementing the alternative that will provide a better Level of Service (LOS), thus improving the operation of the intersection.

7. [MPC 9]. Provide an analysis of the traffic mitigation being proposed to maintain movement in and out of Kahului Harbor area via Hobron Avenue, Kahului.

8. [MPC 10]. Provide analysis of strategic intersections around Lot 8, the impact from the 365 vehicles from the project, and how any impacts will be mitigated.

9. [MPC 11]. Provide further information on the potential use of an alternative entrance (to Lot 8) from Hobron Avenue.

10. [UDRB 2]. Study bicycle traffic options and include them in the Final EA. Continue to work with the HDOT on options that will provide for improved bicycle access to the project. Design bicycle access into traffic patterns.

RESPONSE TO HDOT AND MAUI COUNTY AGENCIES COMMENTS:

1. PROVIDE OFF-SITE ROAD IMPROVEMENTS

The proposed project is committed to implementing three off-site roadway improvements on Hana Highway to accommodate the traffic generated by their project:

a. The northwest bound approach of Hana Highway will be widened from two to four lanes to provide a third through lane and an acceleration/deceleration lane. This improvement will be in compliance with HDOT comment 1a. The third through lane will be designed to accommodate the future widening of Hana Highway and will provide an additional lane for traffic exiting the project site merging onto Hana Highway. The acceleration/ deceleration lane will be a continuous lane beginning at the new exit driveway and terminating at the northwest access roadway. This design will minimize the reconstruction activity fronting the project site when Hana Highway is widened by HDOT. A left turn lane in the median of Hana Highway will accommodate the left turn movements from southeast bound Hana Highway into the project site until traffic signals are installed at Wakea Avenue, at which time U-turns will be permitted at the traffic signal to access the project driveway. U-turns will not be permitted at this unsignalized median opening. A landscaped median with a four foot high hedge will be installed to form a physical barrier to prevent pedestrians from jaywalking across Hana Highway. This improvement is shown on **Figure 1** which is from Figure 2 of the RTIAR.

b. The single right turn lane on the Kamehameha Avenue approach will be widened to double right turn lanes to accommodate the very high number of turns currently being made. This improvement will be in compliance with HDOT comment 1d and is shown on **Figure 2** which is from Figure 8 of the RTIAR.

c. A left turn storage lane will be added to the existing U-turn median opening on Hana Highway on the Wailuku side of the Kamehameha Highway/Hobron Avenue intersection. This facility will be utilized by vehicles leaving from the access (west) driveway and cannot enter the left turn lanes on Hana Highway into Kamehameha Highway. This improvement is shown on **Figure 3** which is from Figure 9 of the RTIAR.

These improvements will be installed at no additional cost to the HDOT. They are also in compliance with HDOT comment 2 of their letter dated September 30, 2010, requesting that the developer coordinate its design with the HDOT-Highways Division and its consultants for the Hana Highway widening project and the traffic signal improvements at Wakea Avenue. The project will prepare the necessary agreements to ensure these improvements are made before the building is occupied.

2. PROPOSED BUS STOP IN ACCELERATION/DECELERATION LANE

As identified in the *Draft Environmental Assessment (EA) for the Proposed Maui Medical Plaza Project* (May 2010), the applicant is proposing to pay for the construction of a bus stop in the vicinity of the project with the objective of facilitating the availability of alternative forms of transportation for its patients and employees.

The HDOT Maui District and Traffic Engineering Branch were consulted during the preparation of the original TIAR to inquire about installing the bus stop within the acceleration/deceleration lane. The Maui Department of Transportation (MDOT), the operators of the Maui public transit system, was also consulted regarding the provision of a bus stop at the proposed project location. The MDOT stated that they did not want their buses going onto the project property; as such, the proposed location on Hana Highway was identified by this agency as the preferred location for the bus stop. A copy of the MDOT letter approving the bus stop location in the context of Maui Bus network is provided in **Appendix A**.

Subsequent to the review of the RTIAR and Draft EA, the HDOT indicated in the September 30, 2010 comment letter that locating bus stops on major urban arterial highways are not acceptable. The URDB also recommended during their review of the project in September/October 2010, that the bus stop not be located in the acceleration/deceleration lane but be situated close to the project.

In a subsequent email dated February 3, 2011, the HDOT Traffic Engineering Branch has since stated the following to the applicant:

> "As far as the concept of the location is concerned, we have no objection to the location. However, details of the striping and traffic control, and how the circulation of conflicting traffic will operate will be interesting."

It should be noted that Maui bus stops are located on other busy highways in Maui such as South Kihei Road, per the *Maui County Bus Stop Planning & Design Services* report (August 2008) by KFH Group. The City and County of Honolulu bus service also operates many bus stops along busy highways such as Kamehameha, Farrington, and Kalanianaole Highways on Oahu; in these instances, traffic is required to stop behind the stopped buses on single lane and multi-lane highways. These other bus stops present a similar situation to having a bus stop within the acceleration/deceleration lane for the proposed project.

The applicant will continue to consult with HDOT during the construction plans preparation process for the project to obtain approval for an acceptable striping and traffic control plan that would allow implementation of a bus stop at the currently proposed location fronting the project site. Should an alternate location for the bus stop in the vicinity of the project be determined and mutually agreed upon by HDOT and MDOT, the applicant will be willing to fund the construction of a bus stop at that future location.

3. TRANSPORTATION MANAGEMENT PLAN

The RTIAR recommends a Transportation Management Plan (TMP) to reduce the trip generation rates generated by the project. A draft TMP report has been submitted to HDOT for their review and approval. The final plan will be provided when approved by HDOT. The TMP report addresses how project-related trips during the construction phase and employee trips during the occupancy phase will be reduced. The plan does not address trips by patients to the project. Highlights of the plan are discussed below.

The project will designate a TMP Manager to implement the TMP during the construction and the occupancy phases of the project. As the program matures after the project reaches full occupancy, the TMP manager's involvement will decrease until project management takes full responsibility of the program.

Construction-related provisions of the TMP will be placed within the project's bid documents and be enforced by the TMP Manager. Project management will notify all new tenants about the TMP when they sign leases. They will notify all tenants about the program and their involvement through bulletin boards or an internal website.

The strategies and actions which will be emphasized during the occupancy phase are known as a Transportation Demand Management (TDM) program. Actions include: carpooling, increased use of transit, increased use of non-motorized modes, and parking strategies. A monitoring plan will be used to evaluate the effectiveness of the program.

4. PEDESTRIAN AND TRANSIT CIRCULATION

Pedestrian facilities and transit service and at the project site can be improved. There are no sidewalks on both sides of Hana Highway in the vicinity of the project site. It is not known at this time whether sidewalks will be added when Hana Highway is widened to six lanes. The responsibility for the design and construction of the future highway widening is shared jointly between A&B Properties, Inc. (A&B) and HDOT Highways Division as a condition of approval for an A&B private development. The schedule for this work is uncertain because A&B does not have the funds at this time to proceed with the project.

Three of the four approaches of the Hana/Hobron/Kamehameha intersection contain pedestrian crosswalks. The southeast leg of Hana Highway does not contain any crosswalks in order to prevent pedestrian traffic from conflicting with the high volumes of vehicular left turns from Hobron Avenue and the right turns from Kamehameha Avenue. A pedestrian path will be constructed as part of the project to provide access to the facility from the bus stops on Kamehameha Avenue. This improvement is shown on **Figure 4**. The project also includes the addition of sidewalks fronting the project site in order to improve pedestrian access, and increase pedestrian safety and comfort. The project will also add a four-foot-high hedge in the median of Hana Highway fronting the project location in order to discourage pedestrians from jaywalking across the highway to improve pedestrian safety.

Four bus routes of the Maui Bus service currently run past the project site. Two commuter routes run limited service during peak commuter periods. Kahului Loop Routes 5 and 6 run in opposing loop routes throughout the day, as shown on **Figure 5**. The closest existing stops to the project site are located at Maui Mall and Ross Stores, with walking distances estimated to be slightly more than one-fourth mile. The addition of the proposed bus stop fronting the project site will shorten this distance considerably for northwest bound buses.

5. COORDINATED TRAFFIC SIGNAL SYSTEM

Two traffic signal timing issues were addressed using Synchro Studio 7 (Synchro), a computer software program used to simulate and optimize traffic signal timings on a roadway network. The issues are:

a. Whether or not the traffic signals on the Hana Highway and Kaahumanu Avenue master systems should be coordinated together.
b. Determination of the optimum traffic signal phasing plan for the Hana Highway/Hobron Avenue/Kamehameha Avenue intersection.

The first issue is discussed in this section; the second issue is discussed in the next section (response item 6) of this Supplemental Report.

Three alternate forecast scenarios were developed to reflect the expected implementation of other traffic improvements in the study area. All three alternate scenarios utilize the project high trip generation forecasts as described in the RTIAR as a worst case scenario:

a. Alternate 1 – The basic alternative includes the three off-site improvements being proposed by the project. These include three through lanes and one acceleration/deceleration lane on the northwest bound lanes of Hana Highway at the project driveway, two right turn lanes on the Kamehameha Avenue approach, and a U-turn lane in the median of Hana Highway west of Hobron Avenue.

b. Alternate 2 – Alternate 1 plus traffic signals at Wakea Avenue. HDOT has announced that they will install this traffic signal but it could be installed before or after the project occupancy. This alternative assumes the traffic signals will be installed before the project occupancy.

c. Alternate 3 – Alternate 2 plus widening of Hana Highway from Kaahumanu Avenue to Dairy Road. The timetable for this improvement is uncertain. This alternative assumes the roadway widening will occur before the project occupancy.

These new alternate scenarios differ slightly from the set of alternatives analyzed in the RTIAR. The development of alternate roadway improvements became better defined during the interim period between studies.

The traffic signals on Kaahumanu Avenue and Hana Highway are currently on separate coordination systems. The HDOT requested that the coordination of traffic signals from Kaahumanu Avenue and Hana Highway to the proposed Kahului Airport Access Road be analyzed. Information on the additional traffic signals east of the Hana Highway/Dairy Road intersection is not available at the time of this analysis. Therefore, only the traffic signals from Pu'unene Avenue to Dairy Road are included in this analysis. Information on the other traffic signals will be included when they become available.

The Synchro program was used to develop optimized traffic signal timing plans on Hana Highway and Kaahumanu Avenue for the three future (2013) total scenarios including the scenarios for this project. As part of its optimization tasks, Synchro calculates whether traffic signals should be coordinated or not and the cycle length. The results shown on **Table 1** also include the results for the existing (2009) and ambient (2013) conditions as shown in the RTIAR for comparison purposes.

The two traffic signals on Kaahumanu Avenue are currently running at different cycle lengths from the two traffic signals on Hana Highway which indicates two separate traffic signal timing systems. For the 2013 ambient conditions, Synchro indicates that the two Kaahumanu Avenue signals and the Hana/Hobron/Kamehameha signal (three western signals) be coordinated in the morning peak, as indicated by these three traffic signals running in coordination at the same cycle lengths. The Dairy Road traffic signal will run actuated or in coordination with the other traffic signals east of this intersection. Synchro indicates that all four signals be coordinated in the afternoon since all the traffic signals are running in coordination at the same cycle length.

For the three 2013 alternate scenarios, Synchro indicates that all four/five traffic signals on the study network should be coordinated in the morning and afternoon peak periods. All study traffic signals on Kaahumanu Avenue and Hana Highway are running in coordination at the same cycle length. This result may change as other traffic signals are included in the analysis.

The Synchro analysis worksheets are provided in **Appendix B**.

6. HANA HIGHWAY/HOBRON AVENUE/KAMEHAMEHA AVENUE TRAFFIC SIGNAL IMPROVEMENTS

Adding a second right turn lane to the Kamehameha Avenue approach to Hana Highway will necessitate changes to the traffic signal timing of the intersection, including phase lengths and possibly cycle lengths. The HDOT requested if other optimum traffic signal phasing plans could be developed for the intersection. The current traffic signal timing has split phases for Hobron Avenue and Kamehameha Avenue due to the high volume of left turns from the former approach and the lack of a separate left turn lane on the latter approach.

The volume of turning movements and current and proposed lane configurations restrict the variations of timing plans that can be implemented at this location. An eight phase (seven phase since the eastbound approach of Hana Highway has no left turn phase) will be feasible only if both opposing approaches have separate left turn lanes, which Kamehameha Avenue does not have.

The operations of an eight phase signal timing plan were analyzed for Alternates 2 and 3 during the afternoon period peak when traffic conditions are worst. The shared through/left turn lane of Kamehameha Avenue was assumed to be a separate left turn lane, and the second right turn lane was assumed to be a shared through/right turn lane for the purposes of this analysis. The first right turn lane will remain an exclusive right turn lane. The results shown on **Table 1** indicate that an eight phase traffic signal timing plan will worsen traffic operations at this intersection. Hence, the split phase traffic signal operations at this intersection represent the optimal phasing.

7. TRAFFIC MITIGATION FOR HOBRON AVENUE TRAFFIC

The double right turn lanes on the Kamehameha Avenue approach will result in new traffic signal timing plans for the intersection as discussed above. **Table 2** summarizes how the traffic signal timings and resultant levels of service/delays change from the ambient (without improvements) condition to the three alternate with improvement scenarios. The table shows how intersection cycle lengths, green phase times for Hobron Avenue (southbound approach), and the levels of service and delays for the intersection, southbound approach, and each lane of the southbound approach change during the morning and afternoon peak hours.

During the morning peak hour, the intersection will operate at a 150 second cycle for the ambient condition but at shorter 130 or 140 second cycles for the three alternate with improvement scenarios. The intersection level of service will improve from level D for the ambient condition to level C for the three alternate with improvement scenarios. The level of service for the southbound approach will also improve from level F for the ambient condition to level E for the three alternate with improvement scenarios. The southbound left turn lane will remain at level of service F but the delay will decrease for the three alternate with improvement scenarios. The level of service for the southbound through lane will improve from level F for the ambient condition to level E for the three with improvement scenarios. The level of service for the southbound right turn will remain at level of service C for all four scenarios. This analysis indicates that the proposed intersection improvements will help improve traffic operations for traffic leaving Kahului Harbor via Hobron Avenue during the morning peak despite the additional traffic generated by the proposed project.

During the afternoon peak hour, the intersection will operate at a 150 second cycle for the ambient condition, at 160 seconds for the first two alternate with improvement alternative scenarios, and at a 150 second cycle for the third alternate with improvement scenario with widened highway. The intersection level of service will improve from level F for the ambient condition to level E for the first two alternate with improvement scenarios, and improve further to level D for the third alternate with improvement scenario. The level of service for the southbound approach will be at level F for all four scenarios, but delays will decrease for the three alternate with improvement scenarios. The levels of service on the southbound left and through lanes will be at level F for all four scenarios, but delays will decrease for the three alternate with improvement scenarios. As with the morning peak hour analysis, this analysis indicates that the proposed intersection improvements will help improve traffic operations for traffic leaving Kahului Harbor via Hobron Avenue despite the additional traffic generated by the proposed project.

8. ANALYSIS OF STRATEGIC INTERSECTIONS AROUND LOT 8

The "Lot 8" referred to in the MPC letter is the project site. The TIAR and RTIAR reports discuss the traffic impacts from the additional traffic generated by the proposed project to six intersections in the vicinity of the project site. The RTIAR recommended three off-site roadway improvements as mitigating measures. The traffic impacts of these and other improvements are further discussed in this Supplemental Report.

9. ANALYSIS OF ALTERNATE ACCESS TO LOT 8

The currently proposed project design includes a single entry point and two exit points on Hana Highway. It does not consider a secondary entry from Hobron Avenue to Lot 8 to be feasible for several reasons. First, the applicant does not own the neighboring properties that such a roadway will have to pass through. Second, these properties are currently in industrial uses as auto wrecking, scrap metal storage, and petroleum handling facilities. These properties are not expected to be placed on the real estate market in the foreseeable future because of their active uses. Third, one of these properties is a drainage canal and wetland pond, which may require a bridge structure to get across. Lastly, it will be very hazardous and unhealthy for vehicles accessing the project to drive through these industrial activities.

The MPC requested an analysis of the traffic impacts of the secondary entrance route from Hobron Avenue and the strategic intersections it will affect. This section summarizes the analysis of such a hypothetical entrance roadway.

A hypothetical second entrance from Hobron Avenue to the project site will only benefit the few vehicles entering the project site from Kamehameha Avenue. These vehicles will be able to travel straight across Hana Highway without having to make a right turn onto Hana Highway and a left turn through the median opening to get to the project access roadway. Based on the traffic forecasts from the RTIAR, there would be about 50 vehicles per hour in the morning peak hour and 25 vehicles per hour in the afternoon peak hour making this movement. The traffic assignments from Figure 7 of the RTIAR were adjusted to account for this change. The modified traffic assignments with a hypothetical Hobron Avenue entrance are shown on **Figure 6** of this Supplemental Report. The major impact of these travel route changes will be on the Hana Highway/Hobron Avenue/Kamehameha Avenue intersection. There will also be minor impacts at the median opening on Hana Highway fronting the project site.

A level of service analysis of the traffic impacts at the Hana Highway/Hobron Avenue/Kamehameha Avenue intersection was conducted. Only the alternate 1 with improvement scenario, which assumed new double right turn lanes on the Kamehameha Avenue approach, was analyzed since it was considered indicative of the other two scenarios. The results shown on **Table 3** compare the results for the "with no alternate access" to the "with secondary access" scenarios for the morning and afternoon peak hours. The intersection cycle length, level of service and delay, and approach/ movement phase length, level of service and delay are shown in the table.

The analysis indicates that adding a secondary entrance on Hobron Avenue will have mixed results. During the morning peak hour, the intersection operations will remain unchanged at level of service C while levels of service on three of the four approaches will change. The northwest bound approach of Hana Highway will change from level B to C, the Kamehameha Avenue approach will change from level E to D, and the Hana Highway approach will change from E to F. During the afternoon peak hour, the level of service for the intersection and three of the four approaches will remain unchanged. The level of service on the northwest bound approach will change from D to E.

The high cost of acquiring the properties to create a second entry route, the limited number of vehicles which will benefit from the second entry, and the mixed results in terms of intersection traffic operations make the second entrance a poor option.

10. BICYCLE TRAFFIC OPTIONS

Project management will continue to work with HDOT to facilitate improved bicycle access to its site. HDOT has jurisdiction over Hana Highway and Kaahumanu Avenue, two major access routes to the project site. The HDOT *Bikeway Master Plan* (2003) lists Hana Highway as having a "signed shared facility" in the future. A "signed shared facility" has extra wide curb lanes for use by bicyclists with street signs identifying it as such. Kaahumanu Avenue already has a bike lane and no further improvements to it are being considered.

HDOT has stated that it would like the bike route on Hana Highway to be added when the highway is widened to six lanes. Once the highway widening project is completed, there will be some form of bicycle facility running along Hana Highway and Kaahumanu Avenue to the project site. As previously discussed, the design and construction of the highway widening project will be shared jointly between HDOT and a private developer and the project schedule is uncertain at this time.

HDOT has stated that it does not want a partial bike route to be built in front of the project before the bike route is implemented with the overall highway widening project. The short length of the bike route may not be consistent with the final bike route design. Therefore, improved bicycle access to the project site and other properties along Hana Highway is not expected to be available until Hana Highway is widened.

The master plan also identifies two existing bicycle facilities under the County of Maui jurisdiction that provide access to the project site. The North Shore Bikeway provides a *makai* route from the airport area to Hobron Avenue. There is also a signed shared road on Kamehameha Avenue from Hana Highway to Pu'unene Avenue. Both of these existing facilities will provide bicycle access to the project site.

References

References

1. *Traffic Impact Analysis Report For Maui Medical Plaza at Kanaha*, AECOM Pacific, Inc., (2009)

2. *Traffic Impact Analysis Report For Maui Medical Plaza at Kanaha, First Revision,* AECOM Pacific, Inc., (2010)

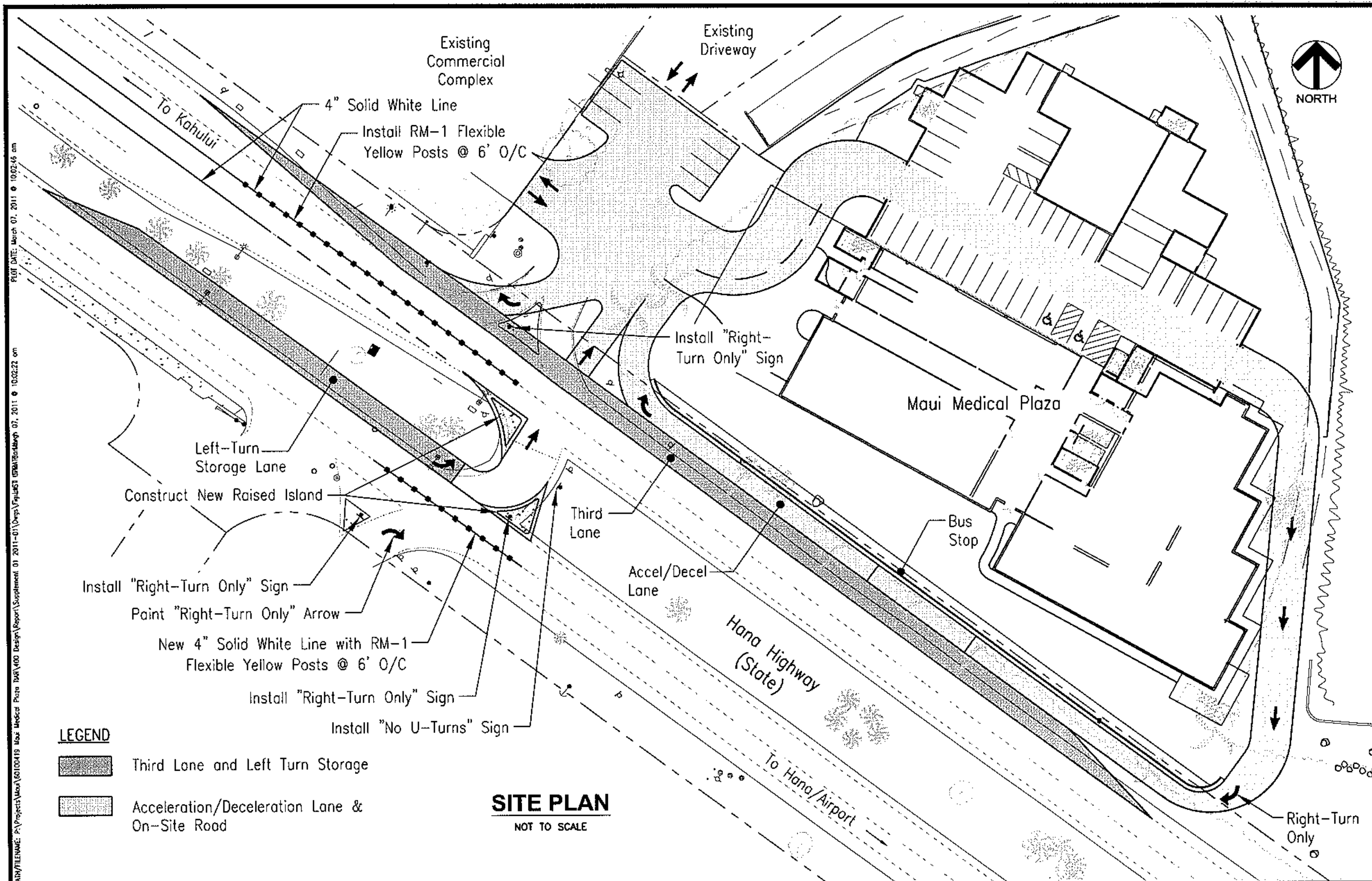
3. *Maui County Bus Stop Planning & Design Services,* KFH Group, (2008)

4. *Synchro Studio 7*, Trafficware, Ltd.

5. *Bikeway Master Plan, State of Hawai'i Department of Transportation*, (2003).

6. *Draft Environmental Assessment for Proposed Maui Medical Plaza Project and Related Improvements at TMK (2) 3-7-011:028*, Prepared for Kanaha Professional Plaza, LLC, Munekiyo & Hiraga, Inc., May 2010

Figures



AECOM

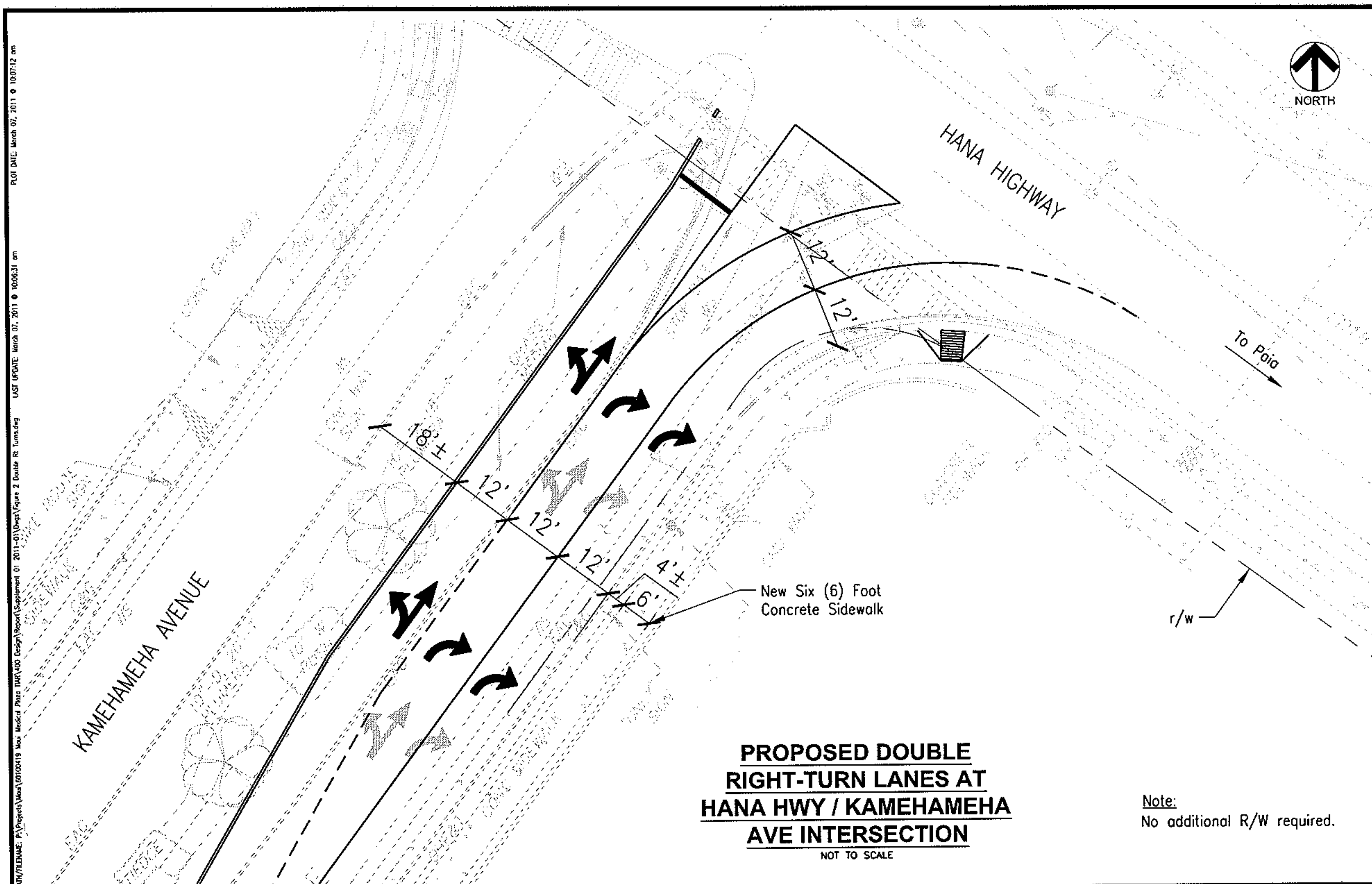
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 1

SITE PLAN

TRAFFIC IMPACT ANALYSIS REPORT, FIRST SUPPLEMENT
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011

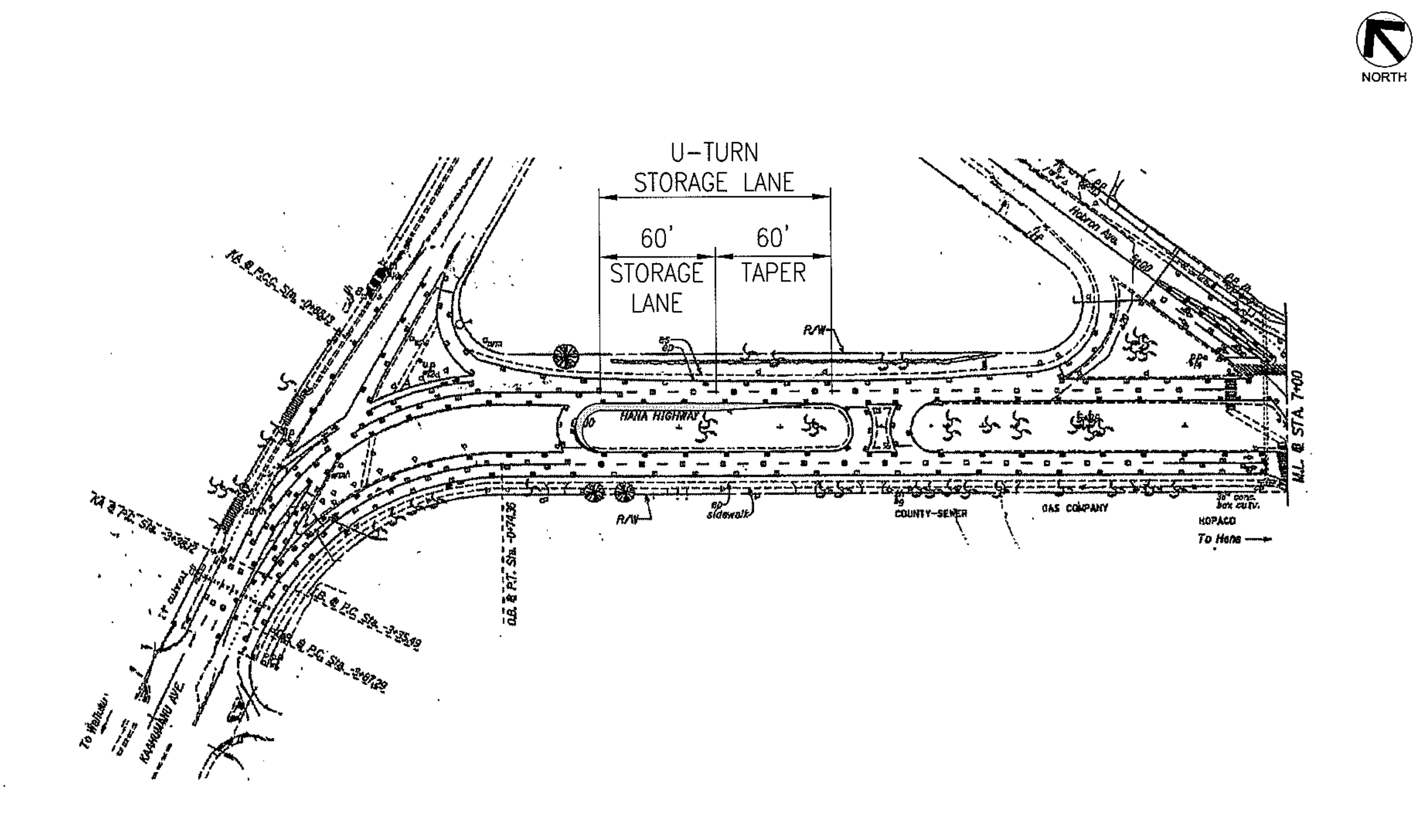


AECOM

1001 BISHOP STREET, SUITE 1600 · HONOLULU, HAWAII 96813

Figure 2
PROPOSED DOUBLE RT-TURN LANES
TRAFFIC IMPACT ANALYSIS REPORT, FIRST SUPPLEMENT
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011



PROPOSED U-TURN STORAGE LANE

NOT TO SCALE

AECOM

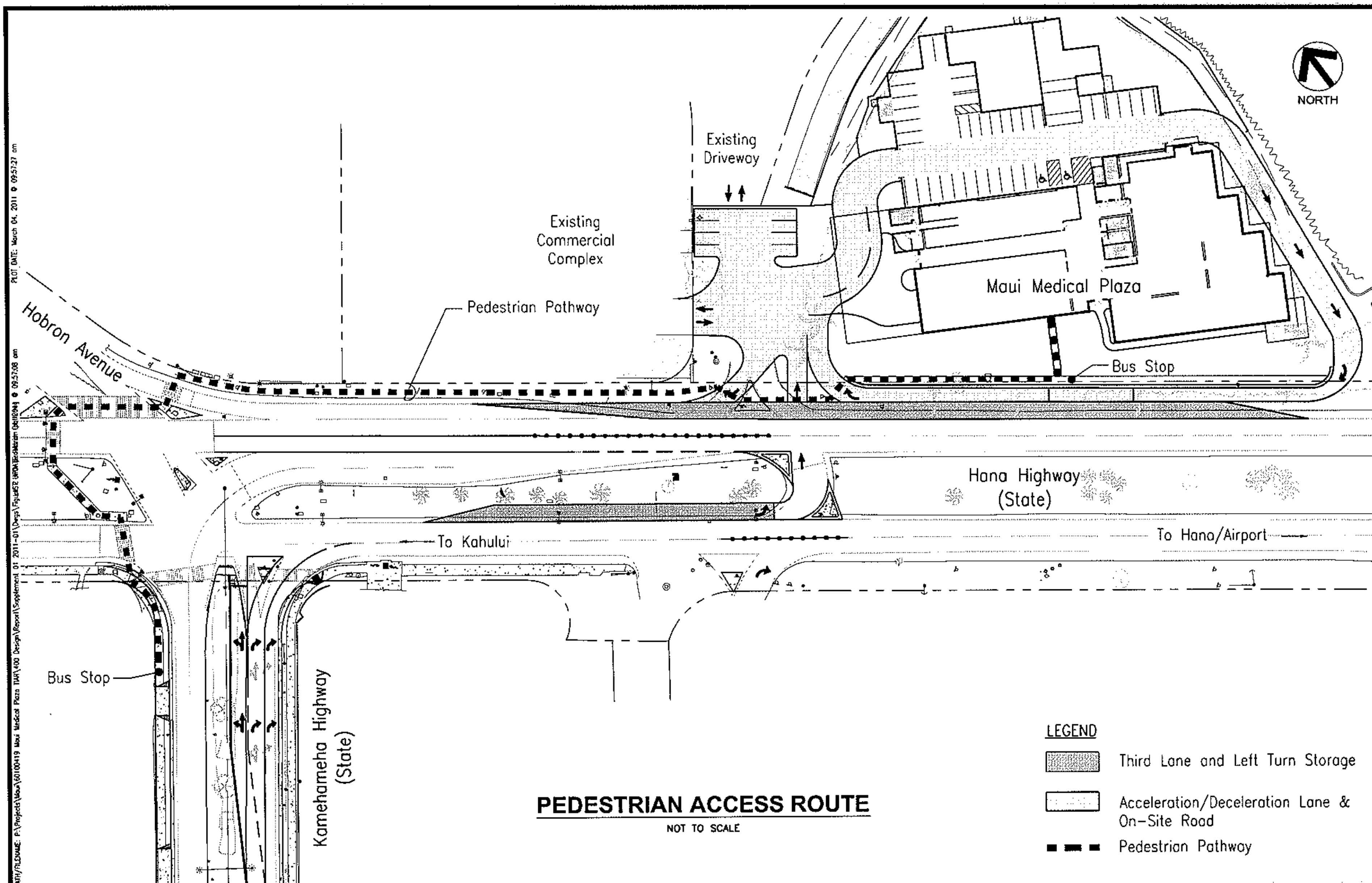
DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 3

PROPOSED U-TURN STORAGE LANE

TRAFFIC IMPACT ANALYSIS REPORT, FIRST SUPPLEMENT
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011



AECOM

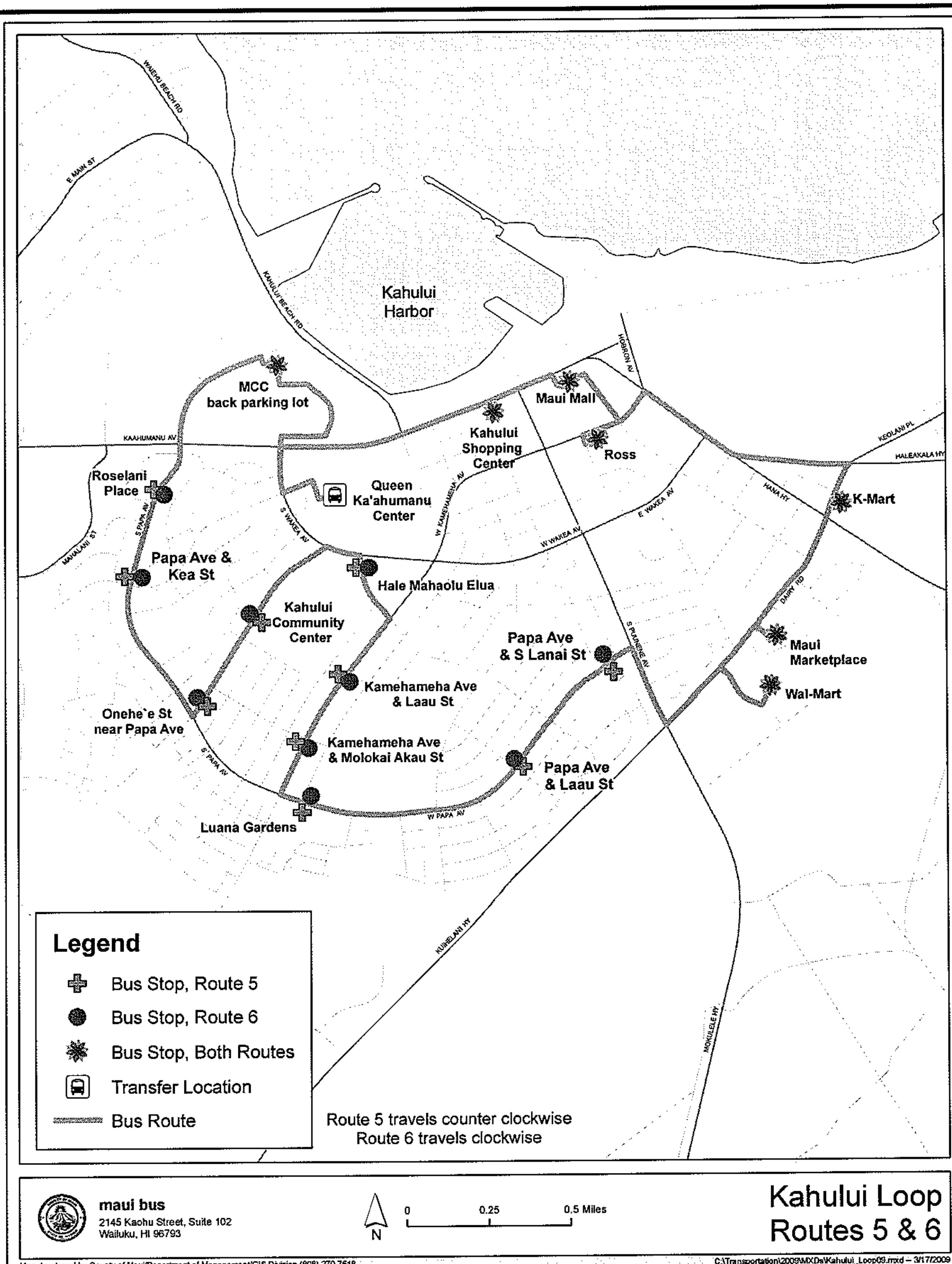
1001 BISHOP STREET, SUITE 1600 · HONOLULU, HAWAII 96813

Figure 4

PEDESTRIAN ACCESS ROUTE

TRAFFIC IMPACT ANALYSIS REPORT, FIRST SUPPLEMENT
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011



AECOM

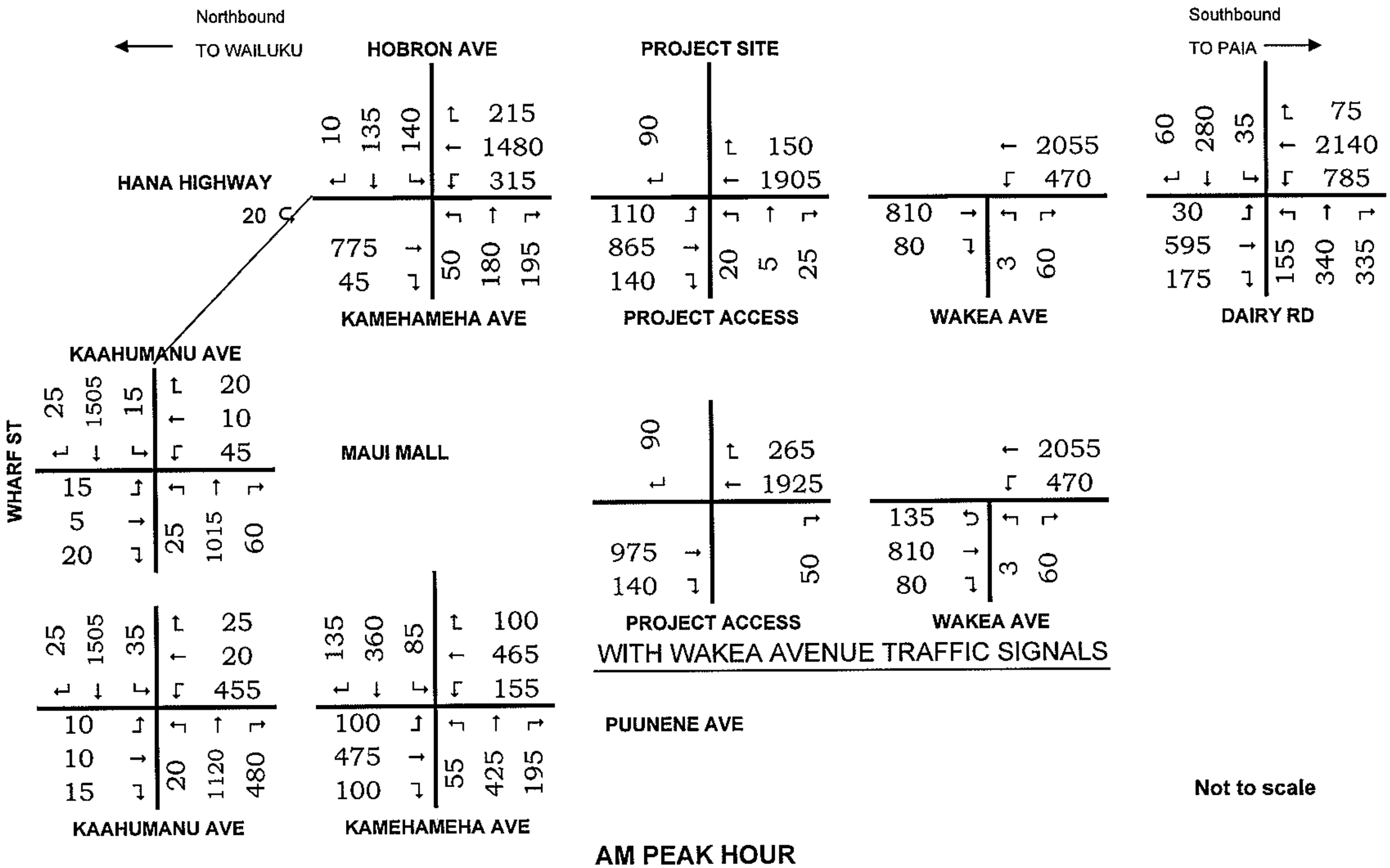
1001 BISHOP STREET, SUITE 1600 · HONOLULU, HAWAII 96813

Figure 5

KAHULUI LOOP BUS ROUTES 5 & 6

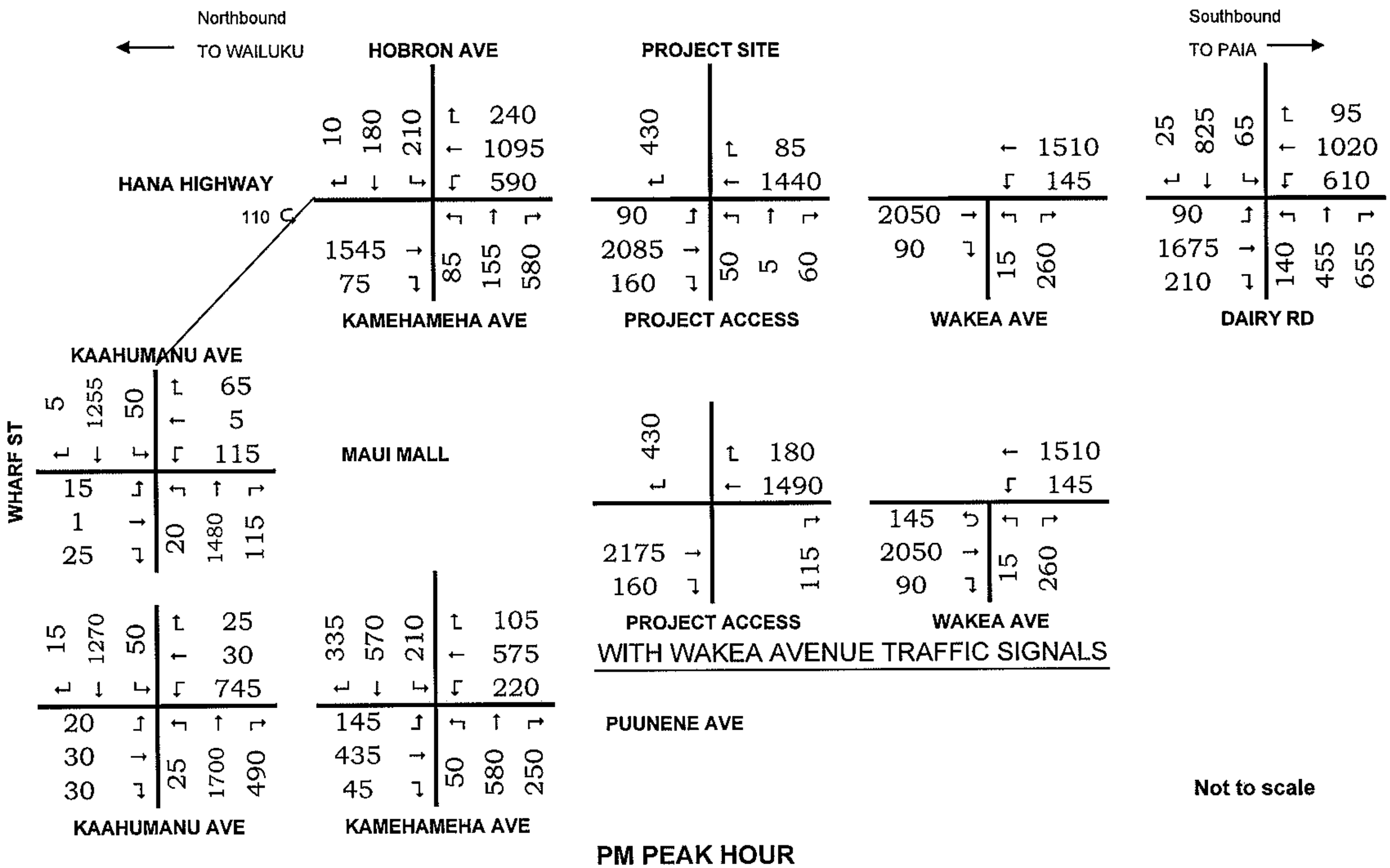
TRAFFIC IMPACT ANALYSIS REPORT, FIRST SUPPLEMENT
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011



2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH SECOND ENTRANCE

FIGURE 6A



2013 TOTAL WITH PROJECT TRAFFIC FORECAST WITH SECOND ENTRANCE

FIGURE 6B

Tables

TABLE 1
SIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

INTERSECTION	2009 EXISTING			2013 AMBIENT			2013 TOTAL HIGH Alternate 1			2013 TOTAL HIGH Alternate 2						2013 TOTAL HIGH Alternate 3					
										SPLIT PHASE			8 PHASE			SPLIT PHASE			8 PHASE		
	Cycle	LOS	Delay	Cycle	LOS	Delay	Cycle	LOS	Delay	Cycle	LOS	Delay	Cycle	LOS	Delay	Cycle	LOS	Delay	Cycle	LOS	Delay
AM PEAK HOUR																					
Kaahumanu Ave & Puunene Ave	150	C	30.7	150	C	24.3	140	C	27.5	130	C	25.3				140	C	23.7			
Kaahumanu Ave & Wharf St/Maui Mall	150	A	8.9	150	A	5.5	140	B	10.1	130	A	3.6				140	A	7.6			
Hana Hwy & Hobron/Kamehameha	130	C	26.2	150	D	39.8	140	C	27.7	130	C	30.2				140	C	28.2			
Hana Hwy & Wakea Ave	N/A			N/A			N/A			130	B	18.9				140	B	18.4			
Hana Hwy & Dairy Rd	130	D	39.3	130A	D	46.7	140	E	56.2	130	E	56.4				140	D	54.5			
PM PEAK HOUR																					
Kaahumanu Ave & Puunene Ave	150	D	40.6	150	E	57.8	160	D	50.2	160	E	55.2	160	D	53.2	150	E	57.0	160	D	54.9
Kaahumanu Ave & Wharf St/Maui Mall	150	B	12.4	150	B	12.1	160	B	12.9	160	B	10.6	160	B	12.5	150	B	13.0	160	B	13.0
Hana Hwy & Hobron/Kamehameha	140	F	91.7	150	F	128.8	160	E	70.4	160	E	64.1	160	F	86.3	150	D	37.3	160	E	58.9
Hana Hwy & Wakea Ave	N/A			N/A			N/A			160	C	25.9	160	C	27.1	150	B	18.2	160	B	17.6
Hana Hwy & Dairy Rd	140	E	66.5	150	E	76.7	160	F	88.3	160	F	89.6	160	F	89.7	150	F	88.7	160	F	89.9

Notes:
1. "Cycle" indicates Cycle Length, in seconds.
2. Alternate 1 includes project mandated improvements: two additional Northwest bound lanes on Hana Highway, double right turn lanes on Northeast approach of Kamehameha Avenue, and U-Turn storage lane on Hana Highway.
3. Alternate 2 includes Alternate 1 improvements and traffic signal at Wakea Avenue.
4. Alternate 3 includes Alternate 2 improvements and widening of Hana Highway from Kaahumanu Avenue to Dairy Road.
5. A after cycle length indicates actuated signal, not in coordination. Cycle length with no A following indicates coordinated traffic signal.

TABLE 2
LEVEL OF SERVICE ANALYSIS AT
HOBRON AVENUE APPROACH TO HANA HIGHWAY

	2013 AMBIENT			2013 TOTAL HIGH ALTERNATE 1			2013 TOTAL HIGH ALTERNATE 2			2013 TOTAL HIGH ALTERNATE 3		
	Cycle Length	LOS	Delay	Cycle Length	LOS	Delay	Cycle Length	LOS	Delay	Cycle Length	LOS	Delay
AM PEAK HOUR												
Intersection	150	D	39.8	140	C	27.7	130	C	30.2	140	C	28.2
Hobron Avenue												
SB Approach	30	F	85.4	27	E	78.9	24	E	76.4	32	E	75.6
SB Left Turn Lane		F	83.6		F	84.2		F	81.9		F	80.5
SB Through Lane		F	91.9		E	77.6		E	74.8		E	74.6
SB Right Turn Lane		C	25.4		C	24.8		C	23.5		C	24.0
PM PEAK HOUR												
Intersection	150	F	128.8	160	E	70.4	160	E	64.1	150	D	37.3
Hobron Avenue												
SB Approach	23	F	177.1	25	F	141.3	25	F	141.3	27	F	99.1
SB Left Turn Lane		F	187.4		F	169.1		F	169.1		F	114.7
SB Through Lane		F	173.9		F	115.4		F	115.4		F	85.2
SB Right Turn Lane		C	28.1		C	28.0		C	28.0		C	26.3

TABLE 3
LEVEL OF SERVICE ANALYSIS WITH HYPOTHETICAL SECONDARY ENTRANCE ON HOBRON AVENUE

	AM PEAK HOUR						PM PEAK HOUR					
	2013 TOTAL HIGH ALTERNATE 1 WITH NO SECONDARY ACCESS			2013 TOTAL HIGH ALTERNATE 1 WITH SECONDARY ENTRANCE			2013 TOTAL HIGH ALTERNATE 1 WITH NO SECONDARY ACCESS			2013 TOTAL HIGH ALTERNATE 1 WITH SECONDARY ENTRANCE		
	C.Len Phase	LOS	Delay	C.Len Phase	LOS	Delay	C.Len Phase	LOS	Delay	C.Len Phase	LOS	Delay
INTERSECTION	140	C	27.7	140	C	27.4	160	E	70.4	160	E	72.5
Hana Highway SE Bound	58	B	14.8	56	B	14.4	80	E	78.4	81	E	72.1
Hana Highway NW Bound	83	B	19.0	81	C	20.1	110	D	53.2	110	E	56.0
NWB Left	25	E	65.5	25	E	64.7	30	F	151.1	29	F	168.0
NWB Through	83	B	11.7	81	B	13.4	110	B	11.9	110	A	7.7
NWB Right	83	A	0.6	81	A	0.8	110	A	1.1	110	A	0.5
Kamehameha Ave	30	E	78.9	33	D	50.8	25	E	60.5	26	E	69.7
NB Left/Through	30	F	90.7	33	E	69.3	25	F	144.0	26	F	165.0
NB Right	30	D	36.1	33	C	29.0	25	C	30.9	26	C	30.3
Hobron Avenue	27	E	78.9	27	F	81.6	25	F	141.3	24	F	159.0
SB Left Turn Lane	27	F	84.2	27	F	87.3	25	F	169.1	24	F	190.0
SB Through Lane	27	E	77.6	27	E	79.5	25	F	115.4	24	F	130.4
SB Right Turn Lane	27	C	24.8	27	C	24.5	25	C	28.0	24	C	28.5

Appendix A

State of Hawai'i DOT and Maui County Agencies Comment Letters

10/ 3257

DOT Pkg rec'd Oct 5
Sent to Mark Roy
OCT 7

(4 letters)

LINDA LINGLE
GOVERNOR

'10 OCT -5 P12:39

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

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

MICHAEL D. FORMBY
INTERIM DIRECTOR

Deputy Directors
FRANCIS PAUL KEENO
JIRO A. SUMADA

IN REPLY REFER TO:

STP 8.0237

September 30, 2010

Ms. Kathleen Ross Aoki
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Aoki:

Subject: Maui Medical Plaza Project (MMPP)
Special Management Area Use Permit (SM1 1020/0006) and
Draft Environmental Assessment (DEA 2010/0002)

The State Department of Transportation (DOT) previously commented on the SMA/ DEA for the subject project in its letter STP 8.0209 dated September 1, 2010 (attached) and for the subject project's request for vehicle access rights in its letter HWY-RM 3.87594 dated 3/4/10 (attached). DOT now offers the following supplemental comments on the Revised Traffic Impact Analysis Report (RTIAR) dated January 2010.

1. The applicant shall provide the following improvements at no cost to the State:

   a. Widen northwest bound Hana Highway to include three (3) lanes and a new acceleration/deceleration lane as described on page 20.

   b. Graphically, Figure 2 shows a bus stop in the middle of the acceleration/deceleration lane. This is not acceptable for new construction projects on a major urban arterial highway, particularly when the lane is designed as an acceleration/deceleration lane.

   c. Develop and implement a traffic management plan (TMP) that includes proactive programs to lower trip generation rates, as noted on page 21 of the RTIAR. Submit the TMP to DOT for review and approval.

   d. Improve Hana Highway and Kamehameha Avenue/Hobron Avenue intersection as discussed in the RTIAR. It is DOT's understanding that eliminating the split phasing will provide more capacity through the intersection. DOT recommends implementing the alternative that will provide a better Level of Service (LOS), thus improving operation of the intersection.

e. The Traffic Engineer needs to verify the ultimate number of phases at the Hana Highway and Kamehameha Avenue/Hobron Avenue intersection. DOT does not envision this intersection becoming an 8-phase movement.

f. The RTIAR should discuss transit and pedestrian circulation.

g. The effects of a coordinated system from Kaahumanu Avenue to Kahului Airport Access Road should be included in the RTIAR.

2. The applicant has agreed to also build the third lane of Hana Highway fronting the Medical Plaza. The developer needs to coordinate its design with the Highways Division and its consultants for the Hana Highway widening project and the traffic signal improvements at Wakea Avenue for the general design parameters and geometrics, including median size, lane width, tapers, etc. This agreement will most likely require a written agreement between the medical center and DOT. It will be important to identify whose project goes first, and agreement on the typical section and right-of-way to detail out their mitigation and costs.

3. Plans for construction in the State highway right-of-way shall be submitted to the Highways Division Maui District Office for review and approval, along with plans for onsite construction. All improvements required in the State highway right-of-way shall be provided at no cost to the State and shall conform to current State requirements and federal guidelines, including the Americans with Disabilities Act.

4. No additional stormwater will be permitted in the State highway right-of-way.

DOT appreciates the opportunity to provide comments. If there are any questions, including the need to meet with Highways Division staff, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 831-7976.

Very truly yours,

Francis Paul Keeno

for MICHAEL D. FORMBY
Interim Director of Transportation

Attachments: STP ltr 8.0209 dtd 9/1/10
HWY-RM ltr 3.87594 dtd 3/4/10

STP (SLP)

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
JIRO A. SUMADA

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

IN REPLY REFER TO:
DIR 0880
STP 8.0209

September 1, 2010

Ms. Kathleen Ross Aoki
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Aoki:

Subject: Maui Medical Plaza Project (MMPP)
Special Management Area Use Permit (SM1 1020/0006) and
Draft Environmental Assessment (DEA 2010/0002)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

DOT understands that the proposed MMPP involves the construction of a professional medical plaza on a 2.5-acre parcel. The project includes a six (6) story building with a total floor area of 140,000 square feet, a six (6) level parking structure with 365 parking stalls and accesses to Hana Highway.

The subject MMPK project may generate adverse impacts to the State highway, Hana Highway and to the State airport, Kahului Airport. DOT has recently provided comments regarding the subject project as follows.

1. To the Maui County Planning Department

    a. Wetland Mitigation Plan and SMA Assessment Application (STP 8.3405 dated 9/10/09),
    b. SMA permit (STP 8.3153 dated 3/5/09, and STP 8.3144 dated 2/27/09),

2. To the U.S. Army Corps of Engineers (USACE) regarding the wetland permit action (STP 8.3097 dated 1/26/09); and

3. To Philip Rowell, Traffic Consultant, in response to an early consultation request for a Traffic Impact Analysis Report (STP 8.2795 dated 3/7/08, and HWY-PS 2.7531 dated 4/7/08).

STP 8.0209

Copies of these letters are attached and all prior DOT comments remain valid and applicable to the subject project.

DOT Airports Division comments are covered in the attached items. However, DOT Highways Division is still conducting its review of the subject SMA & DEA and will provide additional comments as necessary.

DOT appreciates your staff granting DOT the additional time needed to review and comment on this important project. If there are any questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

SLP:km

Attachments:

STP 8.3405 dated 9/10/09
STP 8.3153 dated 3/5/09
STP 8.3144 dated 2/27/09
STP 8.3097 dated 1/26/09
HWY-PS 2.7531 dated 4/7/08
STP 8.2795 dated 3/7/08
GEO 2427 dated 2/12/1969
MOU Preservation of Kahana Pond dated 10/01/96
MOA Address Aircraft-Wildlife Strikes, 2003
FAA Advisory Circular 150/5200-33B Hazardous Wildlife Attractants on or Near Airports
USDA, APHIS-WS letter dated 8/31/09

bc: AIR-EP, AIR-M, HWY-M, HWY-P, STP(SLP)

LINDA LINGLE
GOVERNOR

HIGHWAY DESIGN BRANCH, ROOM 688A
BRIDGE DESIGN SECTION, ROOM 611
CADASTRAL DESIGN SECTION, ROOM 600
HIGHWAY DESIGN SECTION, ROOM 609
HYDRAULIC DESIGN SECTION, ROOM 636
TECHNICAL DESIGN SERVICE, ROOM 688

RIGHT-OF-WAY BRANCH, ROOM 691

TRAFFIC BRANCH, ROOM 602

MOTOR VEHICLE SAFETY OFFICE, ROOM 511

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION AT KAPOLEI
601 KAMOKILA BOULEVARD, ROOM 691
KAPOLEI, HAWAII 96707

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
BRIAN H. SEKIGUCHI
JIRO A. SUMADA

IN REPLY REFER TO:

HWY-RM
3.87594

RECEIVED
MAR 2 2 2010
By________

March 18, 2010

Mr. Lloyd P.C.W. Lee, Sr., P.E.
Senior Project Manager
AECOM Pacific, Inc.
100 Pauahi Street, Suite 207
Hilo, Hawaii 96720

Dear Mr. Lee:

SUBJECT: HALEAKALA ROAD AND PAIA SPUR
HAWAII PROJECT NO. DA-NC 8(1)
KAHULUI TOWN TO KAUNOA SCHOOL
TMK: (2) 3-7-11: 028
REQUEST FOR VEHICLE ACCESS RIGHTS:
MAUI MEDICAL PLAZA AT KANAHA

We have conceptually approved your request and shall continue to process your request subject to the following conditions:

1. Kanaha Professional Plaza, LLC (KPP) shall comply with all applicable statutes, ordinances, rules and regulations of the Federal, State and County governments.

2. All improvements (driveways/sidewalks, etc.) must comply with current Americans with Disabilities Act (ADA) requirements. The driveway layout must conform to Department of Transportation standards for residential driveways.

3. KPP must execute a "Grant of Limited Vehicle Access Rights" document whereby you are granted access for your proposed use and all other rights of vehicle access are restricted along the remainder of the property's Hana Highway frontage.

4. KPP must submit an updated title search for their property, TMK: (2) 3-7-11: 028 to show status of title.

5. KPP shall be responsible for all costs associated with the stipulated highway improvements for the access location.

6. Please provide proof of H.R.S. Chapter 343-5 compliance (E.A. or E.I.S. documentation) when submitting your application for Permit to Perform Work upon State Highways.

EXHIBIT C

7. The requested access shall be granted for the proposed use. Any future increase in density of the lot by an owner, via CPR or the subdivision of the existing/proposed lots, shall require the owner to obtain the use of additional access rights to Hana Highway.

8. KPP must submit two (2) copies of metes and bounds description of the subject area along with a parcel map, which will be used as Exhibits to the document.

9. KPP must submit four (4) sets of construction plans to our Maui Permit Engineer, at our Maui District Office, 650 Palapala Drive, Kahului, Hawaii 96732, for review and approval.

10. KPP shall defend, hold harmless and indemnify the State, from and against all claims or demands for bodily injury, property damage and/or death.

11. KPP shall be responsible for all documentation and recording fees incurred for the requested access.

12. The Highways Division reserves the right to add or impose additional conditions as necessary to mitigate adverse impacts to the State.

If KPP is agreeable to the foregoing conditions, please sign the acceptance portion of this letter and return it to our office. If we do not receive the signed acceptance portion within thirty (30) days from the date of this letter, we will assume you are no longer interested in pursuing the matter.

If you have any questions, please call me at 692-7338.

Very truly yours,

Jaime K. Yamashiro

JAIME K. YAMASHIRO
Right-of-Way Agent
Property Management Section

ACCEPTANCE:

Kanaha Professional Plaza, LLC accepts all terms and conditions as set forth in the Department of Transportation letter (ref. HWY-RM 3.87594) dated March 18, 2010.

Robert T. McDaniel III   Date: 3.25.2010

Print Name: Robert T. McDaniel III

Its: Member

STP (SLP)

LINDA LINGLE
GOVERNOR

BRENNON T. MORIOKA
DIRECTOR

Deputy Directors
MICHAEL D. FORMBY
FRANCIS PAUL KEENO
JIRO A. SUMADA

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

IN REPLY REFER TO:
DIR 0880
STP 8.0209

September 1, 2010

Ms. Kathleen Ross Aoki
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Ms. Aoki:

Subject: Maui Medical Plaza Project (MMPP)
Special Management Area Use Permit (SM1 1020/0006) and
Draft Environmental Assessment (DEA 2010/0002)

Thank you for requesting the State Department of Transportation's (DOT) review of the subject project.

DOT understands that the proposed MMPP involves the construction of a professional medical plaza on a 2.5-acre parcel. The project includes a six (6) story building with a total floor area of 140,000 square feet, a six (6) level parking structure with 365 parking stalls and accesses to Hana Highway.

The subject MMPK project may generate adverse impacts to the State highway, Hana Highway and to the State airport, Kahului Airport. DOT has recently provided comments regarding the subject project as follows.

1. To the Maui County Planning Department

   a. Wetland Mitigation Plan and SMA Assessment Application (STP 8.3405 dated 9/10/09),
   b. SMA permit (STP 8.3153 dated 3/5/09, and STP 8.3144 dated 2/27/09),

2. To the U.S. Army Corps of Engineers (USACE) regarding the wetland permit action (STP 8.3097 dated 1/26/09); and

3. To Philip Rowell, Traffic Consultant, in response to an early consultation request for a Traffic Impact Analysis Report (STP 8.2795 dated 3/7/08, and HWY-PS 2.7531 dated 4/7/08).

Ms. Kathleen Ross Aoki
Page 2
September 1, 2010

STP 8.0209

Copies of these letters are attached and all prior DOT comments remain valid and applicable to the subject project.

DOT Airports Division comments are covered in the attached items. However, DOT Highways Division is still conducting its review of the subject SMA & DEA and will provide additional comments as necessary.

DOT appreciates your staff granting DOT the additional time needed to review and comment on this important project. If there are any questions, please contact Mr. David Shimokawa of the DOT Statewide Transportation Planning Office at telephone number (808) 587-2356.

Very truly yours,

BRENNON T. MORIOKA, Ph.D., P.E.
Director of Transportation

SLP:km

Attachments:

STP 8.3405 dated 9/10/09
STP 8.3153 dated 3/5/09
STP 8.3144 dated 2/27/09
STP 8.3097 dated 1/26/09
HWY-PS 2.7531 dated 4/7/08
STP 8.2795 dated 3/7/08
GEO 2427 dated 2/12/1969
MOU Preservation of Kahana Pond dated 10/01/96
MOA Address Aircraft-Wildlife Strikes, 2003
FAA Advisory Circular 150/5200-33B Hazardous Wildlife Attractants on or Near Airports
USDA, APHIS-WS letter dated 8/31/09

bc: AIR-EP, AIR-M, HWY-M, HWY-P, STP(SLP)

CHARMAINE TAVARES
Mayor
KATHLEEN ROSS AOKI
Director
ANN T CUA
Deputy Director

OCT 19 2010

COUNTY OF MAUI
DEPARTMENT OF PLANNING

October 15, 2010

Mr. Jonathan Starr, Chair
and Members of the Maui Planning Commission
250 South High Street
Wailuku, Hawaii 96793

Dear Chair Starr:

SUBJECT: URBAN DESIGN REVIEW BOARD (UDRB) COMMENTS ON THE SPECIAL MANAGEMENT AREA (SMA) USE PERMIT APPLICATION AND DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR THE PROPOSED MAUI MEDICAL PLAZA PROJECT AND RELATED IMPROVEMENTS LOCATED AT KAHULUI, ISLAND OF MAUI, HAWAI`I; TMK: (2) 3-7-011:028 (SM1 2010/0006) (EA 2010/0002)

At its regular meeting on September 7, 2010 and continued on October 5, 2010, the Urban Design Review Board (UDRB) reviewed the SMA Use Permit Application and Draft EA May 2010, referenced above. Based upon those discussions and questions to the Applicant and Applicant's representatives, the Board voted 6-2 to recommend approval of the project to the Maui Planning Commission, as presented and as based on the six-story design.

The UDRB also issued three (3) design-related recommendations, as stated below:

1. Consider options for adding third-level (third-story) shading, where there is no shading design now;

2. Study bicycle traffic options and include them in the Final EA. Continue to work with the State Department of Transportation on options that would provide for improved bicycle access to the project. Design bicycle access into traffic patterns; and

3. Recommend that the proposed bus stop not be located as part of the proposed acceleration-deceleration lane as depicted in the site plans presented. Locate the bus stop close to the project.

As noted in the main UDRB motion to recommend approval of the project plans, several UDRB members expressed some concern regarding the six-story height of the proposed project.

Please address each of the above-noted recommendations in the Final EA and SMA Use Permit hearing.

The Department of Planning notes that, for the record, Mr. Bryan Maxwell, UDRB member, recused himself from deliberating and voting on the project. Mr. Morgan Gerdal, new UDRB member, was present and voted.

Thank you for your cooperation. If additional clarification is required, please contact Coastal Resource Planner James Buika at james.buika@mauicounty.gov or at (808) 270-6271.

Sincerely,

Kathleen Ross Aoki for

LINDA OKAMOTO, Chair
Urban Design Review Board

xc: Ann T. Cua, Deputy Director
Clayton I. Yoshida, AICP, Planning Program Administrator
James A. Buika, Staff Planner
Mark Alexander Roy, Munekiyo & Hiraga, Inc.
Urban Design Review Board Members
Project File
General File

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CHARMAINE TAVARES
MAYOR

DON A. MEDEIROS
Director
WAYNE A. BOTEILHO
Deputy Director
Telephone (808) 270-7511
Facsimile (808) 270-7505

DEPARTMENT OF TRANSPORTATION

November 23, 2010

COUNTY OF MAUI
200 South High Street
Wailuku, Hawaii, USA 96793-2155

Kathleen Ross Aoki, Director
Attn: James Buika, Staff Planner
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

SUBJECT: Proposed Maui Medical Plaza and Related Improvements at TMK(2) 3-7-011:028, Kahului, Maui, Hawaii (SM1 2010/0006, EA 2010/0002)

Dear Ms. Aoki:

We have reviewed the SMA Use Permit application and Draft Environmental Assessment (EA) for the subject project and are providing the following comments:

We agree that the location for the proposed bus stop, as identified in Figure 12 of the Draft EA, is appropriate towards facilitating the future growth of the Maui Bus network in the future. With this in mind, the applicant has offered to contribute funding to the Maui County Department of Transportation (MDOT) for the construction of a bus shelter at this location. This funding would be provided by Kanaha Professional Plaza, LLC at such time that the MDOT implements operations at the bus stop as part of the Kahului operational network of the Maui Bus.

Should you have any questions, please feel free to call me at 873-3535.

Very truly yours,

Don Medeiros
Director

DM:tn
cc: Mark Alexander Roy, Munekiyo & Hiraga, Inc.
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AUG 27 2010

CHARMAINE TAVARES
Mayor
KATHLEEN ROSS AOKI
Director
ANN T. CUA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

August 24, 2010

Mark Alexander Roy, AICP
Project Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, Hawai'i 96793

Dear Mr. Roy:

SUBJECT: MAUI PLANNING COMMISSION COMMENTS ON THE DRAFT ENVIRONMENTAL ASSESSMENT FOR THE PROPOSED MAUI MEDICAL PLAZA PROJECT AND RELATED IMPROVEMENTS, LOCATED AT KAHULUI, MAUI, HAWAI'I; TMK: (2) 3-7-011:028 (SM1 2010/0006) (EA 2010/0002)

At its regular meeting on July 27, 2010 and continued on August 10, 2010, the Maui Planning Commission (Commission) reviewed the Draft Environmental Assessment (DEA), May 2010, referenced above. Based upon those discussions and questions to the Applicant and Applicant's representatives, the Commission's twenty-eight (28) requests for additional information are listed below:

1. Provide analysis on conformity of the project with the Kahului-Wailuku Community Plan. In particular, address objectives and policies relating to preservation of scenic vistas and stepping height of buildings away from commercial areas;

2. Provide current perimeter length of Hana Highway and Old Haleakala Highway bordering Kanaha Pond. What percentage of the length of the perimeter of the scenic vista will be lost due to placement of buildings?

3. Provide scaled model views of the proposed buildings from different locations, such as Maui Mall, Costco, Dairy Road, and Hana Highway, Kahului;

4. Provide three (3) and four (4) story alternative renderings of the building;

5. Provide information on the previous design proposal that was considered for the Maui Medical Plaza Project prior to the initial consultation meetings with the Urban Design Review Board;

6. Provide samples of plants thriving on other buildings near the shoreline at elevations similar to those proposed in the landscaped planters for the project;

7. Provide statistical information on uses that are proposed to occupy the Maui Medical Plaza building to demonstrate the need for this kind of proposed space;

8. Provide an analysis of the three-dimensional flight pattern (vertical, left, and right) taken by aircraft using Runway 5 at Kahului Airport;

9. Provide an analysis of the traffic mitigation being proposed to maintain vehicle movement in and out of the Kahului harbor area via Hobron Avenue, Kahului;

10. Provide an analysis of strategic traffic intersections around Lot 8, the impact from 365 vehicles from the project, and how any impacts will be mitigated;

11. Provide further information on the potential use of an alternative entrance (to Lot 8) from Hobron Avenue;

12. Explain the drainage easements on the property and how the project will ensure the continued maintenance of the Kahului drainage canals;

13. Provide an explanation of the proposed retention basins relative to both the State Highway right-of-way (along Hana Highway) and the drainage easements on the property;

14. Discuss the potential impact of sea level rise on the proposed drainage system for the project;

15. Address potential tsunami hazard impacts;

16. Provide an explanation about where the water supply for the project will come from and if there is an existing water commitment;

17. Provide information on the proposed fill for the parcel;

18. Describe the geology of the parcel and the proposed foundation system design and pilings structure for the buildings;

19. Estimate total electrical power usage for the project. Discuss electric power reduction strategies and alternative energy options, such as wind and photovoltaic;

20. Address an alternative of centrally dealing with hazardous waste generated by the facility;

21. Provide an analysis of potential lighting and shadow impacts from the Maui Medical Plaza Building and the proposed parking garage structure;

22. Explain how the project would impact the potential creation of an instrument approach to Runway 5 at the Kahului Airport;

23. Discuss future plans for the Kahului Airport;

24. Provide additional information (in Alternatives Analysis section of the DEA) on the site selection process that was conducted for the project;

25. Provide information on heights of comparable (existing and proposed) commercial structures in the Wailuku - Kahului Community Plan region;

26. Provide more background information in the DEA on alternatives considered during the U.S. Army Corps of Engineer's wetland mitigation plan review and acceptance process;

27. Confirm with the Department of Planning's Zoning Administration and Enforcement Division that M-2 zoning allows the proposed elevator shaft above the sixth story of the Maui Medical Plaza building; and

28. Discuss the proposed grading plan for the project and include finished elevations for the project site following construction.

Please address each of the above requests for more information in the Final Environmental Assessment.

Thank you for your cooperation. If additional clarification is required, please contact Coastal Resource Planner James Buika at james.buika@mauicounty.gov or at (808) 270-6271.

Sincerely,

Kathleen Ross Aoki

KATHLEEN ROSS AOKI
Planning Director

xc: Ann T. Cua, Deputy Director
Clayton I. Yoshida, AICP, Planning Program Administrator
Maui Planning Commission
James A. Buika, Staff Planner
EA 2010/0002 file
Project File
General File

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Appendix B

Synchro Worksheets

AM Peak Worksheets

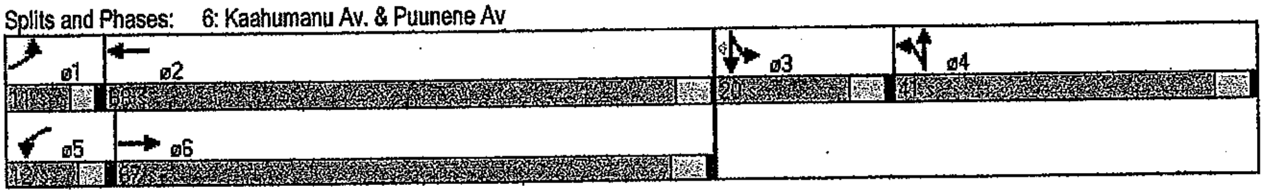
For Tables 1 and 2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	20	1120	35	1505	455	20	10	15
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	67.0	12.0	68.0	41.0	41.0	20.0	20.0
Total Split (%)	7.9%	47.9%	8.6%	48.6%	29.3%	29.3%	14.3%	14.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.0	63.9	5.8	67.1	35.0	35.0	14.0	14.0
Actuated g/C Ratio	0.04	0.46	0.04	0.48	0.25	0.25	0.10	0.10
v/c Ratio	0.34	0.76	0.52	0.68	0.64	0.64	0.12	0.10
Control Delay	80.5	33.1	113.2	14.0	41.8	40.9	59.3	24.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.5	33.1	113.2	14.0	41.8	40.9	59.3	24.7
LOS	F	C	F	B	D	D	E	C
Approach Delay		33.7		16.2		41.3	44.8	
Approach LOS		C		B		D	D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 79 (56%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 27.5 Intersection LOS: C
Intersection Capacity Utilization 62.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

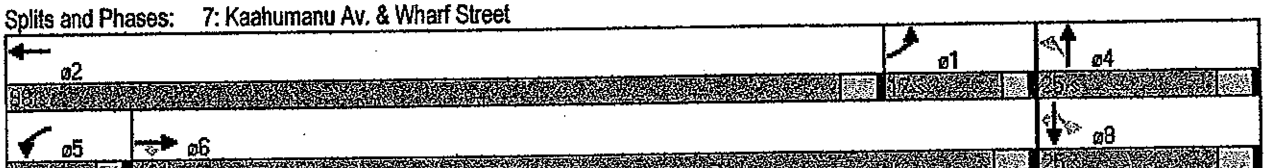


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↱	↰	↱		↰	↱
Volume (vph)	25	1015	60	15	1505	45	10	15	5	20
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	17.0	101.0	101.0	14.0	98.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.1%	72.1%	10.0%	70.0%	17.9%	17.9%	17.9%	17.9%	17.9%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes					
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	9.2	104.1	104.1	5.9	98.8	19.0	19.0		19.0	19.0
Actuated g/C Ratio	0.07	0.74	0.74	0.04	0.71	0.14	0.14		0.14	0.14
v/c Ratio	0.23	0.42	0.05	0.22	0.46	0.26	0.13		0.10	0.09
Control Delay	34.6	0.7	0.1	69.7	13.2	58.4	28.7		54.7	20.4
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	34.6	0.8	0.1	69.7	13.2	58.4	28.7		54.7	20.4
LOS	C	A	A	E	B	E	C		D	C
Approach Delay		1.5			13.8		46.4		37.5	
Approach LOS		A			B		D		D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 80 (57%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.46
Intersection Signal Delay: 10.1 Intersection LOS: B
Intersection Capacity Utilization 51.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

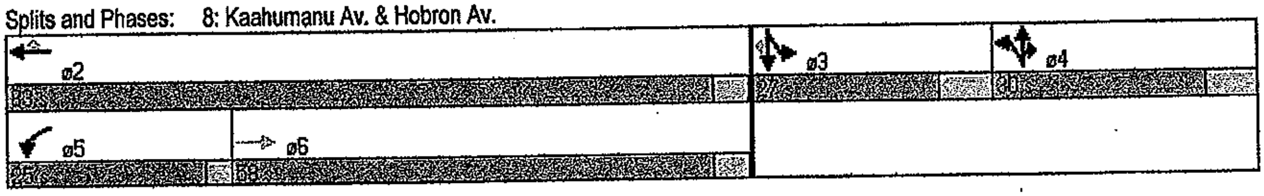


Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	775	315	1480	215	130	245	140	135	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	29.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	58.0	25.0	83.0	83.0	30.0	30.0	27.0	27.0	27.0
Total Split (%)	41.4%	17.9%	59.3%	59.3%	21.4%	21.4%	19.3%	19.3%	19.3%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	-1.0	-1.0	-1.0	-1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	52.5	21.0	77.5	77.5	27.3	27.3	15.7	15.7	16.7
Actuated g/C Ratio	0.38	0.15	0.55	0.55	0.20	0.20	0.11	0.11	0.12
v/c Ratio	0.67	0.66	0.82	0.24	0.55	0.35	0.76	0.70	0.06
Control Delay	14.8	65.5	11.7	0.6	90.7	36.1	84.2	77.6	24.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	65.5	11.7	0.6	90.7	36.1	84.2	77.6	24.8
LOS	B	E	B	A	F	D	F	E	C
Approach Delay	14.8		19.0		59.3			78.9	
Approach LOS	B		B		E			E	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 27.7 Intersection LOS: C
Intersection Capacity Utilization 74.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.

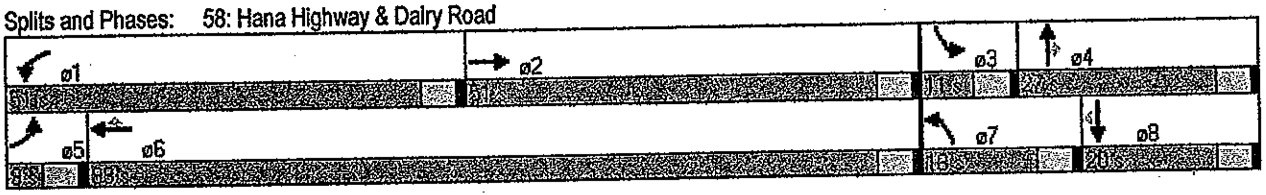


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	30	595	785	2140	75	155	340	335	35	280	60
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	9.0	51.0	51.0	93.0	93.0	18.0	27.0	27.0	11.0	20.0	20.0
Total Split (%)	6.4%	36.4%	36.4%	66.4%	66.4%	12.9%	19.3%	19.3%	7.9%	14.3%	14.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	3.3	51.7	38.6	87.0	87.0	12.0	22.9	22.9	4.8	13.7	14.7
Actuated g/C Ratio	0.02	0.37	0.28	0.62	0.62	0.09	0.16	0.16	0.03	0.10	0.10
v/c Ratio	0.80	0.45	0.90	1.05	0.08	1.11	0.64	0.65	0.64	0.88	0.29
Control Delay	138.8	19.1	61.9	62.5	4.8	163.0	61.1	11.2	109.2	87.8	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	138.8	19.1	61.9	62.5	4.8	163.0	61.1	11.2	109.2	87.8	18.4
LOS	F	B	E	E	A	F	E	B	F	F	B
Approach Delay		23.7		60.9			60.0			78.8	
Approach LOS		C		E			E			E	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 63 (45%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.11
Intersection Signal Delay: 56.2 Intersection LOS: E
Intersection Capacity Utilization 98.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

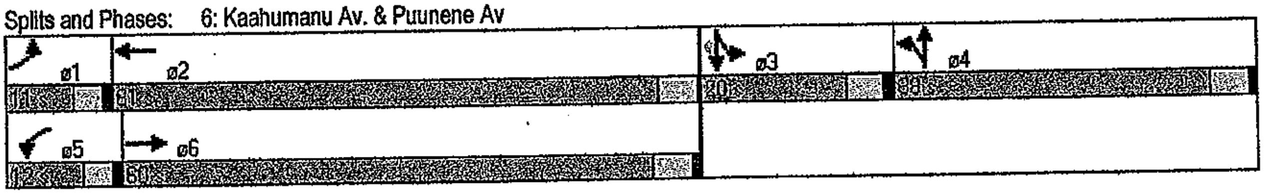


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	20	1120	35	1505	455	20	10	15
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	60.0	12.0	61.0	38.0	38.0	20.0	20.0
Total Split (%)	8.5%	46.2%	9.2%	46.9%	29.2%	29.2%	15.4%	15.4%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	4.9	57.0	5.7	60.1	32.0	32.0	14.0	14.0
Actuated g/C Ratio	0.04	0.44	0.04	0.46	0.25	0.25	0.11	0.11
v/c Ratio	0.32	0.79	0.49	0.71	0.65	0.65	0.12	0.09
Control Delay	73.7	33.4	96.5	8.9	41.6	40.7	54.1	22.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	73.7	33.4	96.5	8.9	41.6	40.7	54.1	22.9
LOS	E	C	F	A	D	D	D	C
Approach Delay		33.9		10.9		41.1	41.0	
Approach LOS		C		B		D	D	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 57 (44%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.79
Intersection Signal Delay: 25.3 Intersection LOS: C
Intersection Capacity Utilization 62.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av



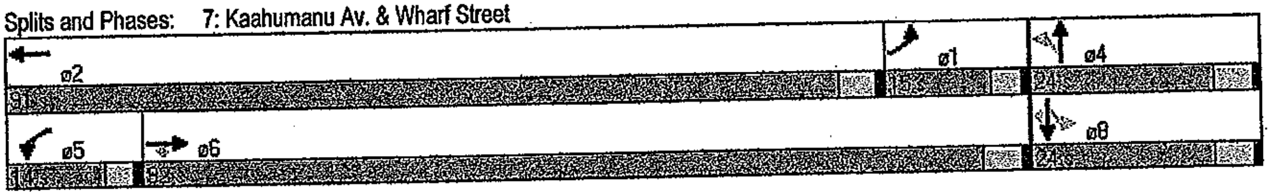
Timings
7: Kaahumanu Av. & Wharf Street

1/22/2011

Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	25	1015	60	15	1505	45	10	15	5	20
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	15.0	92.0	92.0	14.0	91.0	24.0	24.0	24.0	24.0	24.0
Total Split (%)	11.5%	70.8%	70.8%	10.8%	70.0%	18.5%	18.5%	18.5%	18.5%	18.5%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lag	Lag	Lead	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes					
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	8.0	95.2	95.2	5.8	91.0	18.0	18.0		18.0	18.0
Actuated g/C Ratio	0.06	0.73	0.73	0.04	0.70	0.14	0.14		0.14	0.14
v/c Ratio	0.25	0.42	0.06	0.21	0.47	0.25	0.13		0.10	0.09
Control Delay	29.8	0.7	0.1	81.1	1.6	54.0	27.0		50.5	19.6
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	29.8	0.8	0.1	81.1	1.6	54.0	27.0		50.5	19.6
LOS	C	A	A	F	A	D	C		D	B
Approach Delay		1.4			2.4		43.1		35.0	
Approach LOS		A			A		D		D	

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 58 (45%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow	
Natural Cycle: 45	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.47	
Intersection Signal Delay: 3.6	Intersection LOS: A
Intersection Capacity Utilization 51.3%	ICU Level of Service A
Analysis Period (min) 15	

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

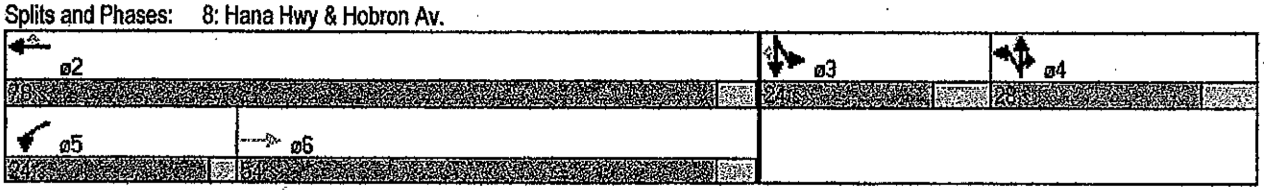


Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	775	315	1480	215	130	245	140	135	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	54.0	24.0	78.0	78.0	28.0	28.0	24.0	24.0	24.0
Total Split (%)	41.5%	18.5%	60.0%	60.0%	21.5%	21.5%	18.5%	18.5%	18.5%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	48.5	20.0	72.5	72.5	23.7	23.7	14.3	14.3	15.3
Actuated g/C Ratio	0.37	0.15	0.56	0.56	0.18	0.18	0.11	0.11	0.12
v/c Ratio	0.68	0.65	0.81	0.24	0.58	0.37	0.77	0.71	0.06
Control Delay	21.7	65.5	24.9	7.0	39.0	5.1	81.9	74.8	23.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.7	65.5	24.9	7.0	39.0	5.1	81.9	74.8	23.5
LOS	C	E	C	A	D	A	F	E	C
Approach Delay	21.7		29.3		19.5			76.4	
Approach LOS	C		C		B			E	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.81
Intersection Signal Delay: 30.2 Intersection LOS: C
Intersection Capacity Utilization 74.5% ICU Level of Service D
Analysis Period (min) 15

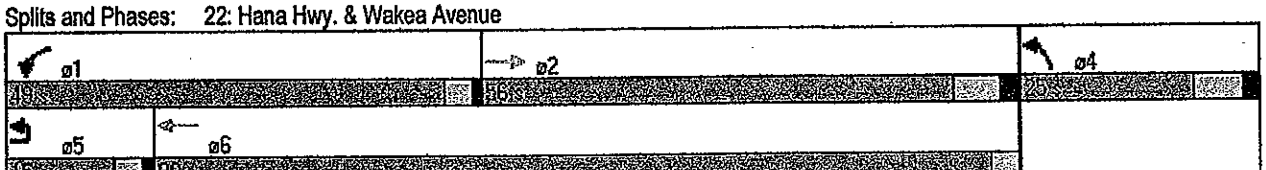
Splits and Phases: 8: Hana Hwy & Hobron Av.



Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	95	795	470	1965	3
Turn Type	Prot		Prot		
Protected Phases	5		1		4
Permitted Phases		2		6	
Detector Phase	5	2	1	6	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	8.0	20.0	25.0
Total Split (s)	15.0	56.0	49.0	90.0	25.0
Total Split (%)	11.5%	43.1%	37.7%	69.2%	19.2%
Yellow Time (s)	3.0	5.0	3.0	3.0	5.0
All-Red Time (s)	1.0	2.0	1.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0	4.0	3.0	7.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	C-Min	None	C-Min	Min
Act Effct Green (s)	13.1	62.1	43.0	95.9	6.9
Actuated g/C Ratio	0.10	0.48	0.33	0.74	0.05
v/c Ratio	0.57	0.57	0.87	0.82	0.46
Control Delay	59.0	18.2	50.2	9.6	25.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	59.0	18.2	50.2	9.6	25.3
LOS	E	B	D	A	C
Approach Delay		22.2		17.4	25.3
Approach LOS		C		B	C

Intersection Summary	
Cycle Length: 130	
Actuated Cycle Length: 130	
Offset: 102 (78%), Referenced to phase 2:EBT and 6:WBT, Start of Green	
Natural Cycle: 90	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 0.87	
Intersection Signal Delay: 18.9	Intersection LOS: B
Intersection Capacity Utilization 76.0%	ICU Level of Service D
Analysis Period (min) 15	

Splits and Phases: 22: Hana Hwy. & Wakea Avenue



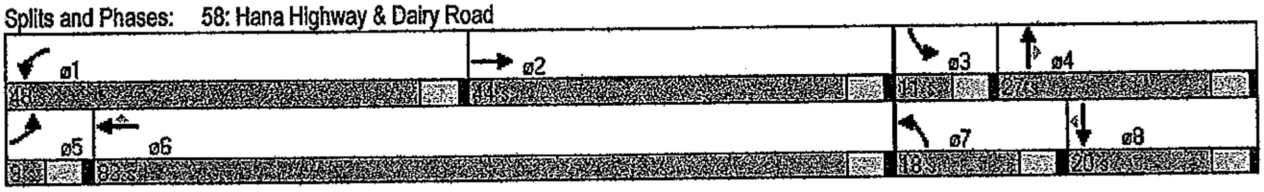
Timings
58: Hana Highway & Dairy Road
1/22/2011

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	30	595	785	2140	75	155	340	335	35	280	60
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	9.0	44.0	48.0	83.0	83.0	18.0	27.0	27.0	11.0	20.0	20.0
Total Split (%)	6.9%	33.8%	36.9%	63.8%	63.8%	13.8%	20.8%	20.8%	8.5%	15.4%	15.4%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	3.3	44.5	36.0	79.3	79.3	12.0	22.7	22.7	4.7	13.5	14.5
Actuated g/C Ratio	0.03	0.34	0.28	0.61	0.61	0.09	0.17	0.17	0.04	0.10	0.11
v/c Ratio	0.73	0.48	0.89	1.07	0.08	1.03	0.60	0.63	0.59	0.83	0.28
Control Delay	137.1	20.0	57.7	69.3	5.2	135.4	54.8	10.4	96.7	76.4	15.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	137.1	20.0	57.7	69.3	5.2	135.4	54.8	10.4	96.7	76.4	15.7
LOS	F	C	E	E	A	F	D	B	F	E	B
Approach Delay		24.5		64.6			51.9			68.6	
Approach LOS		C		E			D			E	

Intersection Summary

Cycle Length: 130
Actuated Cycle Length: 130
Offset: 79 (61%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.07
Intersection Signal Delay: 56.4 Intersection LOS: E
Intersection Capacity Utilization 98.8% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

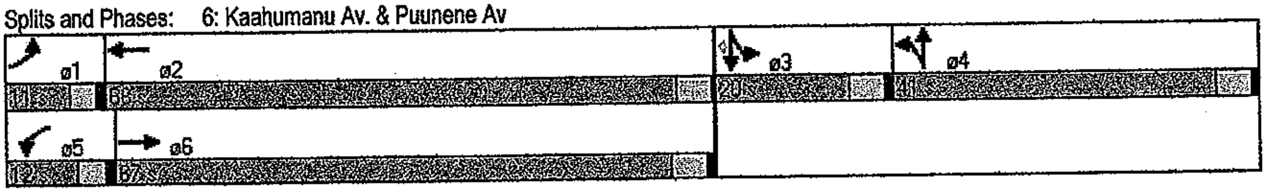


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	20	1120	35	1505	455	20	10	15
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	67.0	12.0	68.0	41.0	41.0	20.0	20.0
Total Split (%)	7.9%	47.9%	8.6%	48.6%	29.3%	29.3%	14.3%	14.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	C-Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.0	63.9	5.8	67.1	35.0	35.0	14.0	14.0
Actuated g/C Ratio	0.04	0.46	0.04	0.48	0.25	0.25	0.10	0.10
v/c Ratio	0.34	0.76	0.52	0.68	0.64	0.64	0.12	0.10
Control Delay	80.5	33.1	124.0	4.1	43.2	42.2	59.3	24.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	80.5	33.1	124.0	4.2	43.2	42.2	59.3	24.7
LOS	F	C	F	A	D	D	E	C
Approach Delay		33.7		6.9		42.7	44.8	
Approach LOS		C		A		D	D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 65 (46%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 100
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 23.7 Intersection LOS: C
Intersection Capacity Utilization 62.9% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

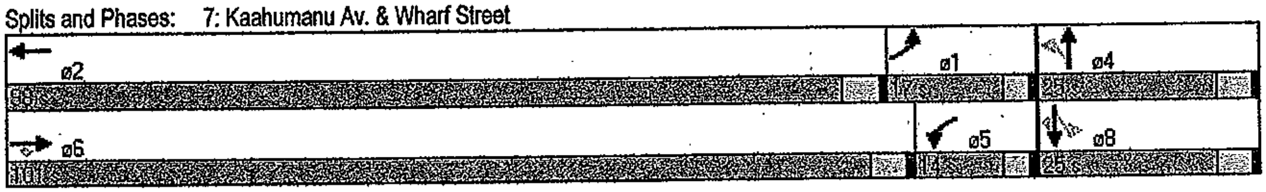


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	25	1015	60	15	1505	45	10	15	5	20
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	10.0	10.0	10.0	10.0	10.0
Total Split (s)	17.0	101.0	101.0	14.0	98.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	12.1%	72.1%	72.1%	10.0%	70.0%	17.9%	17.9%	17.9%	17.9%	17.9%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lag	Lead	Lead	Lag	Lead					
Lead-Lag Optimize?	Yes	Yes	Yes	Yes	Yes					
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	7.4	96.7	96.7	5.9	93.2	26.4	26.4		26.4	26.4
Actuated g/C Ratio	0.05	0.69	0.69	0.04	0.67	0.19	0.19		0.19	0.19
v/c Ratio	0.29	0.45	0.06	0.22	0.49	0.19	0.10		0.07	0.07
Control Delay	48.6	1.1	0.1	85.9	8.2	53.1	27.2		51.2	19.5
Queue Delay	0.0	0.1	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	48.6	1.2	0.1	85.9	8.2	53.1	27.2		51.2	19.5
LOS	D	A	A	F	A	D	C		D	B
Approach Delay		2.2			9.0		42.6		35.4	
Approach LOS		A			A		D		D	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 79 (56%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 45
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.49
Intersection Signal Delay: 7.6 Intersection LOS: A
Intersection Capacity Utilization 51.3% ICU Level of Service A
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



Timings
8: Hana Hwy & Hobron Av.

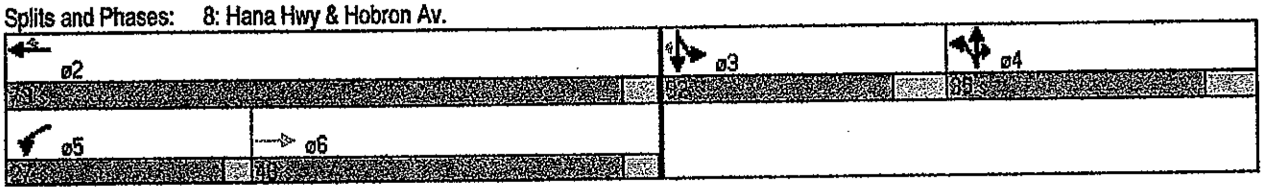
1/17/2011

Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	775	315	1480	215	130	245	140	135	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	46.0	27.0	73.0	73.0	35.0	35.0	32.0	32.0	32.0
Total Split (%)	32.9%	19.3%	52.1%	52.1%	25.0%	25.0%	22.9%	22.9%	22.9%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	40.5	23.0	67.5	67.5	36.8	36.8	16.2	16.2	17.2
Actuated g/C Ratio	0.29	0.16	0.48	0.48	0.26	0.26	0.12	0.12	0.12
v/c Ratio	0.61	0.61	0.65	0.26	0.41	0.29	0.74	0.68	0.06
Control Delay	32.1	74.6	14.8	3.8	28.0	2.8	80.5	74.6	24.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.1	74.6	14.8	3.8	28.0	2.8	80.5	74.6	24.0
LOS	C	E	B	A	C	A	F	E	C
Approach Delay	32.1		23.0		13.5			75.6	
Approach LOS	C		C		B			E	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 28.2   Intersection LOS: C
Intersection Capacity Utilization 62.2%   ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.



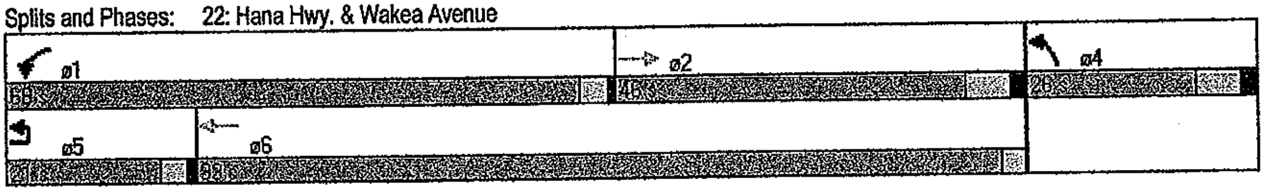
Timings
22: Hana Hwy. & Wakea Avenue

Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	95	795	470	1965	3
Turn Type	Prot		Prot		
Protected Phases	5		1		4
Permitted Phases		2		6	
Detector Phase	5	2	1	6	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	8.0	20.0	25.0
Total Split (s)	21.0	46.0	68.0	93.0	26.0
Total Split (%)	15.0%	32.9%	48.6%	66.4%	18.6%
Yellow Time (s)	3.0	5.0	3.0	3.0	5.0
All-Red Time (s)	1.0	2.0	1.0	0.0	2.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	4.0	7.0	4.0	3.0	7.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	C-Min	None	C-Min	Min
Act Effct Green (s)	13.4	67.3	47.8	105.6	7.0
Actuated g/C Ratio	0.10	0.48	0.34	0.75	0.05
v/c Ratio	0.61	0.39	0.84	0.56	0.48
Control Delay	62.9	12.3	37.9	14.1	27.3
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	62.9	12.3	37.9	14.1	27.3
LOS	E	B	D	B	C
Approach Delay		17.3		18.7	27.3
Approach LOS		B		B	C

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 131 (94%), Referenced to phase 2:EBT and 6:WBT, Start of Green
Natural Cycle: 80
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 18.4 Intersection LOS: B
Intersection Capacity Utilization 62.1% ICU Level of Service B
Analysis Period (min) 15

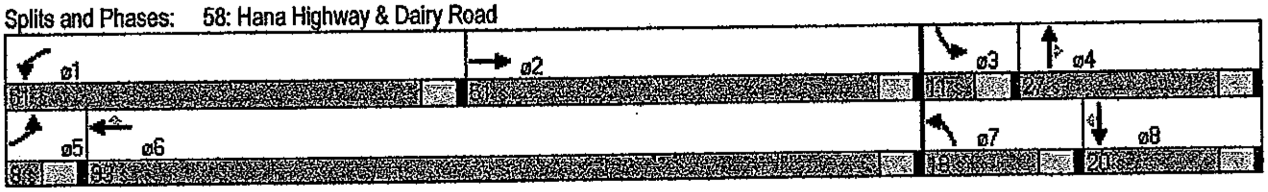
Splits and Phases: 22: Hana Hwy. & Wakea Avenue



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	30	595	785	2140	75	155	340	335	35	280	60
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	20.0	20.0	9.0	20.0	20.0
Total Split (s)	9.0	51.0	51.0	93.0	93.0	18.0	27.0	27.0	11.0	20.0	20.0
Total Split (%)	6.4%	36.4%	36.4%	66.4%	66.4%	12.9%	19.3%	19.3%	7.9%	14.3%	14.3%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	3.3	51.7	38.6	87.0	87.0	12.0	22.9	22.9	4.8	13.7	14.7
Actuated g/C Ratio	0.02	0.37	0.28	0.62	0.62	0.09	0.16	0.16	0.03	0.10	0.10
v/c Ratio	0.80	0.45	0.90	1.05	0.08	1.11	0.64	0.65	0.64	0.88	0.29
Control Delay	153.2	8.0	61.9	62.5	4.8	163.0	61.1	11.2	109.2	87.8	18.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	153.2	8.0	61.9	62.5	4.8	163.0	61.1	11.2	109.2	87.8	18.4
LOS	F	A	E	E	A	F	E	B	F	F	B
Approach Delay		13.5		60.9			60.0			78.8	
Approach LOS		B		E			E			E	

Intersection Summary	
Cycle Length: 140	
Actuated Cycle Length: 140	
Offset: 64 (46%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow	
Natural Cycle: 150	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.11	
Intersection Signal Delay: 54.5	Intersection LOS: D
Intersection Capacity Utilization 98.8%	ICU Level of Service F
Analysis Period (min) 15	

Splits and Phases: 58: Hana Highway & Dairy Road



PM Peak Worksheets

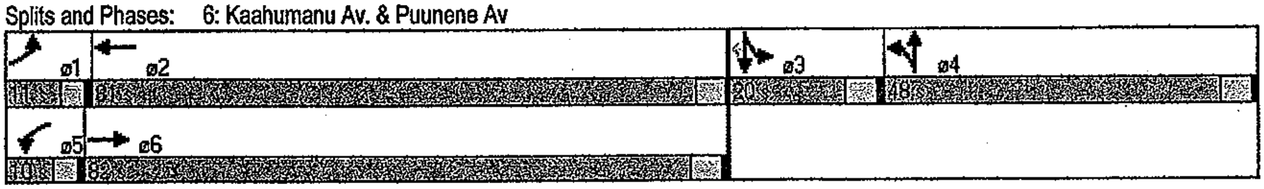
For Tables 1 and 2

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	82.0	10.0	81.0	48.0	48.0	20.0	20.0
Total Split (%)	6.9%	51.3%	6.3%	50.6%	30.0%	30.0%	12.5%	12.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	76.0	5.0	79.9	42.0	42.0	14.0	14.0
Actuated g/C Ratio	0.03	0.48	0.03	0.50	0.26	0.26	0.09	0.09
v/c Ratio	0.47	1.00	0.98	0.55	0.99	0.97	0.34	0.20
Control Delay	102.0	59.7	212.0	8.9	79.7	76.7	75.3	22.7
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	102.0	59.7	212.0	9.0	79.7	76.7	75.3	22.7
LOS	F	E	F	A	E	E	E	C
Approach Delay		60.2		16.7		78.2	55.5	
Approach LOS		E		B		E	E	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 69 (43%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 50.2 Intersection LOS: D
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

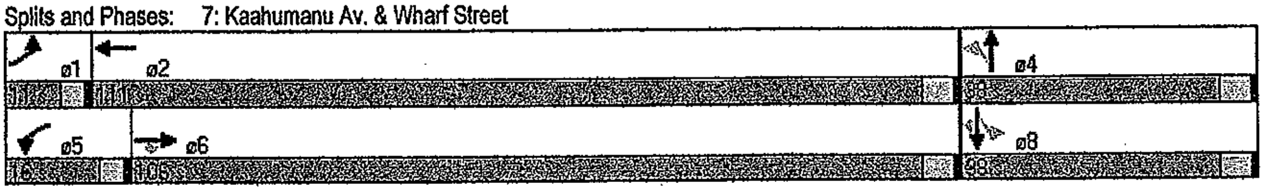


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	20	1480	115	50	1255	115	5	15	1	25
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	106.0	106.0	16.0	111.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	6.9%	66.3%	66.3%	10.0%	69.4%	23.8%	23.8%	23.8%	23.8%	23.8%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.6	104.2	104.2	8.8	109.4	32.0	32.0		32.0	32.0
Actuated g/C Ratio	0.04	0.65	0.65	0.06	0.68	0.20	0.20		0.20	0.20
v/c Ratio	0.35	0.70	0.12	0.56	0.39	0.45	0.20		0.06	0.08
Control Delay	90.8	2.0	0.1	100.0	16.6	62.4	13.9		52.7	17.4
Queue Delay	0.0	0.3	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	90.8	2.3	0.1	100.0	16.6	62.4	13.9		52.7	17.4
LOS	F	A	A	F	B	E	B		D	B
Approach Delay		3.3			19.8		44.2		31.4	
Approach LOS		A			B		D		C	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 89 (56%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 12.9 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

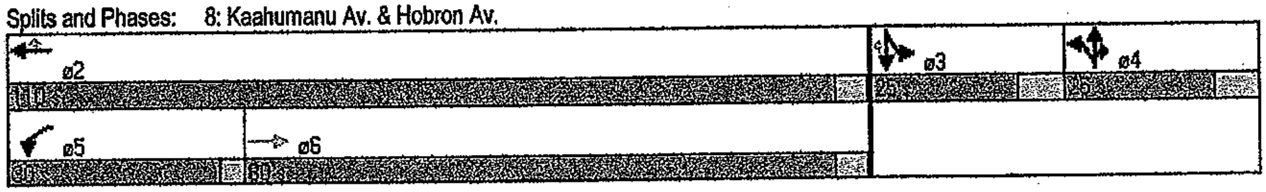


Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	1545	590	1095	240	130	605	210	180	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	80.0	30.0	110.0	110.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	50.0%	18.8%	68.8%	68.8%	15.6%	15.6%	15.6%	15.6%	15.6%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	74.5	26.0	104.5	104.5	18.0	18.0	18.0	18.0	19.0
Actuated g/C Ratio	0.47	0.16	0.65	0.65	0.11	0.11	0.11	0.11	0.12
v/c Ratio	1.07	1.15	0.51	0.23	1.13	0.90	1.15	0.93	0.06
Control Delay	78.4	151.1	11.9	1.1	143.8	30.9	169.1	115.4	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.4	151.1	11.9	1.1	143.8	30.9	169.1	115.4	28.0
LOS	E	F	B	A	F	C	F	F	C
Approach Delay	78.4		53.2		60.5			141.3	
Approach LOS	E		D		E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 70.4 Intersection LOS: E
Intersection Capacity Utilization 104.7% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.

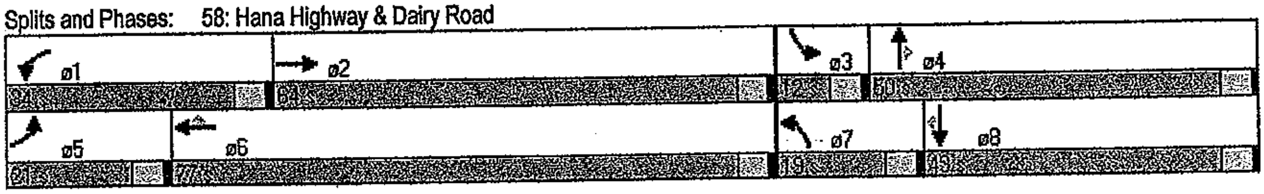


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	455	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	64.0	34.0	77.0	77.0	19.0	50.0	50.0	12.0	43.0	43.0
Total Split (%)	13.1%	40.0%	21.3%	48.1%	48.1%	11.9%	31.3%	31.3%	7.5%	26.9%	26.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	11.7	58.0	28.0	74.3	74.3	13.0	44.0	44.0	6.0	37.0	38.0
Actuated g/C Ratio	0.07	0.36	0.18	0.46	0.46	0.08	0.28	0.28	0.04	0.23	0.24
v/c Ratio	0.76	1.12	1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07
Control Delay	100.3	96.5	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.3	96.5	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
LOS	F	F	F	D	A	F	D	F	F	F	C
Approach Delay		96.6		66.7			82.4			119.1	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 100 (63%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 88.3 Intersection LOS: F
Intersection Capacity Utilization 105.0% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

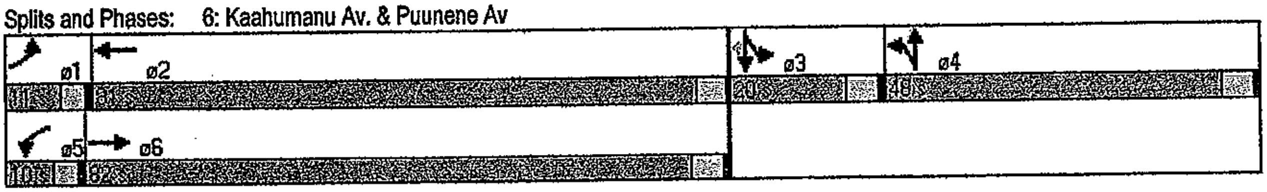


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	82.0	10.0	81.0	48.0	48.0	20.0	20.0
Total Split (%)	6.9%	51.3%	6.3%	50.6%	30.0%	30.0%	12.5%	12.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	76.0	5.0	79.9	42.0	42.0	14.0	14.0
Actuated g/C Ratio	0.03	0.48	0.03	0.50	0.26	0.26	0.09	0.09
v/c Ratio	0.47	1.00	0.98	0.55	0.99	0.97	0.34	0.20
Control Delay	102.0	59.7	194.6	27.6	78.2	75.1	75.3	22.7
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	102.0	59.7	194.6	27.7	78.2	75.1	75.3	22.7
LOS	F	E	F	C	E	E	E	C
Approach Delay		60.2		34.0		76.7	55.5	
Approach LOS		E		C		E	E	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 91 (57%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 55.2 Intersection LOS: E
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

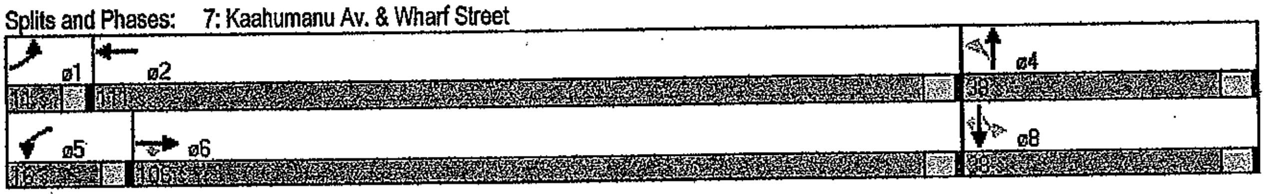


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations	↰	↑↑	↱	↰	↑↑↑↱	↰	↱		↰↑	↱
Volume (vph)	20	1480	115	50	1255	115	5	15	1	26
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	106.0	106.0	16.0	111.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	6.9%	66.3%	66.3%	10.0%	69.4%	23.8%	23.8%	23.8%	23.8%	23.8%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.6	104.2	104.2	8.8	109.4	32.0	32.0		32.0	32.0
Actuated g/C Ratio	0.04	0.65	0.65	0.06	0.68	0.20	0.20		0.20	0.20
v/c Ratio	0.35	0.70	0.12	0.56	0.39	0.45	0.20		0.06	0.08
Control Delay	99.0	1.6	0.1	88.2	11.0	62.4	13.9		52.7	17.4
Queue Delay	0.0	0.8	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	99.0	2.4	0.1	88.2	11.0	62.4	13.9		52.7	17.4
LOS	F	A	A	F	B	E	B		D	B
Approach Delay		3.4			14.0		44.2		31.4	
Approach LOS		A			B		D		C	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 120 (75%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 10.6 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

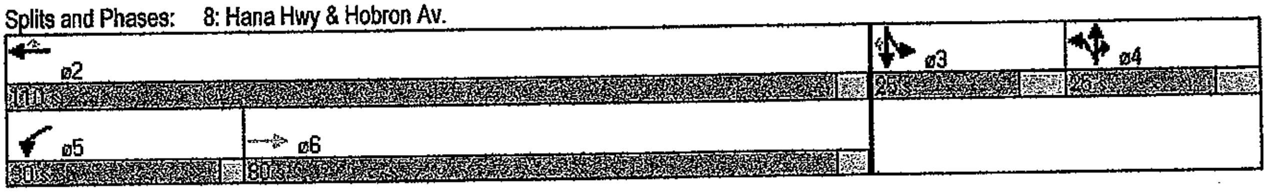


JCHAN
1/16/2011

Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	1545	590	1095	240	130	605	210	180	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	80.0	30.0	110.0	110.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	50.0%	18.8%	68.8%	68.8%	15.6%	15.6%	15.6%	15.6%	15.6%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	74.5	26.0	104.5	104.5	18.0	18.0	18.0	18.0	19.0
Actuated g/C Ratio	0.47	0.16	0.65	0.65	0.11	0.11	0.11	0.11	0.12
v/c Ratio	1.07	1.15	0.51	0.23	1.13	0.90	1.15	0.93	0.06
Control Delay	60.8	147.7	16.4	4.3	137.2	24.9	169.1	115.4	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	60.8	147.7	16.4	4.3	137.2	24.9	169.1	115.4	28.0
LOS	E	F	B	A	F	C	F	F	C
Approach Delay	60.8		55.1		54.3			141.3	
Approach LOS	E		E		D			F	

Intersection Summary	
Cycle Length: 160	
Actuated Cycle Length: 160	
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection	
Natural Cycle: 145	
Control Type: Actuated-Coordinated	
Maximum v/c Ratio: 1.15	
Intersection Signal Delay: 64.1	Intersection LOS: E
Intersection Capacity Utilization 104.7%	ICU Level of Service G
Analysis Period (min) 15	

Splits and Phases: 8: Hana Hwy & Hobron Av.

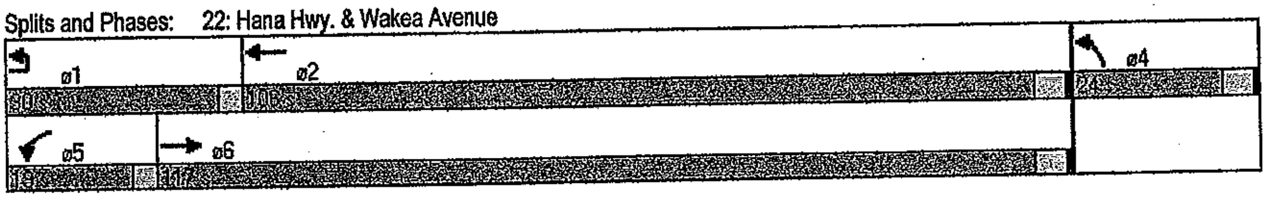


Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	170	2050	145	1510	15
Turn Type	Prot		custom		
Protected Phases	1	6	5	2	4
Permitted Phases			5		
Detector Phase	1	6	5	2	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	20.0	23.0
Total Split (s)	30.0	117.0	19.0	106.0	24.0
Total Split (%)	18.8%	73.1%	11.9%	66.3%	15.0%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	Min	None	C-Min	Min
Act Effct Green (s)	21.4	113.6	15.8	108.0	17.6
Actuated g/C Ratio	0.13	0.71	0.10	0.68	0.11
v/c Ratio	0.78	0.93	0.90	0.68	0.94
Control Delay	69.4	15.3	134.2	17.4	68.9
Queue Delay	0.0	0.3	0.0	0.0	0.0
Total Delay	69.4	15.6	134.2	17.4	68.9
LOS	E	B	F	B	E
Approach Delay		19.5		27.7	68.9
Approach LOS		B		C	E

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 88 (55%), Referenced to phase 2:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 25.9 Intersection LOS: C
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 22: Hana Hwy. & Wakea Avenue



Timings
58: Hana Highway & Dairy Road

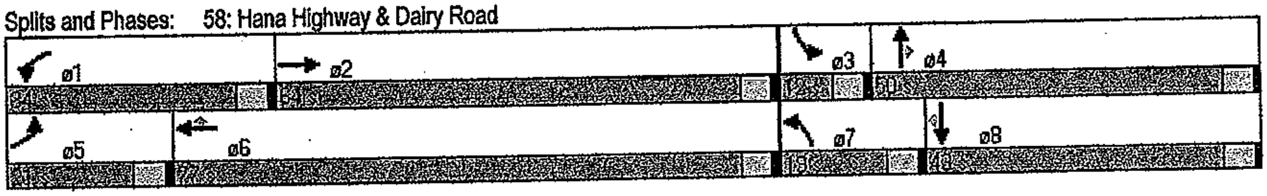
1/22/2011

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	455	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	64.0	34.0	77.0	77.0	19.0	50.0	50.0	12.0	43.0	43.0
Total Split (%)	13.1%	40.0%	21.3%	48.1%	48.1%	11.9%	31.3%	31.3%	7.5%	26.9%	26.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	11.7	58.0	28.0	74.3	74.3	13.0	44.0	44.0	6.0	37.0	38.0
Actuated g/C Ratio	0.07	0.36	0.18	0.46	0.46	0.08	0.28	0.28	0.04	0.23	0.24
v/c Ratio	0.76	1.12	1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07
Control Delay	89.9	101.1	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	89.9	101.1	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
LOS	F	F	F	D	A	F	D	F	F	F	C
Approach Delay		100.6		66.7			82.4			119.1	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 96 (60%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 160
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 89.6 | Intersection LOS: F
Intersection Capacity Utilization 105.0% | ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road



Timings
6: Kaahumanu Av. & Puunene Av

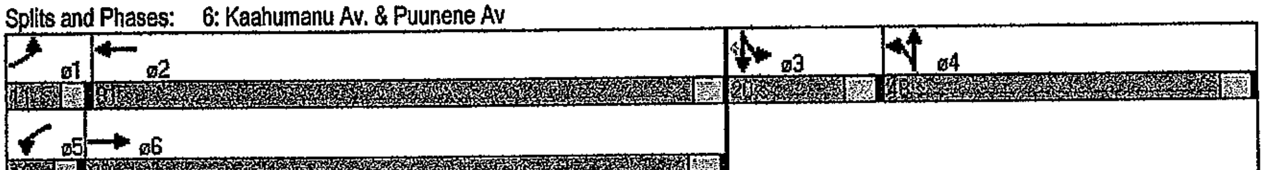
1/22/2011

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	82.0	10.0	81.0	48.0	48.0	20.0	20.0
Total Split (%)	6.9%	51.3%	6.3%	50.6%	30.0%	30.0%	12.5%	12.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	76.0	5.0	79.9	42.0	42.0	14.0	14.0
Actuated g/C Ratio	0.03	0.48	0.03	0.50	0.26	0.26	0.09	0.09
v/c Ratio	0.47	1.00	0.98	0.55	0.99	0.97	0.34	0.20
Control Delay	102.0	59.7	197.1	19.2	80.2	77.1	75.3	22.7
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	102.0	59.7	197.1	19.3	80.2	77.1	75.3	22.7
LOS	F	E	F	B	F	E	E	C
Approach Delay		60.2		26.0		78.7	55.5	
Approach LOS		E		C		E	E	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 94 (59%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 53.2   Intersection LOS: D
Intersection Capacity Utilization 82.6%   ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

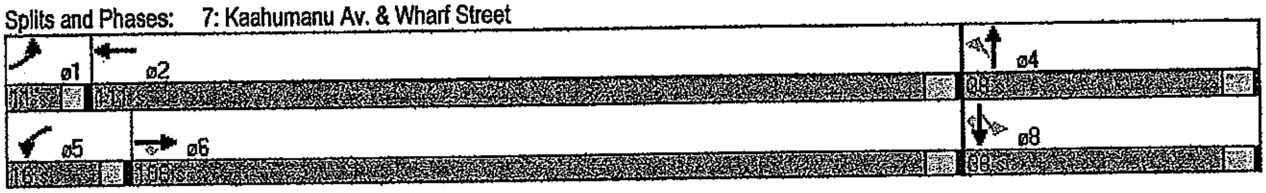


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	20	1480	115	50	1255	115	5	15	1	25
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	106.0	106.0	16.0	111.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	6.9%	66.3%	66.3%	10.0%	69.4%	23.8%	23.8%	23.8%	23.8%	23.8%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.6	104.2	104.2	8.8	109.4	32.0	32.0		32.0	32.0
Actuated g/C Ratio	0.04	0.65	0.65	0.06	0.68	0.20	0.20		0.20	0.20
v/c Ratio	0.35	0.70	0.12	0.56	0.39	0.45	0.20		0.06	0.08
Control Delay	99.0	1.6	0.1	84.7	16.0	62.4	13.9		52.7	17.4
Queue Delay	0.0	0.8	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	99.0	2.4	0.1	84.7	16.0	62.4	13.9		52.7	17.4
LOS	F	A	A	F	B	E	B		D	B
Approach Delay		3.4			18.6		44.2		31.4	
Approach LOS		A			B		D		C	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 123 (77%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 12.5 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

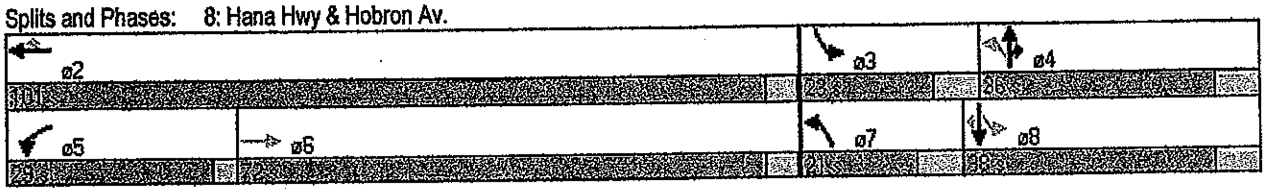


Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	1545	590	1095	240	85	130	605	210	180	10
Turn Type		Prot		Perm	pm+pt		Prot	pm+pt		Perm
Protected Phases		5	2		7	4	4	3	8	
Permitted Phases	6			2	4			8		8
Detector Phase	6	5	2	2	7	4	4	3	8	8
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	21.0	23.0	23.0	23.0
Total Split (s)	72.0	29.0	101.0	101.0	21.0	36.0	36.0	23.0	38.0	38.0
Total Split (%)	45.0%	18.1%	63.1%	63.1%	13.1%	22.5%	22.5%	14.4%	23.8%	23.8%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?										
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	Max	None	None	None
Act Effct Green (s)	66.5	25.0	95.5	95.5	43.0	29.0	29.0	47.0	31.0	32.0
Actuated g/C Ratio	0.42	0.16	0.60	0.60	0.27	0.18	0.18	0.29	0.19	0.20
v/c Ratio	1.20	1.19	0.56	0.25	0.28	1.23	0.76	1.02	0.54	0.03
Control Delay	116.9	167.9	20.3	4.9	32.6	149.2	14.9	110.5	64.6	22.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	116.9	167.9	20.3	4.9	32.6	149.2	14.9	110.5	64.6	22.8
LOS	F	F	C	A	C	F	B	F	E	C
Approach Delay	116.9		63.6			78.7			87.6	
Approach LOS	F		E			E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.23
Intersection Signal Delay: 86.3 Intersection LOS: F
Intersection Capacity Utilization 112.4% ICU Level of Service H
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.



Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	170	2050	145	1510	15
Turn Type	Prot		custom		
Protected Phases	1	6	5	2	4
Permitted Phases			5		
Detector Phase	1	6	5	2	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	20.0	23.0
Total Split (s)	30.0	117.0	19.0	106.0	24.0
Total Split (%)	18.8%	73.1%	11.9%	66.3%	15.0%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	Min	None	C-Min	Min
Act Effct Green (s)	21.4	113.6	15.8	108.0	17.6
Actuated g/C Ratio	0.13	0.71	0.10	0.68	0.11
v/c Ratio	0.78	0.93	0.90	0.68	0.94
Control Delay	61.5	17.9	134.2	17.4	68.9
Queue Delay	0.0	0.7	0.0	0.0	0.0
Total Delay	61.5	18.5	134.2	17.4	68.9
LOS	E	B	F	B	E
Approach Delay		21.7		27.7	68.9
Approach LOS		C		C	E

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 88 (55%), Referenced to phase 2:WBT, Start of Green
Natural Cycle: 110
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.94
Intersection Signal Delay: 27.1 Intersection LOS: C
Intersection Capacity Utilization 96.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 22: Hana Hwy. & Wakea Avenue

ø1 30 s | ø2 106 s | ø4 24 s
ø5 19 s | ø6 117 s

Timings
58: Hana Highway & Dairy Road

1/22/2011

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	455	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	64.0	34.0	77.0	77.0	19.0	50.0	50.0	12.0	43.0	43.0
Total Split (%)	13.1%	40.0%	21.3%	48.1%	48.1%	11.9%	31.3%	31.3%	7.5%	26.9%	26.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	11.7	58.0	28.0	74.3	74.3	13.0	44.0	44.0	6.0	37.0	38.0
Actuated g/C Ratio	0.07	0.36	0.18	0.46	0.46	0.08	0.28	0.28	0.04	0.23	0.24
v/c Ratio	0.76	1.12	1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07
Control Delay	91.0	101.1	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	91.0	101.1	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
LOS	F	F	F	D	A	F	D	F	F	F	C
Approach Delay		100.7		66.7			82.4			119.1	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 160

Actuated Cycle Length: 160

Offset: 96 (60%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Natural Cycle: 160

Control Type: Actuated-Coordinated

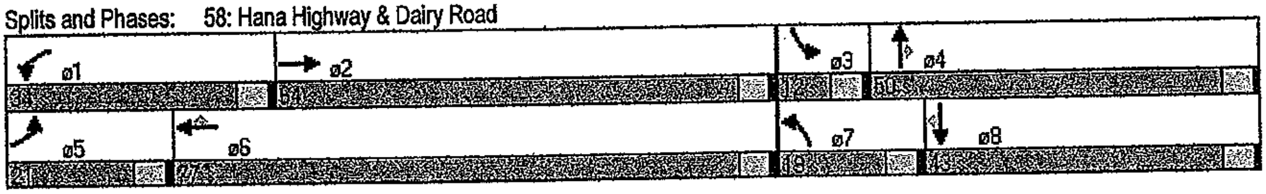
Maximum v/c Ratio: 1.12

Intersection Signal Delay: 89.7 Intersection LOS: F

Intersection Capacity Utilization 105.0% ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

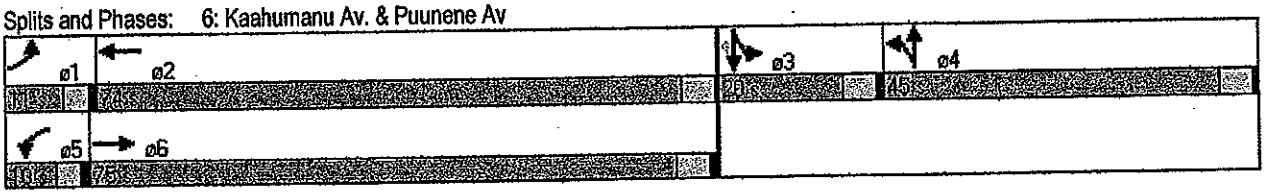


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	75.0	10.0	74.0	45.0	45.0	20.0	20.0
Total Split (%)	7.3%	50.0%	6.7%	49.3%	30.0%	30.0%	13.3%	13.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	69.0	5.0	73.0	39.0	39.0	14.0	14.0
Actuated g/C Ratio	0.03	0.46	0.03	0.49	0.26	0.26	0.09	0.09
v/c Ratio	0.44	1.03	0.93	0.56	1.00	0.98	0.32	0.18
Control Delay	92.9	66.9	177.0	18.8	85.1	81.8	69.2	21.9
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	92.9	66.9	177.0	18.9	85.1	81.8	69.2	21.9
LOS	F	E	F	B	F	F	E	C
Approach Delay		67.1		24.8		83.5	51.4	
Approach LOS		E		C		F	D	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 147 (98%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.03
Intersection Signal Delay: 57.0 Intersection LOS: E
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

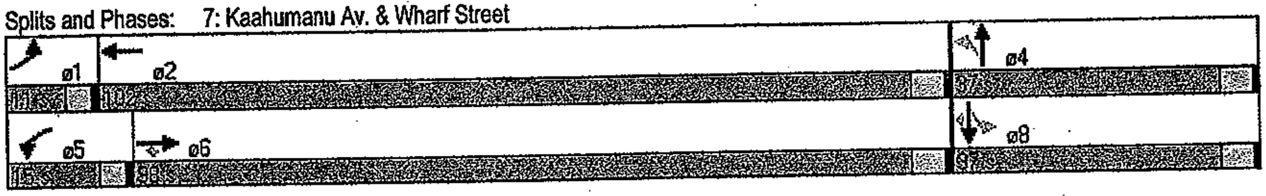


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	20	1480	115	50	1255	115	5	15	1	25
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	98.0	98.0	15.0	102.0	37.0	37.0	37.0	37.0	37.0
Total Split (%)	7.3%	65.3%	65.3%	10.0%	68.0%	24.7%	24.7%	24.7%	24.7%	24.7%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.5	95.7	95.7	8.3	100.4	31.0	31.0		31.0	31.0
Actuated g/C Ratio	0.04	0.64	0.64	0.06	0.67	0.21	0.21		0.21	0.21
v/c Ratio	0.33	0.71	0.12	0.56	0.40	0.43	0.19		0.06	0.08
Control Delay	89.2	1.7	0.0	81.9	18.1	57.5	13.3		48.6	16.3
Queue Delay	0.0	0.7	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	89.2	2.4	0.0	81.9	18.1	57.5	13.3		48.6	16.3
LOS	F	A	A	F	B	E	B		D	B
Approach Delay		3.3			20.6		40.9		29.1	
Approach LOS		A			C		D		C	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 23 (15%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.71
Intersection Signal Delay: 13.0 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street



JCHAN

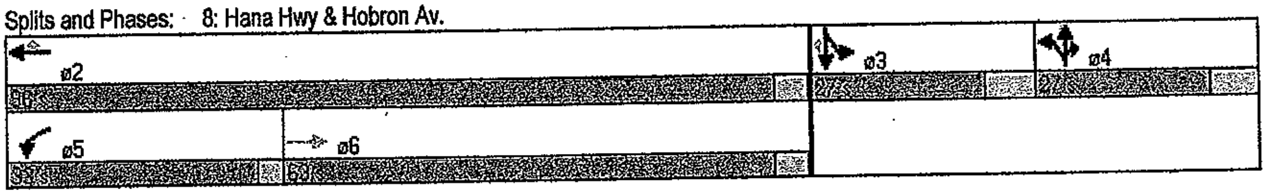
1/16/2011

Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
	→	↙	←	↖	↑	↗	↘	↓	↙
Lane Configurations	↑↑↑	↰↰	↑↑↑	↱	↰	↱↱	↰	↑	↱
Volume (vph)	1545	590	1095	240	130	605	210	180	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	63.0	33.0	96.0	96.0	27.0	27.0	27.0	27.0	27.0
Total Split (%)	42.0%	22.0%	64.0%	64.0%	18.0%	18.0%	18.0%	18.0%	18.0%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	57.5	29.0	90.5	90.5	20.0	20.0	20.0	20.0	21.0
Actuated g/C Ratio	0.38	0.19	0.60	0.60	0.13	0.13	0.13	0.13	0.14
v/c Ratio	0.90	0.96	0.39	0.25	0.95	0.75	0.97	0.78	0.05
Control Delay	22.7	95.9	17.3	6.5	82.4	11.2	114.7	85.2	26.3
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.7	95.9	17.3	6.5	82.4	11.2	114.7	85.2	26.3
LOS	C	F	B	A	F	B	F	F	C
Approach Delay	22.7		40.0		29.9			99.1	
Approach LOS	C		D		C			F	

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 63 (42%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 115
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.97
Intersection Signal Delay: 37.3 Intersection LOS: D
Intersection Capacity Utilization 91.1% ICU Level of Service F
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.

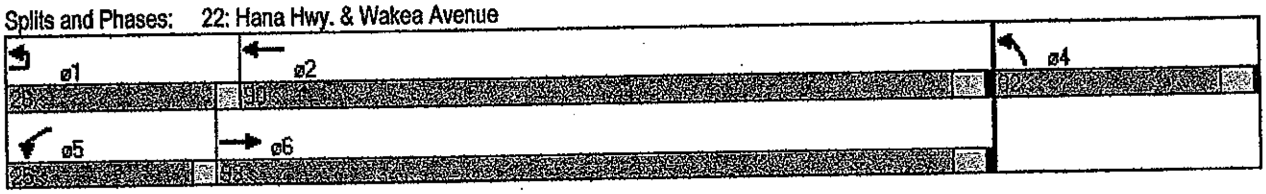


Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	170	2050	145	1510	15
Turn Type	Prot		custom		
Protected Phases	1	6	5	2	4
Permitted Phases			5		
Detector Phase	1	6	5	2	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	20.0	23.0
Total Split (s)	28.0	93.0	25.0	90.0	32.0
Total Split (%)	18.7%	62.0%	16.7%	60.0%	21.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	Min	None	C-Min	Min
Act Effct Green (s)	20.8	105.4	18.5	103.1	13.1
Actuated g/C Ratio	0.14	0.70	0.12	0.69	0.09
v/c Ratio	0.75	0.65	0.72	0.47	0.84
Control Delay	72.8	8.9	83.1	15.8	35.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	72.8	8.9	83.1	15.8	35.7
LOS	E	A	F	B	D
Approach Delay		13.6		21.7	35.7
Approach LOS		B		C	D

Intersection Summary

Cycle Length: 150
Actuated Cycle Length: 150
Offset: 22 (15%), Referenced to phase 2:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 18.2 Intersection LOS: B
Intersection Capacity Utilization 78.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 22: Hana Hwy. & Wakea Avenue



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	455	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	61.0	32.0	72.0	72.0	17.0	46.0	46.0	11.0	40.0	40.0
Total Split (%)	14.0%	40.7%	21.3%	48.0%	48.0%	11.3%	30.7%	30.7%	7.3%	26.7%	26.7%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	11.3	55.0	26.0	69.7	69.7	11.0	40.0	40.0	5.0	34.0	35.0
Actuated g/C Ratio	0.08	0.37	0.17	0.46	0.46	0.07	0.27	0.27	0.03	0.23	0.23
v/c Ratio	0.74	1.11	1.11	0.67	0.13	1.17	0.52	1.10	1.19	1.11	0.07
Control Delay	105.2	90.4	126.9	34.3	7.1	189.3	49.3	96.9	238.0	120.3	21.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	105.2	90.4	126.9	34.3	7.1	189.3	49.3	96.9	238.0	120.3	21.2
LOS	F	F	F	C	A	F	D	F	F	F	C
Approach Delay		91.1		65.5			89.9			126.0	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 150

Actuated Cycle Length: 150

Offset: 141 (94%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow

Natural Cycle: 150

Control Type: Actuated-Coordinated

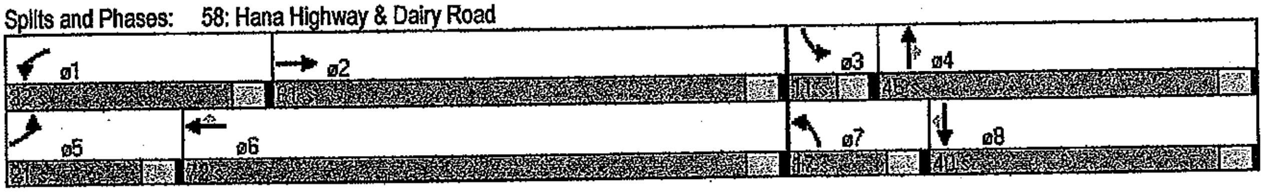
Maximum v/c Ratio: 1.19

Intersection Signal Delay: 88.7 Intersection LOS: F

Intersection Capacity Utilization 105.0% ICU Level of Service G

Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road

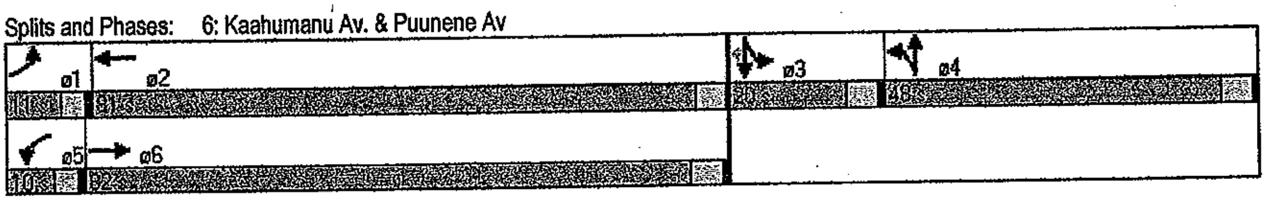


Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBT	SBR
Lane Configurations								
Volume (vph)	25	1700	50	1270	745	30	30	30
Turn Type	Prot		Prot		Split			Perm
Protected Phases	1	6	5	2	4	4	3	
Permitted Phases								3
Detector Phase	1	6	5	2	4	4	3	3
Switch Phase								
Minimum Initial (s)	4.0	15.0	4.0	15.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	22.5	36.0	36.0	20.0	20.0
Total Split (s)	11.0	82.0	10.0	81.0	48.0	48.0	20.0	20.0
Total Split (%)	6.9%	51.3%	6.3%	50.6%	30.0%	30.0%	12.5%	12.5%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	0.5	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	5.0	5.5	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lag	Lead	Lead
Lead-Lag Optimize?								
Recall Mode	None	Max	None	C-Max	Max	Max	Max	Max
Act Effct Green (s)	5.2	76.0	5.0	79.9	42.0	42.0	14.0	14.0
Actuated g/C Ratio	0.03	0.48	0.03	0.50	0.26	0.26	0.09	0.09
v/c Ratio	0.47	1.00	0.98	0.55	0.99	0.97	0.34	0.20
Control Delay	102.0	59.7	192.3	25.2	80.4	77.3	75.3	22.7
Queue Delay	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Delay	102.0	59.7	192.3	25.4	80.4	77.3	75.3	22.7
LOS	F	E	F	C	F	E	E	C
Approach Delay		60.2		31.7		78.8	55.5	
Approach LOS		E		C		E	E	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 99 (62%), Referenced to phase 2:WBT, Start of Yellow
Natural Cycle: 150
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.00
Intersection Signal Delay: 54.9 Intersection LOS: D
Intersection Capacity Utilization 82.6% ICU Level of Service E
Analysis Period (min) 15

Splits and Phases: 6: Kaahumanu Av. & Puunene Av

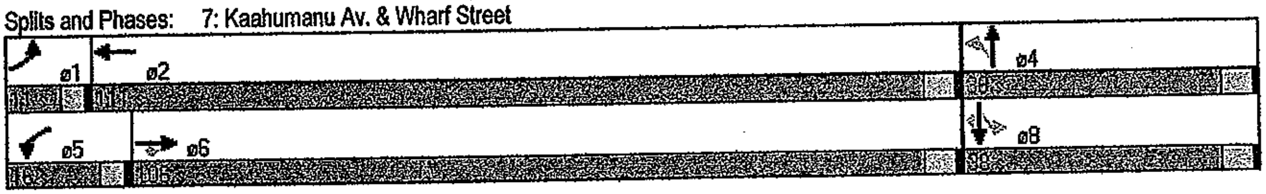


Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	20	1480	115	50	1255	115	5	15	1	25
Turn Type	Prot		Perm	Prot		Perm		Perm		Perm
Protected Phases	1	6		5	2		4		8	
Permitted Phases			6			4		8		8
Detector Phase	1	6	6	5	2	4	4	8	8	8
Switch Phase										
Minimum Initial (s)	4.0	20.0	20.0	4.0	20.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	25.0	25.0	8.0	25.0	36.0	36.0	36.0	36.0	36.0
Total Split (s)	11.0	106.0	106.0	16.0	111.0	38.0	38.0	38.0	38.0	38.0
Total Split (%)	6.9%	66.3%	66.3%	10.0%	69.4%	23.8%	23.8%	23.8%	23.8%	23.8%
Yellow Time (s)	3.0	4.0	4.0	3.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Total Lost Time (s)	5.0	6.0	6.0	5.0	6.0	6.0	6.0	6.0	6.0	6.0
Lead/Lag	Lead	Lag	Lag	Lead	Lag					
Lead-Lag Optimize?										
Recall Mode	None	C-Max	C-Max	None	C-Max	Max	Max	Max	Max	Max
Act Effct Green (s)	5.6	104.2	104.2	8.8	109.4	32.0	32.0		32.0	32.0
Actuated g/C Ratio	0.04	0.65	0.65	0.06	0.68	0.20	0.20		0.20	0.20
v/c Ratio	0.35	0.70	0.12	0.56	0.39	0.45	0.20		0.06	0.08
Control Delay	100.0	1.6	0.1	79.2	17.3	62.4	13.9		52.7	17.4
Queue Delay	0.0	0.9	0.0	0.0	0.0	0.0	0.0		0.0	0.0
Total Delay	100.0	2.5	0.1	79.2	17.3	62.4	13.9		52.7	17.4
LOS	F	A	A	E	B	E	B		D	B
Approach Delay		3.5			19.7		44.2		31.4	
Approach LOS		A			B		D		C	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 129 (81%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.70
Intersection Signal Delay: 13.0 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

Splits and Phases: 7: Kaahumanu Av. & Wharf Street

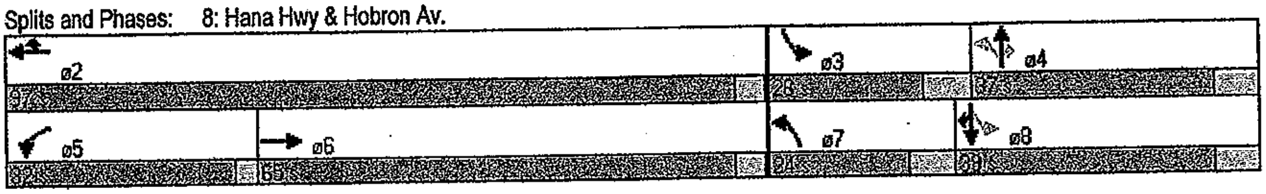


Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	1545	590	1095	240	85	130	605	210	180	10
Turn Type		Prot		Prot	pm+pt		Perm	pm+pt		custom
Protected Phases	6	5	2	2	7	4		3	8	8
Permitted Phases					4		4	8		8
Detector Phase	6	5	2	2	7	4	4	3	8	8
Switch Phase										
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	21.0	23.0	23.0	23.0
Total Split (s)	65.0	32.0	97.0	97.0	24.0	37.0	37.0	26.0	39.0	39.0
Total Split (%)	40.6%	20.0%	60.6%	60.6%	15.0%	23.1%	23.1%	16.3%	24.4%	24.4%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?										
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	Max	None	None	None
Act Effct Green (s)	59.5	28.0	91.5	91.5	47.0	30.0	30.0	51.0	32.0	33.0
Actuated g/C Ratio	0.37	0.18	0.57	0.57	0.29	0.19	0.19	0.32	0.20	0.21
v/c Ratio	1.03	1.18	0.45	0.28	0.28	1.20	0.74	0.98	0.58	0.04
Control Delay	47.4	154.9	16.9	3.9	34.0	137.9	12.9	101.6	66.0	22.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	47.4	154.9	16.9	3.9	34.0	137.9	12.9	101.6	66.0	22.5
LOS	D	F	B	A	C	F	B	F	E	C
Approach Delay	47.4		57.6			72.7			83.6	
Approach LOS	D		E			E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.20
Intersection Signal Delay: 58.9 Intersection LOS: E
Intersection Capacity Utilization 107.6% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Hana Hwy & Hobron Av.

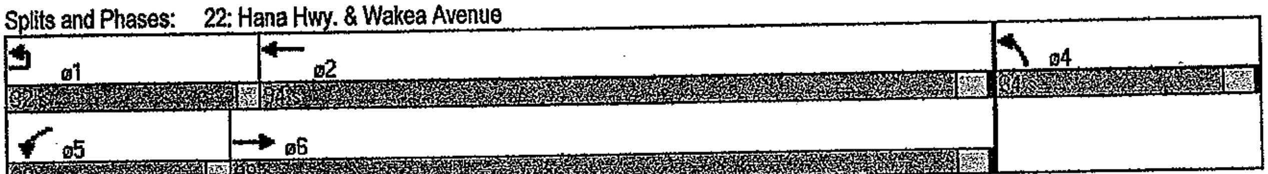


Lane Group	EBU	EBT	WBL	WBT	NBL
Lane Configurations					
Volume (vph)	170	2050	145	1510	15
Turn Type	Prot		custom		
Protected Phases	1	6	5	2	4
Permitted Phases			5		
Detector Phase	1	6	5	2	4
Switch Phase					
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	8.0	23.0	8.0	20.0	23.0
Total Split (s)	32.0	98.0	28.0	94.0	34.0
Total Split (%)	20.0%	61.3%	17.5%	58.8%	21.3%
Yellow Time (s)	3.0	4.0	3.0	4.0	4.0
All-Red Time (s)	0.0	1.0	0.0	1.0	1.0
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0	5.0	3.0	5.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	
Lead-Lag Optimize?					
Recall Mode	None	Min	None	C-Min	Min
Act Effct Green (s)	21.9	115.1	19.4	112.6	12.5
Actuated g/C Ratio	0.14	0.72	0.12	0.70	0.08
v/c Ratio	0.76	0.64	0.73	0.46	0.84
Control Delay	81.3	9.3	73.2	13.7	34.9
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	81.3	9.3	73.2	13.7	34.9
LOS	F	A	E	B	C
Approach Delay		14.6		18.9	34.9
Approach LOS		B		B	C

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 157 (98%), Referenced to phase 2:WBT, Start of Green
Natural Cycle: 75
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.84
Intersection Signal Delay: 17.6 Intersection LOS: B
Intersection Capacity Utilization 78.2% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 22: Hana Hwy. & Wakea Avenue

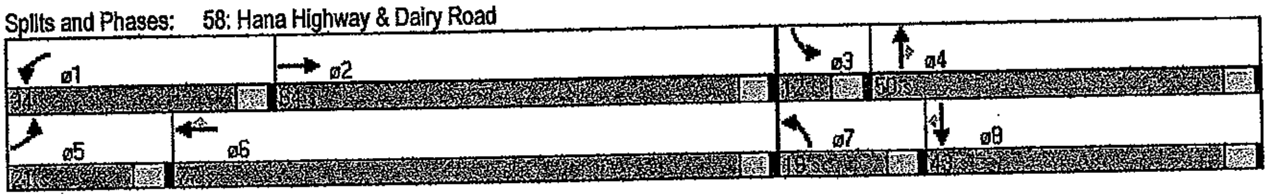


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	90	1675	610	1020	95	140	465	655	65	825	25
Turn Type	Prot		Prot		Perm	Prot		Perm	Prot		Perm
Protected Phases	5	2	1	6		7	4		3	8	
Permitted Phases					6			4			8
Detector Phase	5	2	1	6	6	7	4	4	3	8	8
Switch Phase											
Minimum Initial (s)	4.0	20.0	4.0	20.0	20.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	9.0	27.0	9.0	27.0	27.0	9.0	35.0	35.0	9.0	35.0	35.0
Total Split (s)	21.0	64.0	34.0	77.0	77.0	19.0	50.0	50.0	12.0	43.0	43.0
Total Split (%)	13.1%	40.0%	21.3%	48.1%	48.1%	11.9%	31.3%	31.3%	7.5%	26.9%	26.9%
Yellow Time (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
All-Red Time (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	5.0
Lead/Lag	Lead	Lag	Lead	Lag	Lag	Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?											
Recall Mode	None	C-Min	None	C-Min	C-Min	None	None	None	None	None	None
Act Effct Green (s)	11.7	58.0	28.0	74.3	74.3	13.0	44.0	44.0	6.0	37.0	38.0
Actuated g/C Ratio	0.07	0.36	0.18	0.46	0.46	0.08	0.28	0.28	0.04	0.23	0.24
v/c Ratio	0.76	1.12	1.10	0.67	0.13	1.05	0.51	1.08	1.06	1.09	0.07
Control Delay	100.5	101.6	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	100.5	101.6	126.4	36.4	8.0	157.4	51.1	88.2	199.2	115.7	24.2
LOS	F	F	F	D	A	F	D	F	F	F	C
Approach Delay		101.5		66.7			82.4			119.1	
Approach LOS		F		E			F			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 58 (36%), Referenced to phase 2:EBT and 6:WBT, Start of Yellow
Natural Cycle: 160
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.12
Intersection Signal Delay: 89.9 | Intersection LOS: F
Intersection Capacity Utilization 105.0% | ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 58: Hana Highway & Dairy Road



AM & PM Peak Worksheets

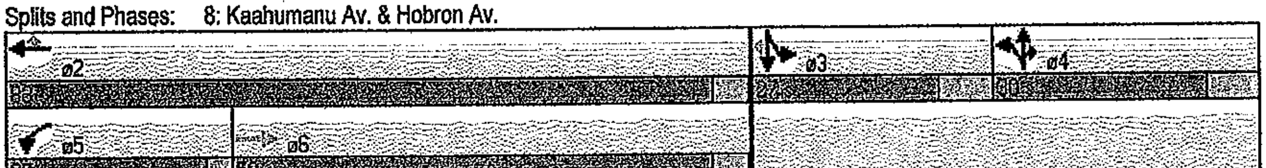
For Table 3

Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	775	315	1480	215	130	245	140	135	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	29.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	58.0	25.0	83.0	83.0	30.0	30.0	27.0	27.0	27.0
Total Split (%)	41.4%	17.9%	59.3%	59.3%	21.4%	21.4%	19.3%	19.3%	19.3%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	52.5	21.0	77.5	77.5	27.3	27.3	15.7	15.7	16.7
Actuated g/C Ratio	0.38	0.15	0.55	0.55	0.20	0.20	0.11	0.11	0.12
v/c Ratio	0.67	0.66	0.82	0.24	0.55	0.35	0.76	0.70	0.06
Control Delay	14.8	65.5	11.7	0.6	90.7	36.1	84.2	77.6	24.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.8	65.5	11.7	0.6	90.7	36.1	84.2	77.6	24.8
LOS	B	E	B	A	F	D	F	E	C
Approach Delay	14.8		19.0		59.3			78.9	
Approach LOS	B		B		E			E	

Intersection Summary

Cycle Length: 140
Actuated Cycle Length: 140
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 95
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.82
Intersection Signal Delay: 27.7 Intersection LOS: C
Intersection Capacity Utilization 74.5% ICU Level of Service D
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.



Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	755	315	1480	215	180	195	140	135	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	29.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	56.0	25.0	81.0	81.0	33.0	33.0	26.0	26.0	26.0
Total Split (%)	40.0%	17.9%	57.9%	57.9%	23.6%	23.6%	18.6%	18.6%	18.6%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	50.5	21.0	75.5	75.5	28.9	28.9	16.1	16.1	17.1
Actuated g/C Ratio	0.36	0.15	0.54	0.54	0.21	0.21	0.12	0.12	0.12
v/c Ratio	0.68	0.66	0.84	0.25	0.65	0.28	0.70	0.80	0.06
Control Delay	14.1	64.7	13.4	0.8	69.3	29.0	79.1	87.9	25.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	14.1	64.7	13.4	0.8	69.3	29.0	79.1	87.9	25.0
LOS	B	E	B	A	E	C	E	F	C
Approach Delay	14.1		20.1		50.8			81.7	
Approach LOS	B		C		D			F	

Intersection Summary

Cycle Length: 140

Actuated Cycle Length: 140

Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection

Natural Cycle: 95

Control Type: Actuated-Coordinated

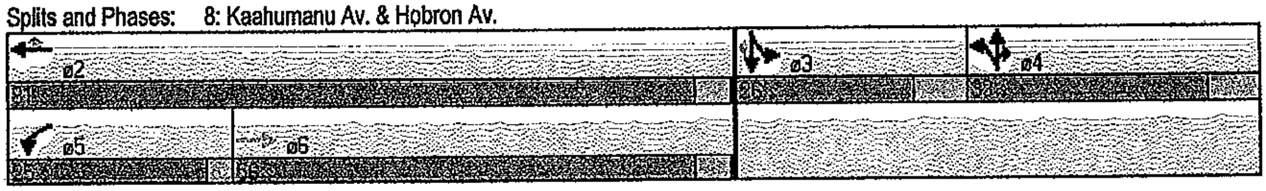
Maximum v/c Ratio: 0.84

Intersection Signal Delay: 27.4 Intersection LOS: C

Intersection Capacity Utilization 76.8% ICU Level of Service D

Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.



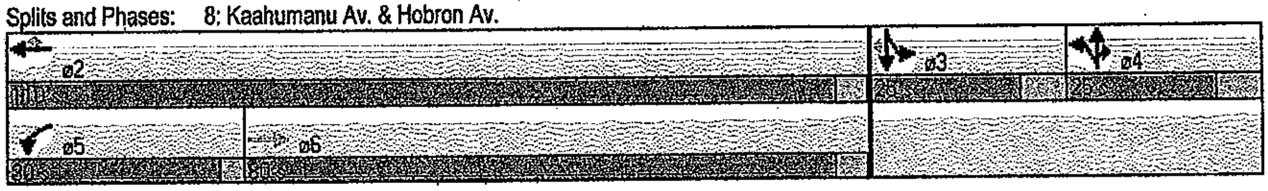
8: Kaahumanu Av. & Hobron Av.

Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	1545	590	1095	240	130	605	210	180	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	80.0	30.0	110.0	110.0	25.0	25.0	25.0	25.0	25.0
Total Split (%)	50.0%	18.8%	68.8%	68.8%	15.6%	15.6%	15.6%	15.6%	15.6%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	74.5	26.0	104.5	104.5	18.0	18.0	18.0	18.0	19.0
Actuated g/C Ratio	0.47	0.16	0.65	0.65	0.11	0.11	0.11	0.11	0.12
v/c Ratio	1.07	1.15	0.51	0.23	1.13	0.90	1.15	0.93	0.06
Control Delay	78.4	151.1	11.9	1.1	143.8	30.9	169.1	115.4	28.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	78.4	151.1	11.9	1.1	143.8	30.9	169.1	115.4	28.0
LOS	E	F	B	A	F	C	F	F	C
Approach Delay	78.4		53.2		60.5			141.3	
Approach LOS	E		D		E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.15
Intersection Signal Delay: 70.4 Intersection LOS: E
Intersection Capacity Utilization 104.7% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.

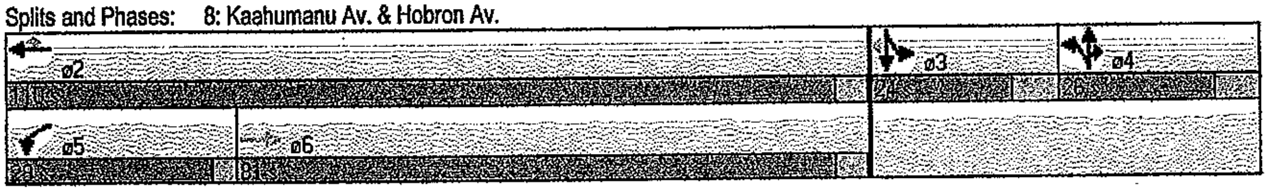


Lane Group	EBT	WBL	WBT	WBR	NBT	NBR	SBL	SBT	SBR
Lane Configurations									
Volume (vph)	1545	590	1095	240	155	580	210	180	10
Turn Type		Prot		Perm		Prot	Split		Perm
Protected Phases		5	2		4	4	3	3	
Permitted Phases	6			2					3
Detector Phase	6	5	2	2	4	4	3	3	3
Switch Phase									
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	26.5	20.0	27.5	27.5	21.0	21.0	23.0	23.0	23.0
Total Split (s)	81.0	29.0	110.0	110.0	26.0	26.0	24.0	24.0	24.0
Total Split (%)	50.6%	18.1%	68.8%	68.8%	16.3%	16.3%	15.0%	15.0%	15.0%
Yellow Time (s)	4.0	3.0	4.0	4.0	6.0	6.0	6.0	6.0	6.0
All-Red Time (s)	0.5	0.0	0.5	0.5	0.0	0.0	0.0	0.0	0.0
Lost Time Adjust (s)	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Total Lost Time (s)	5.5	4.0	5.5	5.5	7.0	7.0	7.0	7.0	6.0
Lead/Lag	Lag	Lead			Lag	Lag	Lead	Lead	Lead
Lead-Lag Optimize?									
Recall Mode	C-Max	Max	C-Max	C-Max	Max	Max	None	None	None
Act Effct Green (s)	75.5	25.0	104.5	104.5	19.0	19.0	17.0	17.0	18.0
Actuated g/C Ratio	0.47	0.16	0.65	0.65	0.12	0.12	0.11	0.11	0.11
v/c Ratio	1.06	1.19	0.51	0.23	1.19	0.86	1.21	0.98	0.06
Control Delay	72.1	168.4	7.7	0.5	165.0	30.3	190.4	130.4	28.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	72.1	168.4	7.7	0.5	165.0	30.3	190.4	130.4	28.5
LOS	E	F	A	A	F	C	F	F	C
Approach Delay	72.1		56.0		69.7			159.2	
Approach LOS	E		E		E			F	

Intersection Summary

Cycle Length: 160
Actuated Cycle Length: 160
Offset: 0 (0%), Referenced to phase 2:WBT and 6:EBT, Start of Yellow, Master Intersection
Natural Cycle: 145
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.21
Intersection Signal Delay: 72.5 Intersection LOS: E
Intersection Capacity Utilization 106.0% ICU Level of Service G
Analysis Period (min) 15

Splits and Phases: 8: Kaahumanu Av. & Hobron Av.



APPENDIX J-3.

Transportation Management Plan

Transportation Management Plan

for

Maui Medical Plaza at Kanaha

Kahului, Island of Maui, Hawai'i

Tax Map Key Number *(2)3-7-011: 028*

MARCH 2011

Prepared for:

Maui Medical Plaza at Kanaha
350 Hukiliki Street, Suite 3D
Kahului, HI 96732

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Maui Medical Plaza at Kanaha

Kahului, Island of Maui, Hawai'i

Transportation Management Plan

TMK (2) 3-7-011: 028

March 2011

WARREN M. YAMAMOTO
LICENSED PROFESSIONAL ENGINEER
NO. 3893-C
HAWAII, U.S.A.

Expiration Date:
April 30, 2012

This work was prepared by me or under my direct supervision.

Signature
AECOM

10 MAR 2011
Date

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TRANSPORTATION MANAGEMENT PLAN FOR THE PROPOSED MAUI MEDICAL PLAZA AT KANAHA

The Maui Medical Plaza at Kanaha, a professional medical plaza being proposed in Kahului, Maui, Hawai'i, is implementing a Transportation Management Plan (TMP) in response to comments by the State of Hawai'i Department of Transportation (HDOT) to reduce the number of auto trips to their proposed facility. This TMP provides a set of strategies to reduce project related trips during the construction phase and employee trips during the occupancy phase of the Maui Medical Plaza at Kanaha. The TMP for the occupancy phase is referred to as the Transportation Demand Management (TDM) program in this report. This report identifies the goals of the Transportation Management Plan (TMP) during both project phases and the specific strategies which will be utilized to achieve these goals.

PROJECT DESCRIPTION

The Maui Medical Plaza at Kanaha will include a six-story structure with 108,000 square feet (sf) of leasable space for medical doctors and technicians. This space can expect to accommodate up to 200 medical professionals and staff. The proposed project is expected to be fully occupied by 2013.

The proposed project site is situated is on a 2.5 acre parcel identified as TMK: (2)3-7-011: 028. The project site is *makai* of Hana Highway, approximately between the Kamehameha Avenue/Hobron Avenue and the Wakea Avenue intersections as shown on **Figure 1**. The site plan and internal roadway network for the proposed project are shown on **Figure 2**. The main medical plaza building will be at the front of the property facing Hana Highway. A six-story parking structure will be located adjacent to and behind the main facility, and will provide approximately 360 off-street parking stalls.

The proposed project will implement three off-site roadway improvements on Hana Highway to accommodate the project generated traffic:

1. The northwest bound approach of Hana Highway will be widened from two to four lanes to provide a third through lane and an acceleration/deceleration lane fronting the project site. The third through lane will be designed to accommodate the future widening of Hana Highway and its design will minimize the reconstruction activity fronting the project site when Hana Highway is widened. A left turn lane in the median of Hana Highway will accommodate the left turn movements from southeast bound Hana Highway into the project site until traffic signals are installed at Wakea Avenue, at which time U-turns will be permitted at the traffic signal to access the project driveway.

2. The single right turn lane on the Kamehameha Avenue approach will be widened to double right turn lanes to accommodate the very high number of turns currently being made.

3. A left turn storage lane will be added to the existing U-turn median opening on Hana Highway on the Wailuku side of the Kamehameha Avenue/Hobron Avenue intersection. This facility will be utilized by vehicles leaving from the access (west) driveway and cannot enter the left turn lanes on Hana Highway into Kamehameha Avenue.

The HDOT is also proposing their own improvements on Hana Highway, including the installation of traffic signals at the Wakea Avenue intersection and widening Hana Highway from four to six lanes with financial assistance from a private developer. The schedules for these two projects are not known at this time.

The *Traffic Impact Analysis Report for Maui Medical Plaza at Kanaha, First Revision* (January 2010) by AECOM evaluated the traffic conditions in the vicinity of the project site. It noted that the Hana Highway/Hobron Avenue/Kamehameha Avenue intersection would be operating at levels of service D and F in the morning and afternoon peak hours, respectively, for the 2013 ambient (without project) forecast conditions. The intersection would improve to levels of service C and E in the morning and afternoon peak hours, respectively, for 2013 with the project. These results show the busy highway conditions at this location and the need to mitigate the traffic impacts during the construction and occupancy phases of the project.

TRANSPORTATION MANAGEMENT PLAN FOR CONSTRUCTION PHASE

Transportation Management Plan (TMP) strategies will be implemented to reduce construction-related trips during the peak traffic hours and also during the off-peak periods to minimize/mitigate traffic congestion at the site. Lydig Construction, Inc., the intended general contractor for the proposed project, will develop a detailed construction schedule and logistics plan in conjunction with all its subcontractors well before the start of construction. The detailed plan will incorporate TMP strategies that would have applicability to this project including:

1. Reducing the number of trips made in the peak traffic period, especially employee trips, through Transportation Demand Management (TDM) measures such as scheduling work in off-peak periods, carpooling, and minimizing on-site parking.

2. Minimizing the number of delivery trips through a detailed material delivery/ traffic plan.

3. Minimizing disruptions to through traffic on Hana Highway by scheduling delivery/pick up areas off the highway.

The general contractor will submit their plans to HDOT for approval. The general contractor is also expected to serve as the TMP Manager to ensure that the subcontractors and suppliers comply with the plans. The TMP Manager is also expected to monitor traffic conditions and prepare reports on the effectiveness of the plans during the construction phase.

Reducing the Number of Peak Hour Commuter Trips

The proposed project is expected to have an average of 35 to 50 workers on-site during the busiest construction periods. Lydig Construction, Inc., will work with its subcontractors to manage the number of workers and their vehicles arriving and leaving at the site at the beginning and end of the day to minimize disruptions to traffic operations on Hana Highway. Implementing a set of TDM measures can help reduce the number of worker commuter trips to and from the project site by as much as 25%±. These TDM measures are expected to come into effect once the project work site has been established and secured. It would not be possible to eliminate all trips during the peak hours since trips will be required to deliver workers, equipment, and supplies for specific work tasks.

The three primary TDM actions to reduce peak hour employee trips include scheduling work in off-peak hours, minimizing on-site parking, and carpooling. These three actions are highly inter-related, in that changes on one action will have an impact on the other actions. These actions will need to be to be coordinated and updated as their requirements will change as the project construction proceeds.

Scheduling Work in Off-peak Hours

The HDOT takes traffic volume counts at road locations throughout the State of Hawai'i. The latest available counts on Hana Highway near the Hobron Avenue/Kamehameha Avenue intersection were taken on May 12-13, 2009. The graphs of eastbound and westbound traffic volumes (by 15 minute intervals) on either side of the intersection are shown on **Figure 3**. These graphs show the peaking pattern of traffic during the morning and afternoon peak hours.

On the east side of the intersection, the two-way volumes during the morning peak show a jump at 7:00 a.m. and return to that level at about 8:30 a.m. The west side of the intersection shows a steady increase from 6:30 to 7:45 a.m., and a steady decline to 8:30 a.m., when traffic volumes level off. During the afternoon, the two-way volumes for the east side of the intersection are higher from 3:30 to 4:45 pm. The two-way traffic volumes on the west side of the intersection are relatively constant until after 5:00 p.m.

These two graphs indicate that morning peak hour traffic volumes are lower before 7:00 a.m. and after 8:30 a.m., and afternoon peak hour volumes are lower before 3:30 p.m. and after 5:15 p.m. Normal construction trade work times are from 7:00 a.m. to 3:30 p.m. Moving the construction start time 15 to 30 minutes earlier would allow workers to start and finish work before traffic volumes on Hana Highway increase and to travel in lighter traffic conditions. This adjustment would not eliminate all trips during the peak traffic hours, but could switch as much as 25%± of the trips out of the peak periods.

The State of Hawai'i Department of Health (DOH) regulations limit construction work between 7:00 a.m. and 6:00 p.m., Monday through Friday. The general contractor will be required to get an exemption from the DOH to begin on-site construction work at 6:30 a.m. An exemption should not be difficult to obtain, given that the surrounding lands are in industrial land uses.

Minimizing On-site Parking

Space to provide on-site parking is expected to be at a premium during construction. The number of available stalls can be expected to change as construction proceeds. The general contractor will work with the subcontractors to identify the number of parking stalls that will be available during the various stages of construction and determine when off-site parking stalls will be required. The general contractor will work with the local community and businesses to determine the best location for off-site parking. They will also have to gear the carpooling program effort to match the demand for rides to and from the off-site location.

Most of the on-site parking stalls will be for company vehicles that are used in the conduct of work. The parking stalls for personally owned vehicles will be for those driving carpool vehicles. The parking limitations may have to be maintained even when the parking garage can be used to park the contractor vehicles to minimize the number of peak hour vehicle trips to the project site.

Carpooling

Carpooling actions will be required to provide transportation for off-site parkers as well as to reduce the number of commuter trips by construction trade workers. Carpools may be formed in several ways. The traditional means is for one worker to pick up several workers at their residences on their commute. Another means is for the carpoolers to meet at a common location and carpool with one vehicle. These common locations could include the County park-and-ride lots, the employers' baseyard, or a nearby vacant area rented for this purpose. Coupled with the earlier work hours, this would require workers to get an earlier start to get to a parking lot and continue to the job site. Another alternative is a "crew bus" concept, wherein the contractor arranges for off-site parking and utilizes a crew bus to transport crews to the construction site and return them to the off-site parking location. The crew-bus alternative would accommodate anyone needing to work overtime as well.

The proposed carpooling program is intended to cover as many employees as possible and would go beyond company "boundaries". Carpools could include workers from several companies, although the composition of carpools could change continually as construction proceeds. There would be a bulletin board with information that can be used to match workers with their rides. A guaranteed ride home program would have to be implemented with the carpool program to provide workers with a ride home in case they miss their scheduled ride due to an emergency or unscheduled overtime. The employer is expected to make provisions for workers who need to go to another job site for their job assignment. This may be to notify the TMP Manager that additional vehicles would need to be maintained on site.

An issue with reducing vehicle trips by carpooling is that workers may have to bring construction equipment and tools (including personal tools) to the job site. Arrangements could be made to securely maintain equipment and tools on-site to minimize the need for workers to transport the equipment to and from the site each day. Also, it may not be possible to implement a carpool program at the initiation of construction until the work yard is established and secured.

These three TDM measures would pertain primarily to workers who are on-site the entire workday. Workers who need to travel to other work sites on the same day would have to coordinate with the TMP Manager to assure that they will have sufficient parking stalls available.

Minimizing the Number of Delivery Trips

Lydig Construction, Inc., will develop a detailed material delivery/traffic plan to identify when and where deliveries will be made to the project site. All deliveries will be scheduled well in advance and coordinated with each supplier/subcontractor to minimize traffic congestion. The plan will clearly identify the routes which truck traffic will enter and egress the project site. The routes will include appropriate signage, flagging, and channelization as appropriate.

Delivery trips during the peak hours of highway traffic operations (7:00 a.m. - 8:30 a.m. and 3:30 p.m. - 5:00 p.m.) should be minimized to the maximum extent possible through scheduling means. The afternoon is not expected to be much of a problem since most construction work is expected to be completed before 3:30 p.m. As is customary in congested urban areas, material deliveries to the site will be scheduled to occur at "off-peak" hours whenever possible. Lydig Construction, Inc. will also ensure the schedule reflects this to the maximum extent possible.

An effort will be made to minimize the total number of delivery trips to the project site by consolidating deliveries. Subcontractors can deliver their supplies and equipment to the general contractor, who will then deliver the products to the job site. The general contractor and TMP Manager will not allow deliveries with partially loaded vehicles unless there is a critical need for the product. As another example, subcontractors would not send their own fuel trucks to the job site since the general contractor would be responsible for fueling all the vehicles and equipment.

Minimizing Disruptions to Through Traffic on Hana Highway

Several actions can be used to mitigate unavoidable traffic disruptions to through traffic on Hana Highway. Construction activities that may disrupt traffic operations on Hana Highway include the initial construction to establish the project work site, delivery of materials and supplies, and the widening of the northwest bound roadway from two to four lanes in front of the project site. Lydig Construction, Inc., will develop detailed site logistics and material delivery/traffic plans to minimize these construction impacts.

All material and supply deliveries will be brought onto the site for unloading. It is not anticipated that delivery trucks will need to stop alongside the highway to unload their provisions. However, on the rare chance that a roadside delivery should become necessary for the project, Lydig Construction, Inc. will schedule the delivery to be done during off-peak or evening hours, with advance notification of the event to HDOT to ensure that it is well-coordinated and safely accomplished using flagging, channelization, or other traffic control measures as required.

It will be difficult to avoid traffic disruptions for northwest bound traffic flow on Hana Highway when the highway is widened from two to four lanes. The current right travel lane will have to be closed when the new adjacent lane is constructed. The best way to minimize traffic disruptions is to conduct construction during off-peak periods. The HDOT limits work on State roadways (such as Hana Highway) to between 8:30 a.m. and 3:30 p.m., Monday through Friday, unless the District Engineer permits otherwise. The HDOT work time limits will force the contractor to do any roadwork during the midday off-peak periods. If necessary, the roadwork could be scheduled during night hours to minimize disruption to traffic flow.

The contractor will schedule their work to complete the lane addition roadwork as quickly as possible to shorten the time of traffic disruption. Lydig Construction, Inc. and their subcontractors for the highway portion will plan all scheduling of work well in advance of starting the roadway construction. Once the final scope of work is delineated, Lydig will coordinate their work plan with the HDOT and arrange to include that plan in the project bidding documents so that all subcontractors will be aware of the TMP provisions.

TRANSPORTATION DEMAND MANAGEMENT PROGRAM FOR OCCUPANCY PHASE

A Transportation Demand Management (TDM) program is a set of strategies and actions that are intended to change travel behavior to reduce traffic congestion and result in more efficient use of the transportation system. The general goal of TDM programs is to reduce the use of single occupancy vehicles in the peak periods and shift travel to higher occupancy or non-motorized transportation modes. A TDM program can include strategies such as incentives/disincentives, service improvements, information dissemination and marketing, and parking management. The proposed TDM program will be specific to the proposed medical office plaza, which presents several challenges:

- The primary focus of the program will be on the tenant employers and their employees, hereinafter referred to as employees, in the facility. Experience elsewhere has shown that work trips are the easiest to shift to alternative transportation modes. Patients would be difficult to shift since they arrive during the off-peak period when traffic conditions are better and travel in small family groups or alone.

- The proposed facility will consist of many small employers rather than a large employer, which makes it more difficult to contact, coordinate, and manage the employees.

- There will be a large number of physicians and other medical professionals with high values on their time. Many physicians may visit their patients at the Maui Memorial Hospital before coming to their office appointments and will depend on their vehicles to them quickly from one location to the next. Both of these attributes make this group difficult to switch away from single occupant vehicles.

- Physicians may request/demand preferred parking stalls, adding more complexity to the parking strategies.

<u>What is a TDM Program?</u>

A TDM program is a subset of the TMP aimed at the employees of the project. As previously stated, the general goal of a TDM program is to reduce the use of single occupancy vehicles in the peak periods and shift travel to higher occupancy or non-motorized transportation modes. A TDM program consists of three general components that are discussed in the following paragraphs:

- Coordination,
- Marketing and Information Dissemination, and
- Actions and Strategies.

<u>Coordination</u>

The Coordination component is the management function that brings together separate elements into a unified TDM program. In order to succeed, corporate commitment will be required to devote adequate resources to sustain the program.

The coordination component will also include a monitoring program to measure the success of the program. The coordinator would set initial goals for the TDM program and develop monitoring programs to determine whether or not the goals have been met. The monitoring program could be complex since it would need to differentiate between two distinct markets: the employees and the visiting patients. There would also be no "no program" benchmark to measure against since the TDM program would be implemented from the initial building occupancy. Hence, a survey of a similar facility may have to be conducted to determine benchmark levels of ridership by travel mode.

Recommendation: To accomplish the program tasks, it is proposed that a contractor be designated as TDM Coordinator to develop a sustaining program that can be assumed and continued by the building management. The contractor would have a heavy initial involvement to implement and market the program. Their involvement would decrease as the program matures after the project reaches full occupancy. They would train the project management to assume the role of the TDM Coordinator. The coordinator could also interface with other similar programs in Kahului.

Marketing and Information Dissemination

The Marketing and Information Dissemination component is used to notify the building's employees of the existence of the program and how they can participate. The three components of TDM marketing include information dissemination, transportation coordinators, and special promotions. A bulletin board or website would be the primary means of information dissemination. The bulletin board is less favorable due to increased privacy concerns. All employees would be aware of the existence of the TDM program from their initial occupancy. Marketing efforts would be directed toward individual employer offices at this project.

Transportation coordinators from the employee pool will assist the TDM Coordinator with information dissemination and maintaining interest in the program. The program would also promote special programs to increase and maintain interest in the TDM program.

Actions and Strategies

The Actions and Strategies component includes a wide range of potential actions and strategies that can be used to meet the goals of the TDM program. The following paragraphs discuss the applicability of several actions to this particular project.

Carpooling

Carpooling is the most prevalent action in most TDM programs. It is the process of grouping commuters into carpool arrangements at the area-wide, employer, or informal levels. The primary incentive for carpooling is to reduce the total cost of commuting for those who participate, including their auto operating expenses and parking. For those who do not drive or have access to an auto, carpooling represents another viable mode of transportation to work. Successful carpooling programs can attract above 12% of work trips.

A carpooling strategy is actually a collection of many sub-components which can include:

1) notification system (information dissemination such as a bulletin board or a website) to let employees know of other potential carpoolers,
2) maintaining a database of potential carpoolers,
3) preferential parking spaces,
4) reduced parking fees,
5) joining an area-wide program, and
6) provision of an emergency ride home program for carpoolers to get home when an emergency or unscheduled overtime forces them to miss their pool.

Increased Use of Transit

The proposed project site is currently not well served by the Maui public transit system. Although several bus routes on Hana Highway pass by the site, the nearest bus stop/station is in the Maui Mall about a quarter mile away. To improve bus access to the site, the management is working with the HDOT and the Maui County Department of

Transportation to locate a bus stop fronting the facility. Transit service improvements would have a great potential to increase bus ridership.

Another incentive to encourage transit use is to provide discounted or subsidized bus fares. One reason for employers to offer subsidized bus fares is the cost savings from the reduced need to provide additional parking facilities. The proposed parking facility with its approximately 360 stalls is expected to meet demand for many years into the future; hence, discounted bus fares are not expected to markedly increase bus ridership in the short term. The discounted fares strategy may not work well with the proposed project unless bus stops are located closer to the project site and transit service is increased.

A very strong TDM action to increase transit ridership is the mandatory pre-paid transit voucher. This action would require each employee in the project to pay a mandatory monthly fee equal to the cost of a monthly bus pass. The employees would then receive a voucher which can only be used to purchase a monthly bus pass. The fee would be required for all employees regardless of whether the voucher is used. This measure is thought to be too drastic for this project given the level of transit service at the project.

Increased Use of Other Modes Such as Bicycling and Walking/Jogging

Facilities can encourage bicycling and walking/jogging as commuting modes by providing amenities such as showers, change rooms, and secure bike racks. Most of the tenants are expected to have their own shower facilities so that the building would not have to provide a common shower facility. The project architect has included secured bicycle facilities in the building design.

Outside (i.e., government) support would be required to implement improvements such as bike lanes and sidewalks that are normally publicly provided. The future widening of Hana Highway is expected to include bicycle facilities in line with the HDOT *Bikeway Master Plan* (2003) recommendation, which lists Hana Highway as having a "signed shared facility." The HDOT does not want the project to install a bicycle facility in front of the project, since it may not be compatible with the future design of the highway widening. The schedule for the highway widening is uncertain since it is funded by private monies that are currently not available.

The project site is currently difficult for pedestrians to access due to the lack of sidewalks in this industrial area. The project will provide sidewalks fronting the facility to improve pedestrian safety and comfort. It is not known whether or not sidewalks will be included with the highway widening project.

Parking Strategies

The parking supply will be fixed by the design of the parking structure. Parking management, primarily through the setting of parking rates, will have an important but complex role in determining the demand for parking, and could affect the marketability of the building. Parking rates that are too high could cause employees to seek out less expensive parking off-site. Several Honolulu hospitals and large medical centers create problems on their neighboring streets when employees utilize the on-street parking stalls in the area. Employees do this due to a lack of on-site parking and/or do not want to pay the parking fees.

Parking strategies can encourage carpooling through several means. The most effective is offering discounted rates to drivers who carpool, with deeper discounts for larger size carpools. Additionally, preferential parking stalls would also make carpooling more attractive.

Disincentive parking management tools which would encourage carpooling include no free parking for non-carpoolers and no employer paid parking.

Vanpooling

Vanpools have been successful with large employers in locales with long commute distances. Vanpooling is not thought to be appropriate for this project since it does not have a large number of employees and is not expected to have long commute distances. If the opportunity does arise to create a vanpool, the TDM Coordinator can contact the HDOT Vanpool Hawai'i program for assistance and access to van vehicles.

Variable Work Hours

Variable work hours have the potential to shift trips out of the peak period to reduce the number of vehicle trips in the peak period. The private medical profession is in a sense already practicing variable work hours since medical doctors and their staffs generally have office hours and work shifts before or after the main commute peak times.

Compressed Work Week

The compressed work week has the potential to reduce the number of work days a week and number of commuter trips made. Many private practicing doctors generally have their own compressed work week program where they shift part of a weekday work day to Saturday. So a compressed work week program would not have a large traffic impact. It should be noted that a strong variable work hours and compressed work week program can work counter to a carpooling program since they dilute the concentration of work times that help make carpooling successful.

Teleworking

Teleworking, or working from an off-site location via telecommunication devices, is not applicable to this project since doctors and their staff must be on-site to see their patients.

Recommendation: The carpooling, increased use of transit, increased use of other non-motorized modes, and parking strategies alternatives would have the greatest impact for this particular project. The TDM Coordinator would work with the project management to fine tune a specific program. The building management would need to include areas for showers and secured bike racks in their design.

References

References

1. *Transportation Impact Analyses for Site Development*, Institute of Transportation Engineers, (2006).

2. *Traffic Impact Analysis Report For Maui Medical Plaza at Kanaha*, AECOM Pacific, Inc., (2009)

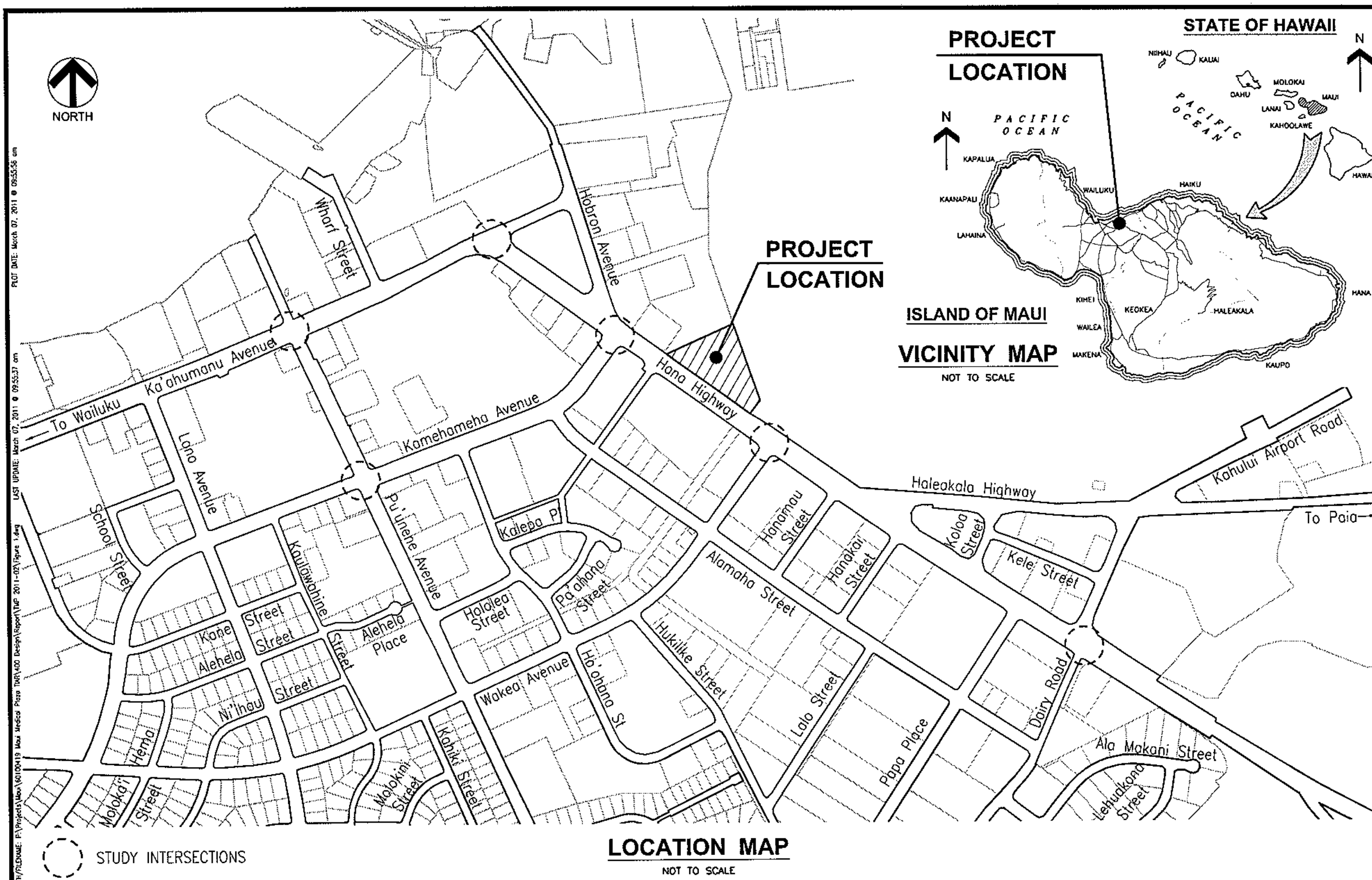
3. *Traffic Impact Analysis Report For Maui Medical Plaza at Kanaha, First Revision*, AECOM Pacific, Inc., (2010)

4. *Maui County Bus Stop Planning & Design Services Report*, KFH Group, (2008)

5. Synchro Studio 7, Trafficware, Ltd.

6. *Bikeway Master Plan*, State of Hawai'i Department of Transportation, (2003).

Figures



LOCATION MAP

NOT TO SCALE

AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

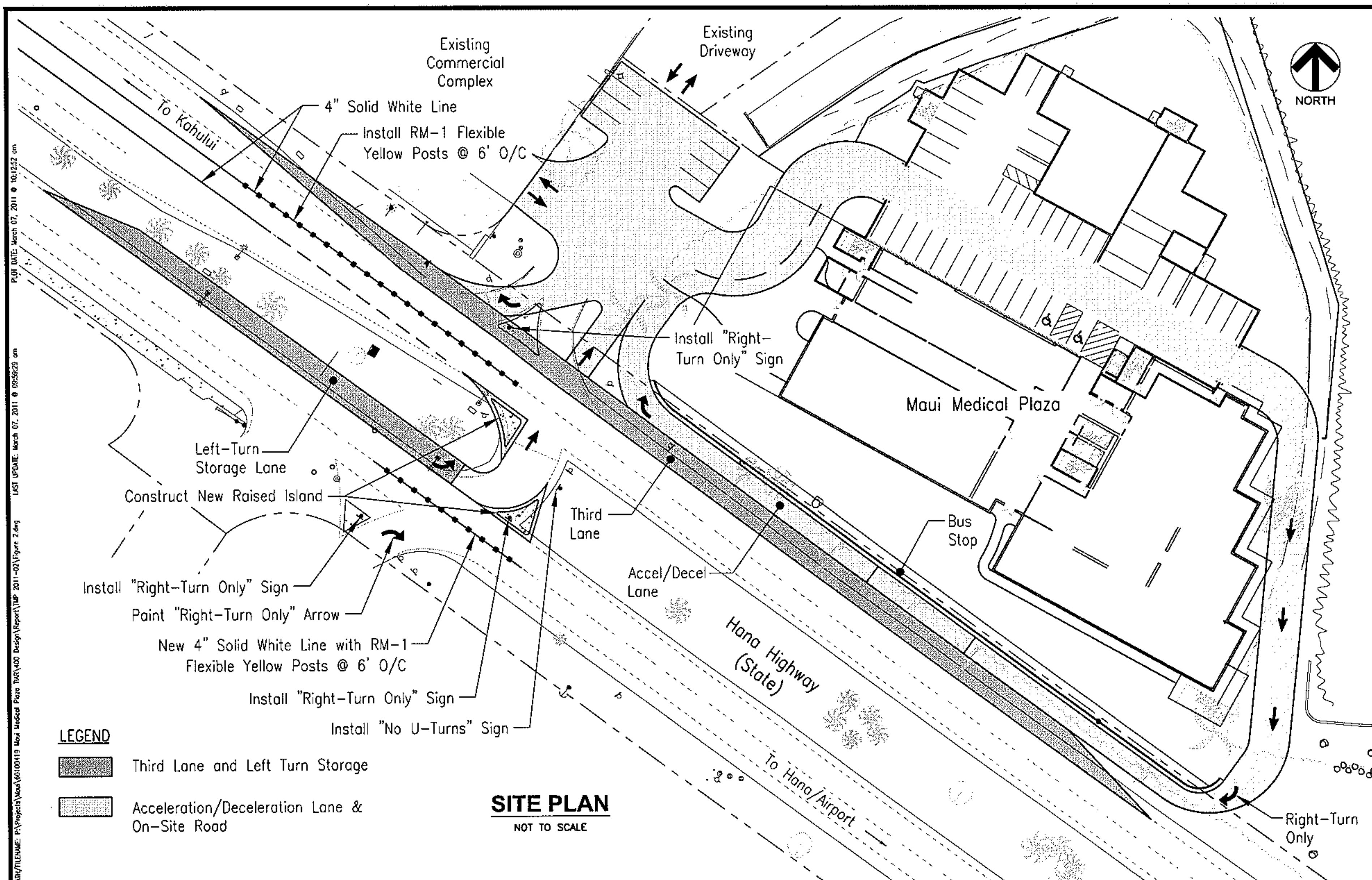
Figure 1

LOCATION MAP

TRANSPORTATION MANAGEMENT PLAN
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011

PLOT DATE: March 07, 2011 @ 09:55:56 am
LAST UPDATE: March 07, 2011 @ 09:55:37 am
PATH/FILENAME: P:\Projects\Maui\60100419 Maui Medical Plaza TMP\400 Design\Report\TMP 2011-02\Figure 1.dwg



AECOM

DAVIES PACIFIC CTR, STE 1900 · 841 BISHOP ST, HONOLULU, HAWAII 96813

Figure 2
SITE PLAN
TRANSPORTATION MANAGEMENT PLAN
MAUI MEDICAL PLAZA AT KANAHA
KAHULUI, MAUI, HAWAII

MARCH 2011

FIGURE 3
PEAK TRAFFIC VOLUMES ON HANA HIGHWAY AT HOBRON AVENUE

A. MORNING PEAK TRAFFIC VOLUMES

	EAST OF HOBRON AVE			WEST OF HOBRON AVENUE		
15 Minute	15 MINUTE TRAFFIC VOLUMES			15 MINUTE TRAFFIC VOLUMES		
Period Starting	East Bound	West Bound	Total Two Way	East Bound	West Bound	Total Two Way
6:30	162	251	413	156	154	310
6:45	166	317	483	151	247	398
7:00	178	312	490	184	265	449
7:15	200	397	597	178	302	480
7:30	202	428	630	165	347	512
7:45	208	402	610	214	342	556
8:00	193	366	559	187	297	484
8:15	218	327	545	179	284	463
8:30	209	296	505	161	245	406
8:45	186	308	494	176	223	399
9:00	181	274	455	175	229	404
9:15	202	272	474	193	200	393

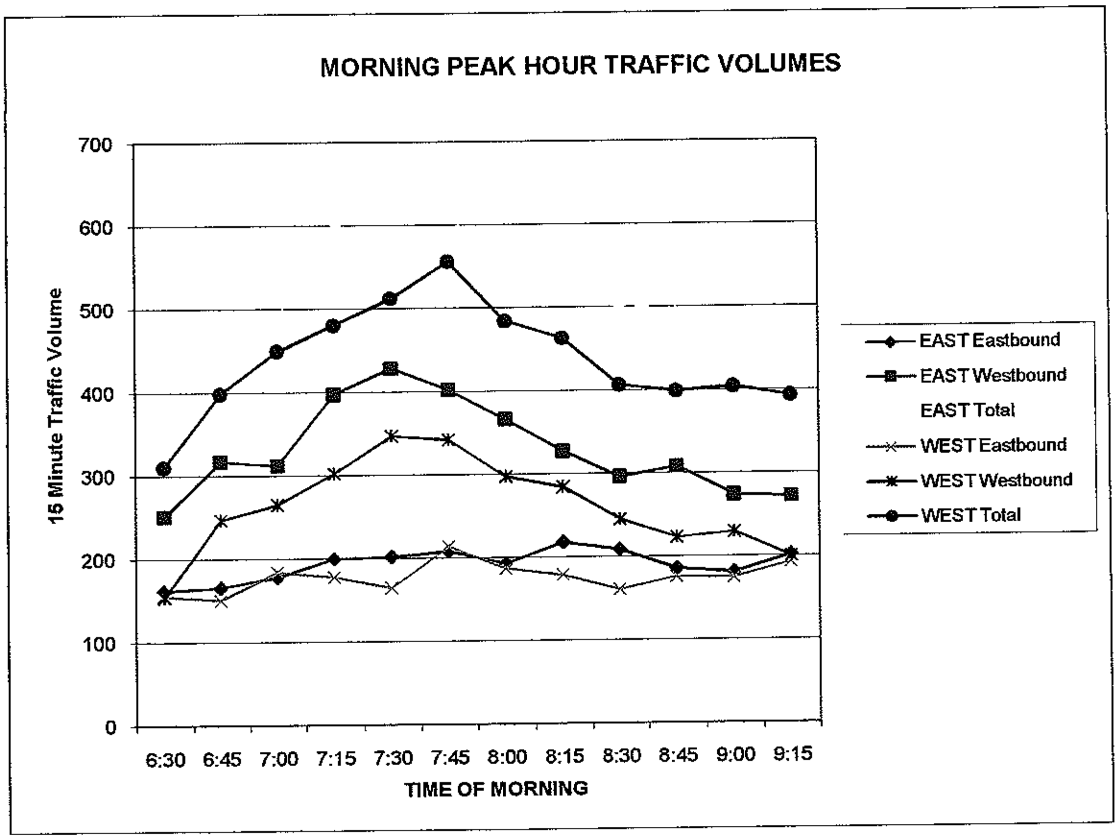
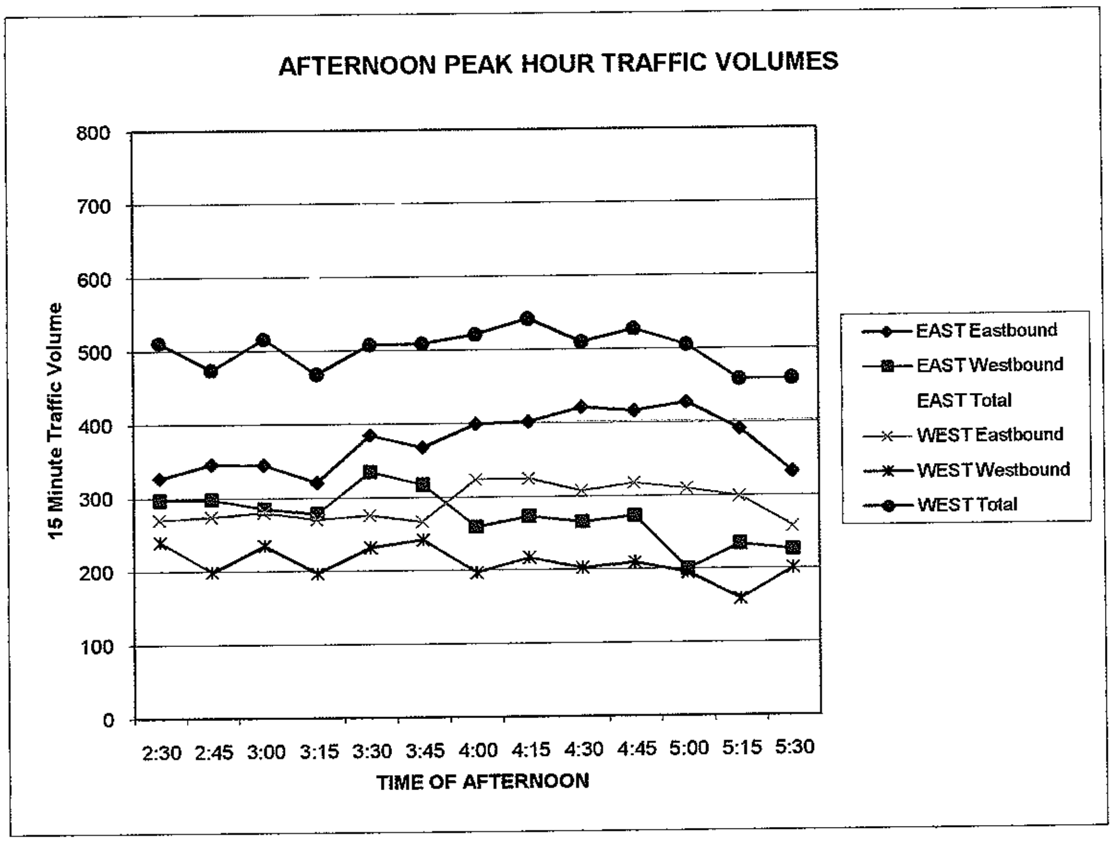


FIGURE 3
PEAK TRAFFIC VOLUMES ON HANA HIGHWAY AT HOBRON AVENUE

B. AFTERNOON PEAK TRAFFICVOLUMES

	EAST OF HOBRON AVE			WEST OF HOBRON AVENUE		
15 Minute	15 MINUTE TRAFFIC VOLUMES			15 MINUTE TRAFFIC VOLUMES		
Period Starting	East Bound	West Bound	Total Two Way	East Bound	West Bound	Total Two Way
2:30	327	297	624	271	240	511
2:45	346	298	644	275	199	474
3:00	345	285	630	281	235	516
3:15	321	278	599	271	197	468
3:30	385	335	720	276	232	508
3:45	368	317	685	267	242	509
4:00	399	259	658	324	197	521
4:15	402	273	675	325	217	542
4:30	421	265	686	308	202	510
4:45	416	273	689	318	209	527
5:00	427	200	627	310	195	505
5:15	391	234	625	299	159	458
5:30	332	226	558	258	201	459
5:45	334	215	549	251	187	438



APPENDIX K.

Letters of Support

ALAN M. ARAKAWA
MAYOR

KEITH A. REGAN
MANAGING DIRECTOR

OFFICE OF THE MAYOR
Ke'ena O Ka Meia
COUNTY OF MAUI – Kalana O Maui

March 8, 2011

Mr. Benjamin Brown
Dr. James Hansen
Mr. Robert McDaniel
Kanaha Professional Plaza LLC
350 Hukilike Street, Suite D
Kahului, Hawaii 96732

Dear Mr. Brown, Dr. Hansen, & Mr. McDaniel:

SUBJECT: Proposed Maui Medical Plaza at Kanaha Project
TMK(2) 3 – 7 – 011 : 028
Kahului, Maui

I am writing this letter in support of your project for several important reasons. First, the proposed project will provide quality medical office space in a centralized, contemporary medical facility where physicians and other healthcare professionals can deliver coordinated medical services to our residents and visitors alike; second, the new state of the art facility essentially replaces the old Maui Clinic building which was built in 1958 and has become sorely inadequate to address expansion and technological needs in our growing community; third, the proposed project site is a central (urban infill) location, in the State Urban District and its intended use is in conformance with the Wailuku – Kahului community plan and Maui County Zoning; and fourth, this project will produce a wide range of economic benefits for our community, from creating short and long term jobs to purchasing a multitude of goods and services from our local businesses.

Again, I am in support of this project and wish you great success in providing our community members with enhanced and expanded health care services and economic opportunities.

Sincerely,

ALAN M. ARAKAWA
Mayor, County of Maui

c: William Spence, Director, Department of Planning

200 South High Street, Wailuku, Hawai'i 96793-2155 Telephone (808) 270-7855 Fax (808) 270-7870 e-mail: mayors.office@mauicounty.gov

CHARMAINE TAVARES
MAYOR

200 South High Street
Wailuku, Hawaii 96793-2155
Telephone (808) 270-7855
Fax (808) 270-7870
e-mail: mayors.office@mauicounty.gov

OFFICE OF THE MAYOR
County of Maui

November 12, 2009

Mr. Benjamin Brown
Doctor James Hansen
Mr. Robert McDaniel
Kanaha Professional Plaza LLC
350 Hukilike Street, Suite D
Kahului, Hawaii 96732

Dear Mr. Brown, Dr. Hansen & Mr. McDaniel:

SUBJECT: PROPOSED MAUI MEDICAL PLAZA AT KANAHA PROJECT AT TMK (2) 3-7-011:028, KAHULUI, MAUI

As our community continues to grow on Maui, the need for proper medical services increases. The proposed Maui Medical Plaza at Kanaha will give physicians and other health specialists on the island an accessible and central location in which they can provide care for their patients. It intends to replace the loss of medical space that will be experienced with the expected closure of the Maui Clinic Medical Center on Puunene Avenue.

I support and appreciate your efforts to provide the community with a medical office facility that can administer timely healthcare services and contribute to the economic well-being of Maui County. The proposed facility will afford physicians, clinical laboratory personnel, physical therapists, radiologists and others the opportunity to work together to assist in the overall physical and mental wellness of each individual patient.

I look forward to seeing this project come to fruition and become a real and viable venue for enhanced medical practices in Central Maui.

Aloha,

Charmaine Tavares

CHARMAINE TAVARES
Mayor, County of Maui

CT:gi

MAUI
MEDICAL
PLAZA

The Maui Medical Plaza at Kanaha is a new health care facility and medical office building proposed for development at 151 Hana Highway in Kahului. As a long-time neighbor of this project location, I support this new health care facility for central Maui. It will be a positive contribution to the neighborhood and benefit all of our central Maui community.

Additional Comments: Welcome to our neighborhood & I wish you all the luck in your venture!

Signature: [signature] Date 8/17/09

Printed Name: Roy M. Kitagawa Date 8/17/09

Kitagawa Motors, Inc.
DBA: Island Honda &
Island Auto Center

350 Hukilike Street, Suite D • Kahului, Maui, HI 96732 • 808.283.8811 (cell) • 866.812.8585 (toll free) • 808.876.0861 (fax) •

To: Maui Planning Commission
C/O Planning Department
250 South High St
Wailuku, HI 96793

'10 NOV 22 P2:09

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

RE: Proposed Maui Medical Plaza at Kanaha

Our family is receiving its care from Maui Clinic, and the current building is old and limited in capacity.
A new building could help to improve the services available to us and the community. We would like to register our support for the new building and the advance in medical care that it represents to Maui County.

Sincerely,

Takayo Douglas & Dennis Douglas

Mark Roy

From:	James Buika [James.Buika@co.maui.hi.us]
Sent:	Wednesday, October 20, 2010 10:10 AM
To:	Lee Krieger
Cc:	Mark Roy
Subject:	letter of Support: Maui Medical Plaza at Kanaha

Dear Lee Krieger,

Thank you for your email. It will become a matter of public record if this is what you desire. I am passing it on to the Applicant's representative to take note.

Thank you for your interest in the Maui Medical Plaza, Jim Buika

Jim Buika, Planner
Department of Planning
Current Division
County of Maui
250 South High Street
Wailuku, HI 96793
(808) 270-6271
(808) 270-1775 Fax
james.buika@mauicounty.gov

>>> Lee Krieger <leeonmaui@hotmail.com> 10/20/2010 1:58 AM >>>

Mr. Buika,

I am writing this letter in support of the proposed Maui Medical Plaza at Kanaha. Maui is one of the top resort destinations in the world, and yet the level of our health care choices is poor. We have an aging group of physicians here, and many quality doctors have left, due to the lack of modernized, superior facilities.

The Maui Medical Plaza would be such a place, and it could attract new physicians to the island, while keeping others from leaving.

Access to quality health care is an important issue to all of us, and I urge you to facilitate the creation of the new Maui Medical Plaza. The people of Maui would benefit greatly, and it would make our island an even better place to live.

Mahalo,

Lee Krieger
Kihei

- -

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DATE: October 12, 2010

Maui Planning Commission attn: James.Buika@mauicounty.gov
County of Maui
Planning Department
250 S. High Street
Wailuku, HI. 96793

RE: Maui Medical Plaza at Kanaha

I have lived on Maui for almost 30 years now, and I know we have always struggled to get and keep the proper amount of well qualified medical professionals here on Maui. I know that many of you all know someone that when they required critical surgery were flown to Oahu for treatments. The better facilities we can have here on Maui the better. Maui is and for many years has been the number one visitor destination in the world, the medical facilities that we have are just not sufficient for the growing population as well as the 3 million visitors we get here annually. We are in great support of this new facility, and hope you see thru to the finalization of this facility for the greater good of the community and the county as a whole.

Sincerely,

Dale DeSalvo

Dale DeSalvo, President
Access Hardware Inc, Maui Lock Service

Maui Medical Plaza at Kanaha 101210

285 Hukilike St. B102 • Kahului, HI 96732 • (808) 871-4200 • Fax (808) 877-0306

10/3138

'10 SEP 28 P1 :08

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

To: Maui Planning Commission
C/O Planning Department
250 South High St
Wailuku, HI 96793

RE: Proposed Maui Medical Plaza at Kanaha

We are pediatricians that operate an office at Maui Clinic, having taken over from Dr Bill Kepler in 2005. The location of the current building has proved convenient, although we draw patients from as far as Hana and the west side. However, the physical structure is old, deteriorating in form and function, and limited in capacity.

The proposed new building could help to improve the services available to us and the community. We would like to register our support for the new building and the advance in medical care that it represents for Maui County. The process has been long (we started this planning process in 2006!), and meticulous. Please help advance this needed project.

Sincerely,

Andrew Fox

Andrew Fox, MD

Beth Fox

Beth Fox, MD

Tel 871-8611
Fax 893-0211

APPENDIX L.

Model of Original Design Concept as Presented at 2006 Urban Design Review Board Pre-Consultation Meetings


01/19/2011 15:02


01/19/2011 15:04


01/19/2011 15:02

APPENDIX M.

Letter from Project Architect Evaluating Three (3) and Four (4) Story Design Alternatives

Harrison G. Fagg & Associates, A.I.A. 800 Granite Tower 222 North 32nd Street Billings, Montana 59101 (406) 248-7811 Fax (406) 259-9278

March 11, 2011

Mr. Mark Alexander Roy, AICP
Program Manager
Munekiyo & Hiraga, Inc.
305 High Street, Suite 104
Wailuku, HI 96793

HGFA ARCHITECTS

RE: Proposed Maui Medical Plaza Project and Related Improvements at TMK (2) 3-7-011:028, Maui, Hawaii

Dear Mr. Roy:

The following information is offered in response to Comment No. 4 of the Maui Planning Commission's comment letter, dated August 24, 2010, which requests analysis of three- and four-story renderings of the subject project.

In the course of the design of the Maui Medical Plaza, I have, at the owner's request, evaluated numerous configurations of the proposed building. It should be pointed out prior to discussing these solutions, three (3) basic facts that have governed the process of assessing alternative design concepts for the project.

1. Because of so many front end costs, the cost of the land and numerous other expenses (including site work, landscaping and entitlements), the project will not be economically feasible without a minimum of 100,000 square feet (s.f.) of leasable floor space. This essentially means designing a building of roughly 120,000 s.f. in gross floor area. This equates to a building area of roughly three (3) acres in size.

2. The project site (approximately two (2) acres in area) has numerous setbacks required by the Maui County Code that reduce the buildable footprint substantially thereby not allowing a great deal of flexibility in the building design and still meeting the 100,000 s.f. requirement of item no. 1 above.

3. The project to meet code requires 361 off-street parking stalls. This takes, even with a multi-story parking facility, a large portion of the site.

To this end, the following discussion is offered regarding alternative building design concepts for the project:

1. A three-story building is unworkable. It would use the entire site and would take on the appearance of traditional 'big box' building in order to provide the necessary 100,000 s.f. required for project feasibility. Further,

Harrison G. Fagg A.I.A., P.I.C. • Michael J. Burke A.I.A • Sherill E. Burke • Jack Clark • Jeffrey Winkler • Scuther • Todd Keller
Licensed in California, Hawaii, Idaho, Montana, New Mexico, North Dakota, South Dakota, Washington and Wyoming. Certified by the National Council of Architectural Registration Boards.

this type of facility would equate to a building of approximately one (1) acre per floor and would not leave enough room for the required 361 off-street parking stalls to be provided on the site. In summary, the three-story design alternative is not feasible given the size of the project site and the requirements set forth in the Maui County Code.

2. A four-story building would be much the same as the three-story alternative – it would occupy too much of the site and would not allow for compliance with setbacks required by the Maui County Code. As shown in the preliminary concept plans attached as **Exhibit "A"**, the final design would also take on the appearance of a traditional box-like building and would not comply with the input that has been provided on the project over the last few years by the Urban Design Review Board (UDRB).

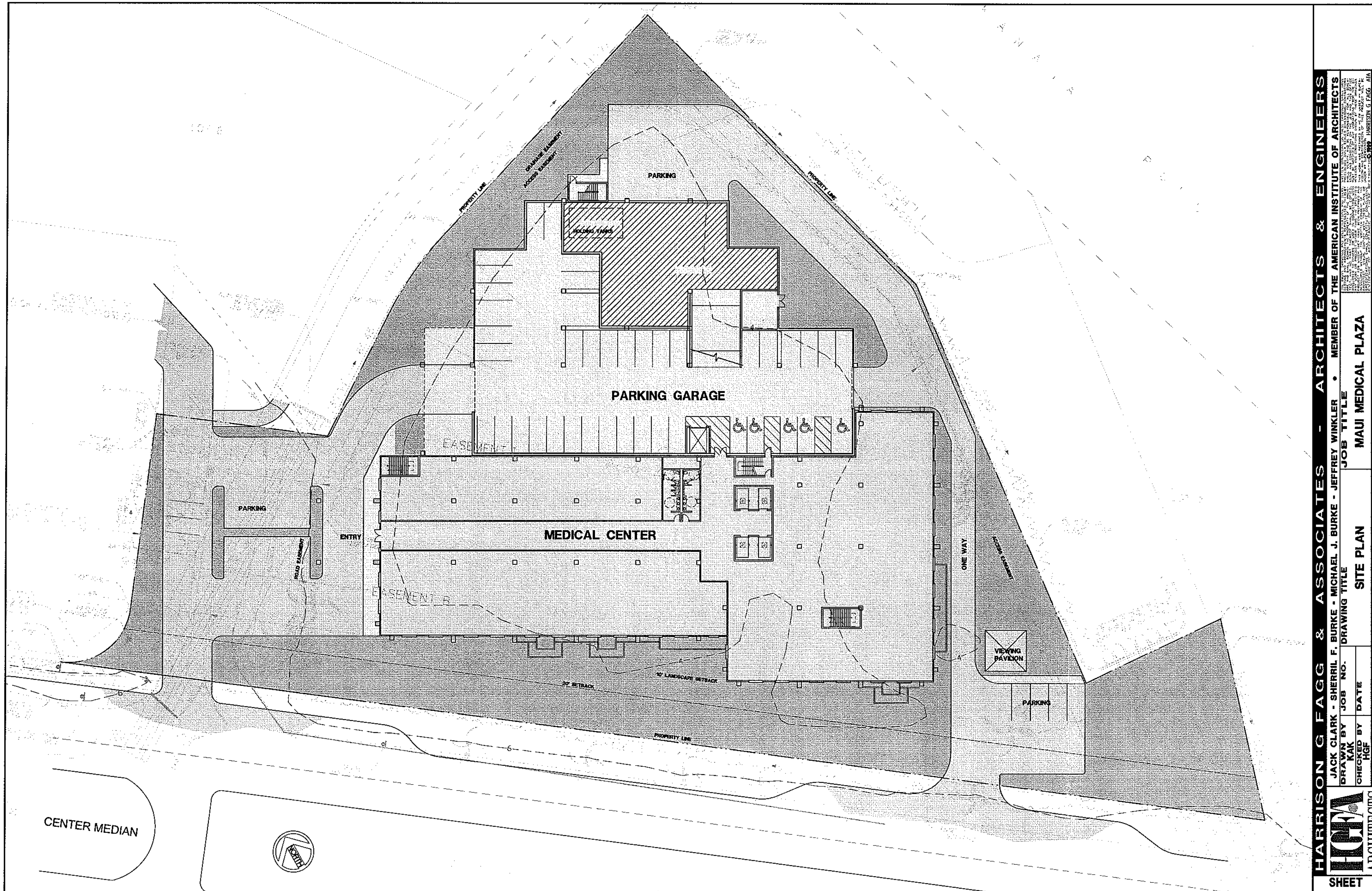
3. A five-story primary building with a four-floor wing was initially designed as the first design concept for the project. The plans for this alternative were reviewed by the Urban Review Design Committee in pre-consultation meetings held in 2006. The UDRB rejected the initial design and asked for a solution that allowed for incorporation of setbacks from floor to floor.

4. The current proposed design (as reflected in the Final EA) for the project incorporates the requested floor to floor setback and, thus, meets both the requirements of the UDRB and the requirements of the owner.

The proposed design for the Maui Medical Plaza Project, as discussed in item No. 4 above, was presented to the UDRB at meetings held on September 7, 2010 and October 5, 2010. Following review of the proposed staggered or stepped-back design, the UDRB issued a recommendation for approval of the project to the Maui Planning Commission by letter dated October 15, 2010. As such, the proposed plans (as discussed in the final EA) are being presented by Kanaha Professional Plaza, LLC as the finalized solution to the building design.

Sincerely,

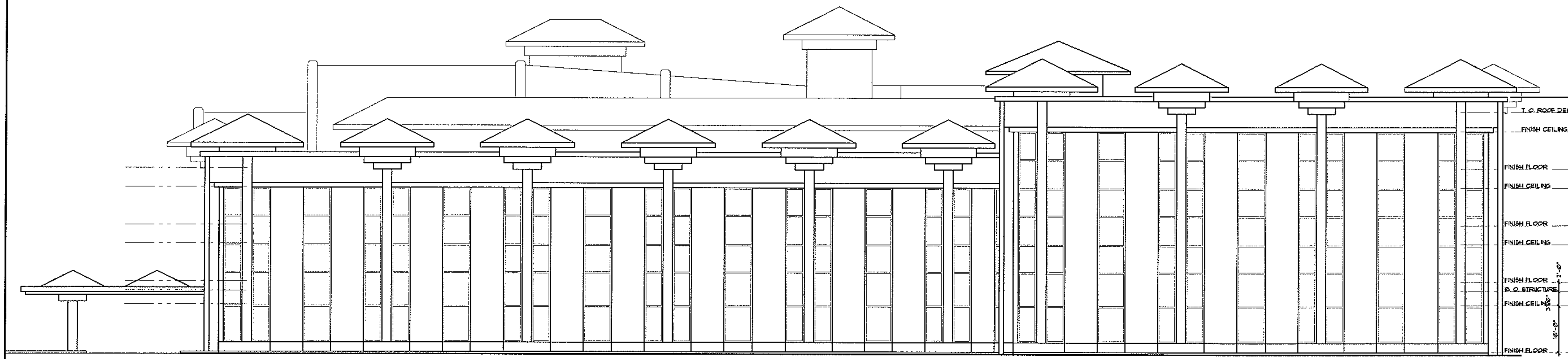
Harrison G. Fagg, Project Architect
Harrison G, Fagg & Associates



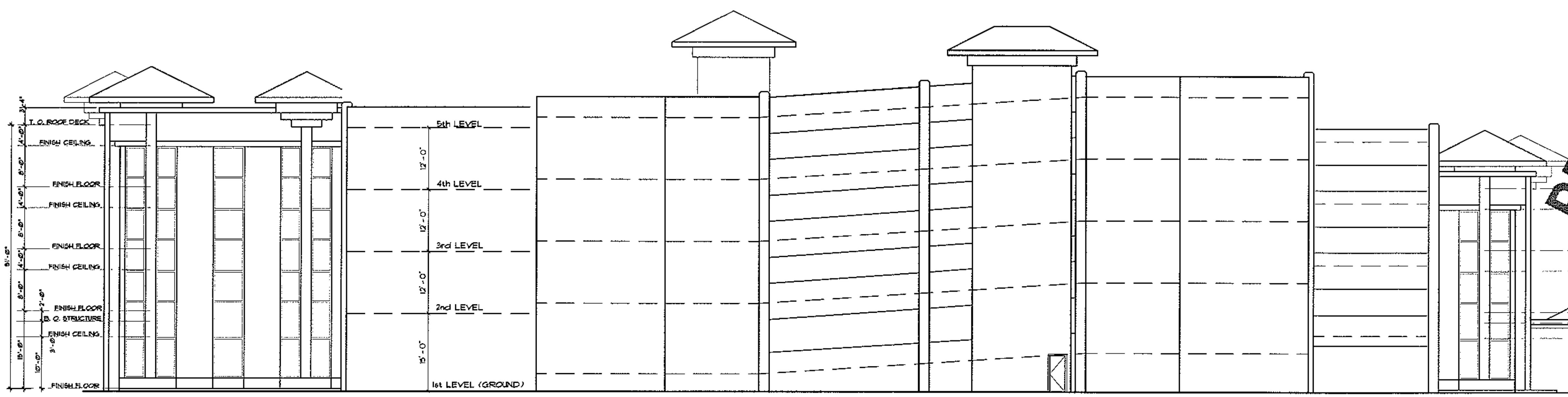
PRELIMINARY SITE PLAN

SCALE 1" = 20'

EXHIBIT A



1 SOUTH ELEVATION
3/32" = 1'-0"



1 NORTH ELEVATION
3/32" = 1'-0"

PRELIMINARY

HARRISON G FAGG & ASSOCIATES - ARCHITECTS & ENGINEERS

JACK CLARK - SHERRIL F. BURKE - MICHAEL J. BURKE - JEFFREY WINKLER • MEMBER OF THE AMERICAN INSTITUTE OF ARCHITECTS

HGFA ARCHITECTS

DRAWN BY KAK	JOB NO. 2637	DRAWING TITLE	JOB TITLE
CHECKED BY HGF	DATE 12-11-06	NORTH/SOUTH ELEVATIONS	MAUI MEDICAL PLAZA

800 GRANITE TOWER, BILLINGS, MONTANA 59101 - PH (406) 248-7811 - FAX (406) 259-9278 - Email HGFA@hgfa.net

SHEET
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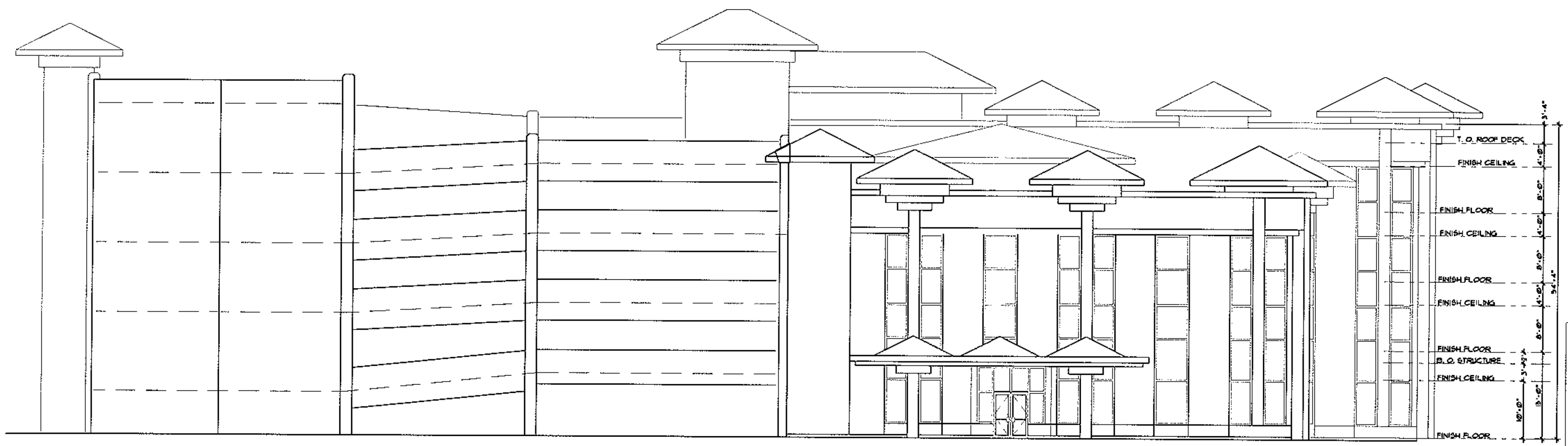
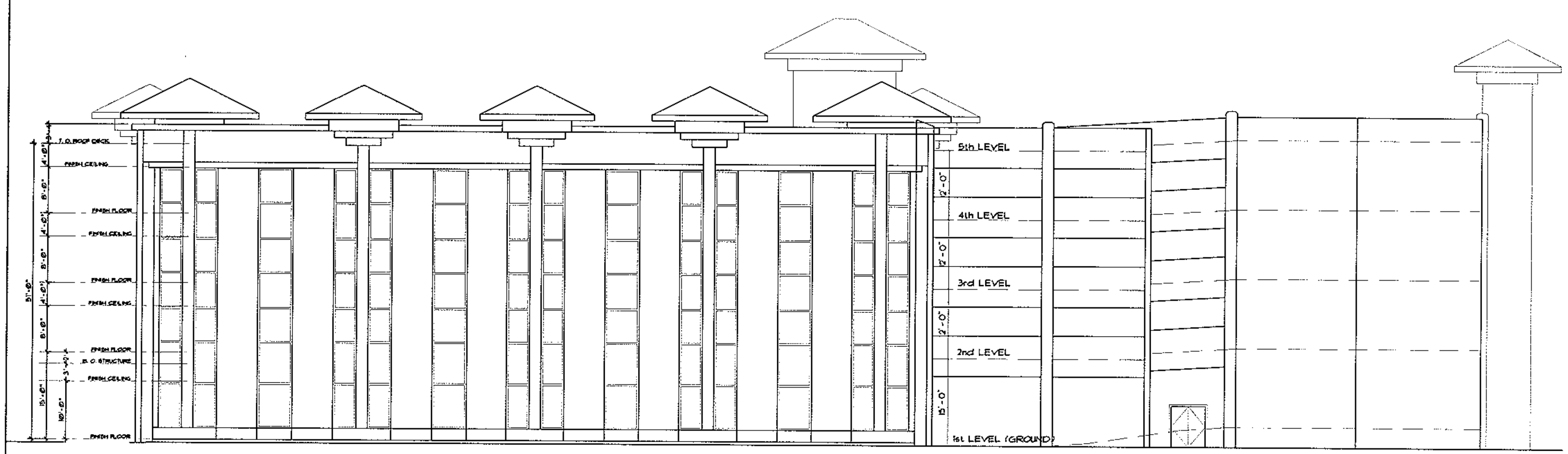
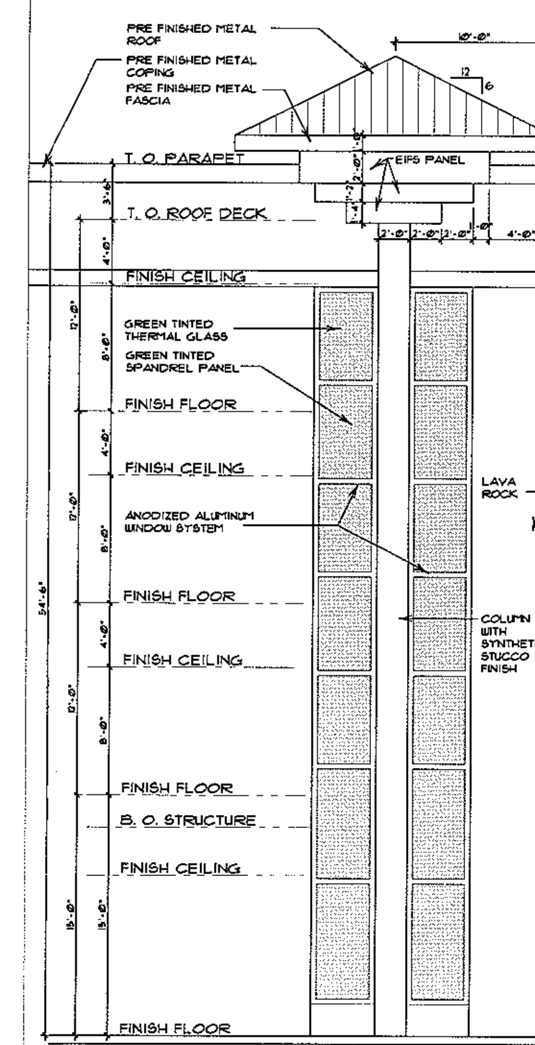
OF



1 WEST ELEVATION
3/32" = 1'-0"



1 EAST ELEVATION
3/32" = 1'-0"



4 TYP BAY ELEVATION
SCALE 3/16" = 1'-0"

PRELIMINARY

HARRISON G FAGG & ASSOCIATES - ARCHITECTS & ENGINEERS
JACK CLARK - SHERRIL F. BURKE - MICHAEL J. BURKE - JEFFREY WINKLER • MEMBER OF THE AMERICAN INSTITUTE OF ARCHITECTS
HGFA ARCHITECTS
800 GRANITE TOWER, BILLINGS, MONTANA 59101 - PH (406) 248-7811 - FAX (406) 259-9278 - Email HGFA@hgfa.net

DRAWN BY	KAK
CHECKED BY	HGF
JOB NO.	2637
DATE	12-11-06
DRAWING TITLE	EAST/WEST ELEVATIONS
JOB TITLE	MAUI MEDICAL PLAZA

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